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Contested Compromise: Public Policy Reforms as Share Contests

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ABSTRACT

Public policy reforms often benefit certain societal groups while being costly for others. Both supporters and opponents of reforms can form lobby groups to influence the policy outcome in their preferred direction. This paper presents a simple two-stage model of a public policy reform that results from the partial implementation of a policy proposal. The compromise is modeled as a share contest. I analyze the influence of lobby groups on equilibrium policies and how regulators' preferences for lobbying activities influence the policy proposal. The results show that in regimes where these activities are regarded as harmful, lobby efforts lead to modest reform proposals and equilibrium reforms, whereas in regimes where regulators favor lobbying activities the levels of reform proposal and resulting policy are higher. Interest groups that suffer costs from the reform are always better off in regimes that regard lobbying as harmful, whereas groups that profit from a reform can be better off with regulators that favor lobby contributions.

JEL Classification: C72, D72, H40

1 | Introduction

Policy reforms create winners and losers in an economy. Affected firms or societal groups often organize in lobby groups to influence the political process in their preferred direction: those that benefit from a reform engage to support it and those who have to bear the costs try to impede its implementation. This is the case in various policy fields including climate policy (Meng and Rode 2019; Hagen and Schopf 2024), trade policy (Blanga-Gubbay et al. 2025), energy policies (Kang 2016), and immigration (Facchini et al. 2011). Regulators are aware of such lobbying activities and can tailor their reforms according to their preferences about lobbying. Some policymakers are in favor of lobby contributions, while others view lobbying as harmful and therefore try to avoid it. Having preferences for lobby contributions does not necessarily imply accepting bribery but can also mean that campaign contributions are considered as beneficial.[1]

This position is reflected in much of the economic literature on lobbying following Grossman and Helpman (1994), sometimes called quid pro quo lobbying (Bombardini and Trebbi 2020). In contrast, the view that lobbying is harmful aligns with the rent-seeking literature with seminal contributions by Tullock (1967) and Krueger (1974), which emphasizes that lobbying not only leads to potentially harmful policy distortions but also causes social costs by diverting resources to unproductive lobbying activities that could be used elsewhere. Public criticism of lobbying comes from across the political spectrum (Hasen 2012).

I study how preferences for or against lobby contributions affect the level of policy reforms, and whether these preferences are beneficial or detrimental to supporters and opponents of the reform. To do so, I analyze a two-stage model of public policy reforms in which a regulator makes a first proposal for a reform, which is afterward contested between supporters and opponents.

I assume that costs for opponents are convex and benefits for supporters are concave in the level of the implemented reform. This implies that a higher reform proposal increases the stakes for both groups and increases the marginal costs for opponents but decreases the marginal costs for supporters of the reform. The second stage is modeled as a share contest that results in partial implementation of the proposal as a compromise. I find that an increase in the politicians' preferences for lobby efforts leads to more ambitious public policy proposals and a higher level of equilibrium policies. Furthermore, the results show that interest groups that incur costs from policy reforms are always better off with regulators that regard lobbying as harmful, whereas groups that benefit from the reform can be better off with regulators that favor lobby contributions.

This paper contributes to the literature on the influence of lobby groups on public policy.[2] One strand of this literature studies ex-ante lobbying, with lobbying taking place before policies are chosen. This literature often uses models in line with Grossman and Helpman (1994),[3] where in the first stage, lobby groups provide a menu of contributions to the policymaker, depending on the policy choice. Then, the policymaker decides about the implemented policy, maximizing a weighted sum of political contributions and welfare. This large literature includes applications to various policy fields such as trade (Grossman and Helpman 1994; Goldberg and Maggi 1999), or environmental policies (Aidt 1998; Marchiori et al. 2017; Hagen et al. 2021). Another strand of literature studies lobbying that takes place after policy proposals are made, assuming that the lobby groups compete about the (probability of) implementation of a policy that is proposed in the first stage. You (2017) explicitly studies the issue of timing and finds that policies with high collective benefits draw mainly ex-ante lobbying, whereas ex-post lobbying targets policies with rather particularistic provisions.

I add to the literature that studies competing lobby groups that influence public policy after policy proposals have been made by applying contest theory. An extensive presentation of such approaches is provided by Epstein and Nitzan (2007) and recent contributions include applications in specific policy fields (Kang 2016; Meng and Rode 2019; Blanga-Gubbay et al. 2025). Previous studies have used two-stage games in which a regulator moves first, followed by a rent-seeking contest between lobby groups (Appelbaum and Katz 1987; Baye et al. 1993; Epstein and Nitzan 2002; MacKenzie 2017). So far, this literature has analyzed winner-takes-all contests, in which the winner receives the entire rent with a certain probability. Besides this interpretation, contests in the spirit of Tullock can be interpreted as share contests, where the winner receives a deterministic share of the rent, based on relative rent-seeking efforts. While those two interpretations are equivalent if utility is linear in the size of the obtained rent, this is not the case otherwise. In public policymaking, we can assume that linear benefits from policies are rather an exceptional case. Dickson et al. (2018) provide a novel theory that allows to study share contests between players with more realistic preferences, which include decreasing marginal benefits from the contest allocation.

Building on this theory, I present a simple two-stage model of endogenous public policy reform to analyze asymmetric effects of political preferences regarding rent-seeking activities on supporters and opponents of a reform. In the first stage, a regulator makes a proposal for a policy reform. Then, a reformer lobby and a lobby that prefers the status quo, in the following *reformers* and *conservatives*,[4] engage in a share contest that determines the implemented compromise between the status quo and the reform proposal in the second stage. The regulator has an interest to maximize welfare, which she trades off against a preference for or against lobbying efforts. Closest to this paper is Cardona et al. (2022), who compare share and winner-takes-all (lottery) contests for lobbying. Their focus is on cases, where lobbyists select policy proposals themselves before they engage in a contest to support their own proposal.[5] They show that in this setting, lobbyists moderate their proposals in winner-takes-all contests to reduce lobby efforts in the second stage. In share contests, this is not the case. This paper, in contrast, focuses on a setting where the policy proposal is made by a policymaker that has preferences for or against lobby-contributions and the contest is modeled as a share contest. A comparison with a winner-takes-all setting, in which the second stage is a lottery contest about the probability of implementing the proposed reform shows that policymakers that are neutral toward lobbying efforts choose policy proposals that are lower than the equilibrium compromise in case of a share contest to increase the probability of implementation.

This paper is the first to study the choice of endogenous policy reform proposals by policymakers followed by a share contest between lobby groups with nonlinear returns from the contest allocation. The model applies to various contexts of public policy reforms, including climate policies, where environmental NGOs (reformers) and fossil fuel industries (conservatives) compete, and containment policies in the case of a pandemic, where vulnerable groups (reformers) profit from strong policies, whereas restricted businesses (conservatives) suffer costs. In particular, a share contest is better suited than a winner-takes-all contest to study cases where public policy is chosen on a continuum. Examples include the level of a tax or a subsidy, the stringency of standards, minimum wage levels, or the level of an emissions cap.

The remainder of the paper is structured as follows: In Section 2, I present the model and solve the policy contest of the-second stage. I analyze the choice of the reform proposal (the first stage) in Section 3, Section 4 summarizes the comparison with the alternative setting of a winner-takes-all contest, and Section 5 concludes.

2 | The Policy Contest

The model embeds a share contest for public policies (Dickson et al. 2018) where lobby groups have nonlinear utility from the size of the implemented reform[6] in a game where a regulator endogenously decides about the size of the policy proposal. The two-stage setting is in line with previous work that analyzes endogenous public policy choice as a winner-takes-all game (Appelbaum and Katz 1987; Baye et al. 1993; Epstein and Nitzan 2002; MacKenzie 2017). A policy reform in one political dimension can potentially have three effects on parts of the population: some parts (reformers) profit from the reform, some parts (conservatives) suffer costs and therefore prefer the status

quo, whereas other parts are not affected at all. For simplicity, I assume that the affected fractions of the economy are organized in two aggregate lobby groups:[7] one that represents the interests of the reformers and one that represents the interests of the conservatives. The political process is modeled as a two-stage game. In the first stage, a regulator proposes a reform of a public policy. In the second stage, lobby groups influence the political decision and the implemented policy results from a share contest as a compromise between the original proposal and the status quo.

In the second stage, the interest groups take the level of the proposed policy reform R as given and engage in a share contest about the implemented compromise ρ between the status quo and the proposal. They exert rent-seeking efforts x^i with $i \in \{r, c\}$ where superscript r denotes reformers and superscript c conservatives. Total rent-seeking efforts are $X = x^r + x^c$. I denote by $\sigma^i = \phi(x^i, x^{-i})$ the *share of the compromise*, which determines how far the group can influence the compromise in its preferred direction, where x^{-i} denotes the rent-seeking efforts of the other lobby group. $\phi(x^i, x^{-i})$ is the contest success function and, for simplicity, I assume the simple Tullock-contest success function with

$$\phi^i(x^i, x^{-i}) = \frac{x^i}{x^i + x^{-i}} \quad \text{if } X > 0, \text{and} \qquad \phi^r(0,0) = 1. \tag{1}$$

In the absence of lobbying, I assume that the suggested reform proposal is fully implemented. The reformer lobby would always prefer the case of no lobbying, as this would result in their preferred policy without requiring lobby contributions. However, the conservative lobby group can always choose an (infinitely) small positive amount of lobby contributions l that guarantees $\pi^c(0, l) > \pi^c(R, 0)$, which requires $0 < l < c(R)$. Thus, the reformer lobby will always be active and we can thus focus on lobbying contests with active participants. The size of the implemented policy reform is given by $\rho = \sigma^r R = R - \sigma^c R = (1 - \sigma^c)R$.[8] The costs from an implemented reform for the conservative lobby, $c(\rho)$, are strictly increasing and convex in the size of the policy, $c(0) = 0, c'(\rho) > 0, c''(\rho) > 0$. The payoffs of the conservative lobby are given by

$$\pi^c(\rho, x^c) = -c(\rho) - x^c. \tag{2}$$

The benefits for the reformer lobby $b(\rho)$ are strictly increasing and concave in the size of the implemented policy, $b(0) = 0, b'(\rho) > 0, b''(\rho) < 0$, and the lobby's payoff is given by

$$\pi^r(\rho, x^r) = b(\rho) - x^r. \tag{3}$$

The benefits and costs of a reform are depicted in Figure 1.

Both lobby groups maximize π^i s.t. $\rho = \sigma^r R$, which gives the first-order conditions for the reformer lobby group[9]

$$\frac{1}{b'(\rho)} = \frac{x^c}{(x^c + x^r)^2} R, \tag{4}$$

and the conservative lobby group

$$\frac{1}{c'(\rho)} = \frac{x^r}{(x^c + x^r)^2} R. \tag{5}$$

The equilibrium shares and total efforts of the lobby groups are thus implicitly defined by

$$\frac{1}{b'(\sigma^r R)} - (1 - \sigma^r)\frac{R}{X} = 0 \tag{6}$$

for the reformers, and

$$\frac{1}{c'((1 - \sigma^c)R)} - (1 - \sigma^c)\frac{R}{X} = 0 \tag{7}$$

for the conservatives. Writing the resulting equilibrium shares as a function of X and R, $\sigma^i = s^i(X, R)$, so that Equation (6) defines $s^r(X, R)$ and Equation (7) defines $s^c(X, R)$, allows to show by implicit differentiation that

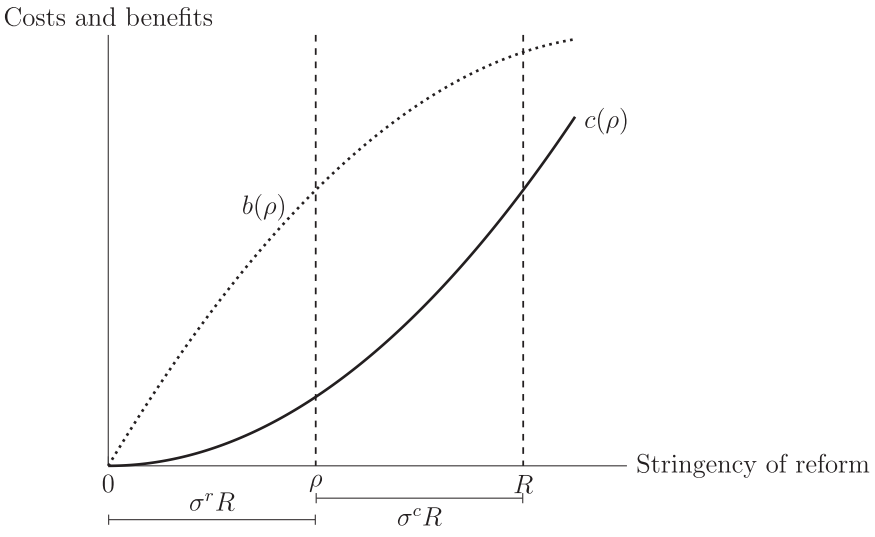

FIGURE 1 | Costs and benefits of a reform.

$$s_X^r = -\frac{(1-\sigma^r)\frac{R}{X^2}}{\frac{-b''(\sigma^r R)R}{b'(\sigma^r R)^2} + \frac{R}{X}} < 0 \tag{8}$$

and

$$s_X^c = -\frac{(1-\sigma^c)\frac{R}{X^2}}{\frac{c''((1-\sigma^c)R)R}{c'((1-\sigma^c)R)^2} + \frac{R}{X}} < 0, \tag{9}$$

as well as

$$\begin{aligned} s_R^r &= -\frac{\frac{-b''(\sigma^r R)\sigma^r}{b'(\sigma^r R)^2} - (1-\sigma^r)\frac{1}{X}}{\frac{-b''(\sigma^r R)R}{b'(\sigma^r R)^2} + \frac{R}{X}} \\ &= \frac{(1-\sigma^r)b'(\sigma^r R)^2 + X\sigma^r b''(\sigma^r R)}{R(b'(\sigma^r R)^2 - Xb''(\sigma^r R))} \end{aligned} \tag{10}$$

and

$$s_R^c = -\frac{\frac{-c''((1-\sigma^c)R)(1-\sigma^c)}{c'((1-\sigma^c)R)^2} - (1-\sigma^c)\frac{1}{X}}{\frac{c''((1-\sigma^c)R)R}{c'((1-\sigma^c)R)^2} + \frac{R}{X}} = \frac{1-\sigma^c}{R} > 0. \tag{11}$$

From Equations (8)–(11), I can derive the first result, which draws on Proposition 3 in Dickson et al. (2018) that provides a general condition for whether rent-seeking efforts in share contests are increasing or decreasing in the size of the rent, defining the equilibrium aggregate rent-seeking efforts as a function of the reform proposal $X(R)$. It is proven in Appendix A2 that

Proposition 1. *Total equilibrium rent-seeking efforts increase in the level of the reform proposal*, $X'(R) > 0$.

The sum of lobby contributions from reformer and conservative lobby groups increases with the level of the policy reform that is proposed in the first stage. Although this result seems intuitive, Dickson et al. (2018) have shown that the conventional wisdom of contest effort that increases with the rent size does not have to hold in share contests with nonlinear utility from the obtained rent. It is thus important to note, that in this setting, it holds on an aggregate level. This result has to be seen in context of the specific implications of the model assumptions for the effect of an increase R on the lobby groups: While in normal rent-seeking contests all contestants prefer a higher rent, in our setting conservatives dislike a higher R, since it increases their potential total costs as well as marginal costs which strongly increases their stakes in the contest. In contrast, increasing R decreases the marginal benefits for the reformers and thus has an asymmetric effect on the two lobby groups. These implications of an increase in R can be seen in Figure 1, considering that for given lobby contributions an increase in R also increases ρ. Proposition 1 shows that a monotonic relationship between R and X always results from these different effects. However, Proposition 1 does not necessarily imply that both lobby groups will increase their contributions. Indeed, Lemma 1, which is proven in Appendix A3, shows that this is not the case.

Lemma 1. *If the policy reform proposal increases, the reformer lobby decreases [increases] its lobby contributions if and only if*

$$b''(\sigma^r R) < [>] - \frac{(b'(\sigma^r R))^2\Big((c'(\sigma^r R))^2 + \sigma^r X c''(\sigma^r R)\Big)}{\sigma^r X (c'(\sigma^r R))^2}.$$

This result shows that equilibrium contributions from the reformer lobby can decrease with a higher reform proposal if the marginal benefits are strongly decreasing in the level of the implemented reform. Then, for low levels of an implemented reform, the lobby has much higher marginal benefits compared to higher reform levels. If the proposed reform level is low, the group thus will always have high marginal benefits from increased levels of the implemented reform and compete fiercely to increase the equilibrium level of reform. Increasing the reform proposal lowers the average marginal benefits from the reform for the reformers, and this effect is stronger if the marginal benefits are decreasing strongly. As the contest is about the share of the reform but the benefits depend on the implemented level, an increasing proposal implies that the same level of reform is reached with a smaller share of the total reform proposal, and the incentives to secure a larger share through higher lobby contributions are decreasing. If the marginal costs for the conservative lobby increase strongly, the lobby will engage heavily to avoid a higher equilibrium reform if the proposal increases. If this is not the case, an increasing reform proposal affects the incentives between the lobby groups such that the efforts of the reformer lobby are decreasing. However, this does not imply that the equilibrium level of reform has to decrease. Lemma 2 turns to the effects of a higher reform proposal on the level of equilibrium policy and is proven in Appendix A4.

Lemma 2. *A higher level of the proposed policy reform leads to a higher level of equilibrium policy*, $\rho_R > 0$.

Although we have seen from Lemma 1 that the lobby payments of the reformer lobby can decrease with an increasing reform proposal, Lemma 2 shows that this effect is never strong enough to make the equilibrium policy decrease with an increase of the reform proposal.

3 | The Choice of the Policy Reform Proposal

In the first stage, the regulator weighs social welfare, which, assuming that all interests of society connected to the policy reform are represented through the interest groups, is given by the sum of their payoffs and the preferences for lobby contributions[10] according to her objective function

$$\begin{aligned} B(R) &= \alpha(\pi^c(\rho, x^c) + \pi^r(\rho, x^r)) + (1-\alpha)X(R) \\ &= \alpha(b(s^r(X(R), R)R) - c(s^r(X(R), R)R)) \\ &\quad + (1-2\alpha)X(R), \end{aligned} \tag{12}$$

with $\alpha \in [0, 1]$. Depending on the political system and the preferences of the regulator, lobby contributions can enter the objective function $B(R)$ positively or negatively,[11] depending on α: With $\alpha = 1$ lobbying is regarded as wasteful. With $\alpha = 0$ the regulator tries to maximize lobby contributions and completely disregards welfare.[12] With $\alpha = 0.5$ lobbying is regarded as

neutral for society. A regulator that favors lobby contribution is characterized by $\alpha < 0.5$, whereas $\alpha > 0.5$ characterizes a regulator that regards lobbying as harmful. In the following, the notation $\overline{\alpha}$ and $\underline{\alpha}$, such that $\underline{\alpha} < 0.5 < \overline{\alpha}$, will be useful. As a benchmark comparison, I further denote the level of reform that a regulator would implement directly to maximize societal net benefits of the reform if no lobbying would take place, i.e., the socially optimal reform, by $\bar{\rho}$. In Appendix A5, I prove.

Lemma 3. *If lobby contributions are regarded as neutral for society, the regulator chooses the policy reform proposal such that the resulting equilibrium policy is at the level that would be chosen if no lobbying would take place.*

It is important to note, that although the resulting equilibrium policy is at the same level as without lobbying, both lobby groups are worse off. Without lobbying, they would face the same level of costs and benefits from the policy while avoiding the costs of lobby contributions. Lemma 3 appears intuitive, because a regulator that is neutral toward lobbying can still achieve the socially optimal level of reform and simply disregards the lobby expenditures leading to it. However, in case of a winner-takes-all contest a neutral regulator would choose a lower reform proposal (see Section 4 and Appendix A8).

Proposition 2. (*i*) *If* $\alpha > 0.5$, *the resulting equilibrium policy is lower than* $\bar{\rho}$, *and* (*ii*) *if* $\alpha < 0.5$, *the resulting level of equilibrium policy will be higher than* $\bar{\rho}$.

The intuition behind this result, which is proven in Appendix A6, is as follows. If the regulator has preferences for [against] lobby contributions, she is willing to sacrifice payoffs of the interest groups to increase [reduce] lobby contributions. From Proposition 1 we know that a higher reform proposal leads to higher aggregate lobby contributions. Thus, if the regulator has preferences for [against] such contributions, this leads to an upward [downward] deviation from the socially optimal policy to influence the resulting lobby contest in the preferred direction. Considering Lemma 2, this implies also that the equilibrium policy level will be distorted upwards [downwards] if the regulator favors [dislikes] lobby contributions.

Proposition 3.

i. *The conservative lobby is better off if lobby contributions are regarded as harmful to society than if lobbying is regarded as neutral. If the regulator favors lobby contributions, it is worse off:*

$$\pi^c(\rho^*(\overline{\alpha})) > \pi^c(\bar{\rho})) > \pi^c(\rho^*(\underline{\alpha})).$$

ii. *For a reformer lobby, the payoff ranking depends on the curvature of the benefits from the implemented reform as follows: If and only if*

$$b''(\sigma^r R) < \frac{(b'(\sigma^r R))^2\left(Rb'(\sigma^r R)(c'(\sigma^r R))^2 - \sigma^r X^2 c''(\sigma^r R) - X(c'(\sigma^r R))^2\right)}{\sigma^r X^2 (c'(\sigma^r R))^2},$$

then

$$\pi^r(\rho^*(\overline{\alpha})) < \pi^r(\bar{\rho})) < \pi^r(\rho^*(\underline{\alpha})).$$

Otherwise, the reformer lobby has the same payoff ranking as the conservative lobby.

Proposition 3, which is proven in Appendix A7, shows how political preferences regarding lobby contributions affect the payoffs of lobby groups as a result of the change in the level of the reform proposal. We know from Proposition 2 that a preference for lobby contributions leads to a higher reform proposal and from Lemma 2 that a higher reform proposal results in a higher equilibrium policy. This affects the conservative lobby's payoffs negatively in two ways: the higher reform proposal leads to higher equilibrium contributions for the conservatives, and the higher equilibrium policy leads to higher costs from the reform. In other words, the conservative lobby pays more and gets a worse policy outcome compared to a regulator that doesn't care about the lobby contest (i). For the reformers the picture is different and depends on the slope of the marginal benefits from the reform. A higher proposed policy results in a higher equilibrium policy that is favorable from the perspective of the reformer lobby. If the marginal benefits decrease strongly, the reformers even decrease lobbying efforts and gain through two channels: they pay less lobby contributions and get a more favorable policy that provides higher benefits. If this condition does not hold, they will increase their efforts and get a more favorable policy. This can include cases where the benefits from a favorable policy more than compensate for the higher contributions (ii) and cases where the higher benefits from the policy reform do not compensate for the higher outlays in the lobby contest with fierce competition. This implies that the conservative lobby always prefers a regulator that regards lobbying as harmful over a regulator that regards lobbying as neutral, whereas a reformer lobby can prefer a regulator that favors lobby contributions.

4 | Comparison With Winner-Takes-All Contest

To compare the results with the alternative setting of a winner-takes-all contest between lobby groups in the second stage of the game, I study this alternative model specification in Appendix A8. The most important results of this analysis are the following: While for linear benefits and costs, the equilibrium contributions in both types of contests would be the same, they differ otherwise. In case of a winner-takes-all contest, equilibrium contributions of either of the lobby groups can be decreasing with increasing reform proposals, but total lobby contributions always increase, which is similar to the case of the share contest (Proposition 1). It is important to highlight that in case of a lottery contest, the implementation of the reform is always all-or-nothing, i.e. either the full proposal R will be implemented or the status quo persists. Then, σ^r denotes the probability that the full reform will be implemented. In case of the winner-takes-all contest σ^r can be either increasing or decreasing in the size of the reform proposal (Lemma 4). Considering the choice of the reform proposal in the first stage

of the game and its influence on the payoffs of the lobby groups, the suggested reform proposal in case of a winner-takes-all contest does not lead to the same equilibrium reform as the socially optimal in absence of lobbying, as the suggested reform is either fully implemented or the status quo is maintained. In contrast, the regulator chooses a reform proposal that is below the level chosen in absence of lobbying, to increase the probability of implementation (Proposition 4). As in the case of a share contest, increasing the taste for lobby contributions increases the level of reform proposal (Proposition 5) and the conservative lobby is better off with a policymaker that regards lobbying as harmful than with one that favors lobby contributions (Proposition 6). For the reformer lobby, the payoff ranking can be reversed, but depends on a different condition than in the case of a share contest. In summary, the result that a preference for lobby contributions increases the level of reform proposals is robust also in case of a winner-takes-all contest. However, a winner-takes-all contest between lobby groups leads to suboptimally low reform proposals by neutral policymakers whereas they reach the socially optimal level of reform in case of a share contest (Lemma 3).

5 | Conclusion

Public policy reforms often result from a political contest in which an initial policy proposal is supported and opposed by lobby groups that represent the interests of different societal groups affected by the reform. In this paper I present a model of such a contest that considers nonlinear utility from the implemented policy for the interest groups, which is arguably reasonable for policy reforms, building on a novel theory by Dickson et al. (2018).

My findings show that, with a regulator that tries to avoid lobbying contests, conservative groups that would incur costs from a large policy reform are better off, compared to a regulator that favors lobby contributions. In contrast, reformer groups that profit from a change in the policy can profit from a regulator favoring lobby contributions. I have shown how preferences for lobby contributions, although not biased toward any particular group, can lead to reform proposals that benefit some special interest groups while harming others. For the politico-economic reality, the results imply that systematically fueling or constraining the policy contest that shapes political compromise can implicitly favor particular groups. I provide an explanation of how the interests of lobby groups that suffer costs from high levels of certain policies align well with regulators that try to avoid political rent-seeking. Viewing intensive lobbying as welfare-detrimental can systematically hamper reforms and play into the hands of those with an interest in maintaining the status quo.

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Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Endnotes

[1] Political action committees raised approximately $15.7 billion in the U.S. 2023–2024 election cycle (Federal Election Commission 2025).

[2] For a recent general overview of formal models of lobbying from a political science perspective see Schnakenberg and Turner (2024).

[3] Voss and Schopf (2018) compare this model with Nash bargaining between the government and the lobby groups and find that the two approaches usually imply different sets of lobbies.

[4] Note that the term *conservative* does not describe a political ideology here but the fact that this group aims to *conserve* the status quo. Depending on the actual context, these can be groups from the whole political spectrum.

[5] Such endogenous proposals by contestants are also studied by e.g. Münster (2006) and Cardona et al. (2021).

[6] Dickson et al. (2018) suggest in Section 5.1 and Footnote 11 to apply their model to a setting with rent-seeking over public policy, that is similar to the second stage analyzed in this paper, but does not consider a regulator that makes an endogenous reform proposal.

[7] The formation of such interest groups has been studied by e.g. Olson (1965) and Damania and Fredriksson (2000).

[8] Figure A1 in Appendix A1 depicts the share of the implemented reform determined as the outcome of the contest, for different levels of lobbying.

[9] The second-order conditions are given by $\frac{Rx^c(Rx^c b''(\rho) - 2(x^r + x^c)b'(\rho))}{(x^r + x^c)^4} < 0$ for the reformer and by $-\frac{Rx^r(Rx^r c''(\rho) + 2(x^r + x^c)c'(\rho))}{(x^r + x^c)^4} < 0$ for the conservative lobby group. Given the assumptions of the model, these always hold.

[10] For a discussion and further applications of this assumption see e.g. Persson and Tabellini (2000), Besley and Coate (2001), Grossman and Helpman (2001), Epstein and Nitzan (2007).

[11] Positive weights can be motivated as campaign contributions or bribes and are used by e.g. Grossman and Helpman (2001) and Besley and Coate (2001). Negative weights correspond to the assumption that resources spent to influence policies are wasteful, see e.g. Tullock (1967), Krueger (1974), Posner (1975).

[12] This extreme case corresponds to models of optimal contest design, where the regulator only cares about lobby contributions as in e.g. Baye et al. (1993).

[13] Note that the model assumptions of $b(0) = 0, c(0) = 0, b'(0) > 0, c'(0) = 0, c''(R) > 0$, and $b''(R) < 0$ imply that $c'(R) = b'(R) \Rightarrow b(R) \neq c(R)$.

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Appendix A

A.1 | Share of implemented reform

Figure A1 depicts the outcome share σ^r of the contest, for three different levels of lobbying by the conservative group and varying lobbying efforts by the reformer group.

A.2 | Proof of Proposition 1

Proof. Writing $1 = s^r(X(R), R) + s^c(X(R), R)$, with $X(R)$ denoting equilibrium efforts, and differentiating implicitly gives

$$X'(R) = -\frac{s_R^r + s_R^c}{s_X^r + s_X^c}. \tag{A1}$$

Equations (8) and (9) show that both s_X^r and s_X^c are negative so that

$$Sgn\{X'(R)\} = Sgn\left\{s_R^r + s_R^c\right\}. \tag{A2}$$

Using (10) and (11) I can show that this is always positive:

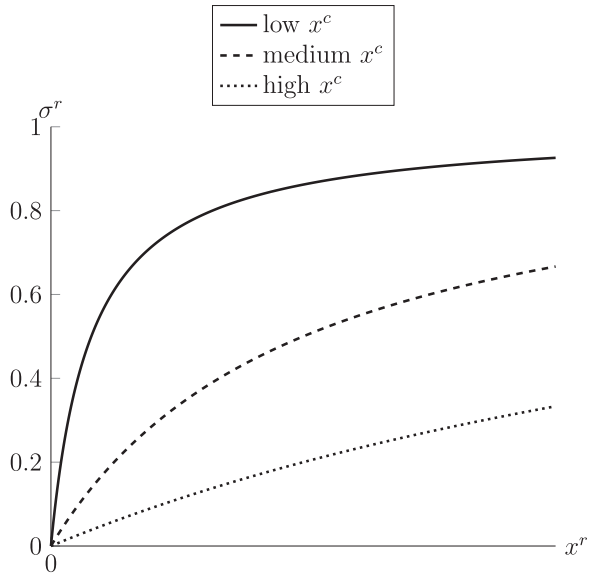

FIGURE A1 | Share of implemented policy reform.

$$s_R^r + s_R^c = \frac{b'(\sigma^r R)^2}{R(b'(\sigma^r R)^2 - RXb''(\sigma^r R))} > 0. \tag{A3}$$

□

A.3 | Proof of Lemma 1

Proof. We know that $x^i = \sigma^i X$ and define the equilibrium efforts of group i as a function of the reform proposal $x^i(R) = s^i(X(R), R))X(R)$. Therefore,

$$x^{i'} = s_R^i(X(R), R)X + X'(R)s^i(X(R), R).$$

By using (8)–(11), and (A1), we get

$$x^{r'} = \frac{\begin{array}{l}\sigma^r X\Big((b'(\sigma^r R))^2\Big((c'(\sigma^r R))^2 + \sigma^r X c''(\sigma^r R)\Big) \\ + \sigma^r X b''(\sigma^r R)(c'(\sigma^r R))^2\Big)\end{array}}{\begin{array}{l}R\Big((b'(\sigma^r R))^2\Big((c'(\sigma^r R))^2 - (\sigma^r - 1)X c''(\sigma^r R)\Big) \\ - \sigma^r X b''(\sigma^r R)(c'(\sigma^r R))^2\Big)\end{array}} \tag{A4}$$

Further inspection shows that the denominator of (A4) is positive and thus

$$\begin{array}{l}x^{r'} \lessgtr 0 \Leftrightarrow \sigma^r X\Big((b'(\sigma^r R))^2\Big((c'(\sigma^r R))^2 + \sigma^r X c''(\sigma^r R)\Big) \\ + \sigma^r X b''(\sigma^r R)(c'(\sigma^r R))^2\Big) \lessgtr 0.\end{array} \tag{A5}$$

This can be rearranged to

$$x^{r'} \lessgtr 0 \Leftrightarrow b''(\sigma^r R) \lessgtr -\frac{(b'(\sigma^r R))^2\Big((c'(\sigma^r R))^2 + \sigma^r X c''(\sigma^r R)\Big)}{\sigma^r X (c'(\sigma^r R))^2}. \tag{A6}$$

□

A.4 | Proof of Lemma 2

Proof. Considering that $\rho = \sigma^r R = s^r(X(R), R)R$, I can write

$$\frac{ds^r(X(R), R)R}{dR} = R\Big(s_R^r + s_X^r X'(R)\Big) + s^r(X(R), R),$$

which, using the above results, after some algebraic manipulations can be written as

$$\rho_R = -\frac{\sigma^r (b'(\sigma^r R))^2 (c'(\sigma^r R))^2}{\begin{array}{l}\sigma^r X b''(\sigma^r R)(c'(\sigma^r R))^2 - (b'(\sigma^r R))^2 \\ ((c'(\sigma^r R))^2 - (\sigma^r - 1)X c''(\sigma^r R))\end{array}} > 0. \tag{A7}$$

□

A.5 | Proof of Lemma 3

Proof. The first-order conditions of the regulator's optimization problem are given by

$$B'(R) = \alpha(b'(\rho) - c'(\rho))\rho_R + (1 - 2\alpha)X'(R) = 0. \tag{A8}$$

The second-order condition for the regulator is given by

$$\begin{array}{l}B''(R) = \alpha(\rho_R(b''(\rho) - c''(\rho)) + \rho_{RR}(b'(\rho) - c'(\rho)) \\ + (1 - 2\alpha)X''(R) < 0.\end{array} \tag{A9}$$

This always holds for the case of $\alpha = 0.5$, which implies $b'(\rho) - c'(\rho) = 0$ (see below). Then, the condition requires just

$$\rho_R(b''(\rho) - c''(\rho)) < 0, \tag{A10}$$

which always holds. Otherwise it requires

$$\rho_R(b''(\rho) - c''(\rho)) < -\Big(\rho_{RR}\Big(b'(\rho) - c'(\rho) + \Big(\frac{1}{\alpha} - 2\Big)X''(R)\Big). \tag{A11}$$

We assume that this holds so that there exists an internal solution that maximizes the policymaker's objective. This can always be guaranteed by choosing an α sufficiently close to 0.5. Note, however, that there can also exist cases, where the regulator chooses a corner solution of either $R \to \infty$ or $R \to 0$. The latter cases imply that the regulator is so averse against lobby contributions that she abstains from any reform proposal, whereas the former would imply that the policymaker has such an high weight on lobby contributions, that she chooses an infinitely high reform proposal to collect high lobby contributions.

In absence of lobbying, the regulator would choose the directly implemented reform $\bar{\rho}$ to maximize welfare, given by

$$W(\bar{\rho}) = b(\bar{\rho}) - c(\bar{\rho}). \tag{A12}$$

From (A7) we know that $\rho_R > 0$ so that if $\alpha = 0.5$ the equilibrium level of ρ satisfying (A8) is implicitly given by

$$b'(\rho) = c'(\rho). \tag{A13}$$

This is exactly the first-order condition for the maximization of (A12). □

A.6 | Proof of Proposition 2

See Figure A2.

Proof. Denote the socially optimal level of reform $\bar{\rho}$. Both (i) and (ii) follow from further inspection of (A8) and Proposition 1. I can rewrite (A8) as

$$\alpha b'(\rho) + \frac{(1 - 2\alpha)X'(R)}{\rho_R} = \alpha c'(\rho), \tag{A14}$$

and the resulting level of reform is implicitly defined as $\rho^*(\alpha)$ that solves

$$c'^{-1}\Big(b'(\rho) + \frac{(1 - 2\alpha)}{\alpha}\Delta\Big) = \rho \tag{A15}$$

with

$$\Delta := \frac{X'(R)}{\rho_R}. \tag{A16}$$

Using (8)–(11), (A1) and (A7), I can show that

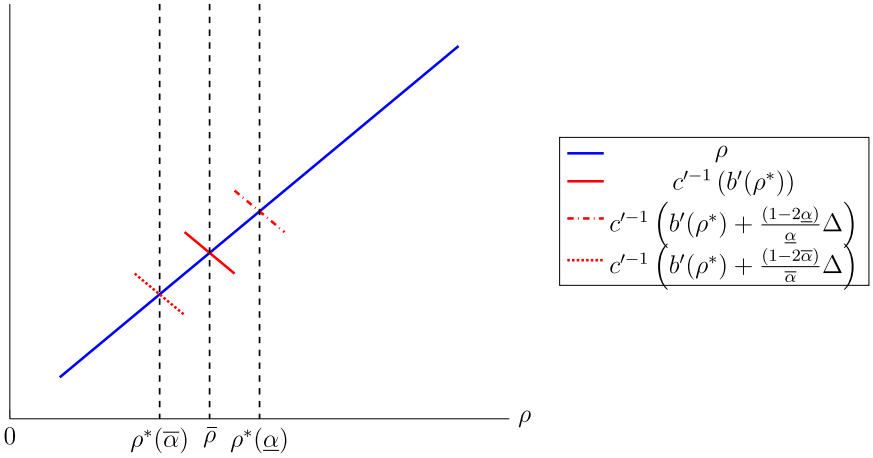

FIGURE A2 | Equilibrium level of reform. Note that $c'^{-1}(b'(\rho^*))$, $c'^{-1}\left(b'(\rho^*)+\frac{(1-2\underline{\alpha})}{\underline{\alpha}}\Delta\right)$, and $c'^{-1}\left(b'(\rho^*)+\frac{(1-2\overline{\alpha})}{\overline{\alpha}}\Delta\right)$ are generally not linear but decreasing at the intersection if the second-order condition for the regulator holds. [Color figure can be viewed at wileyonlinelibrary.com]

$$\Delta = \frac{X(Xc''(\rho)+c'(\rho)^2)}{\rho c'(\rho)^2} > 0. \tag{A17}$$

As $b''(.) < 0$ and $c''(.) > 0$, the LHS of (A15) is decreasing in ρ for $\alpha = 0.5$. Consider $\overline{\alpha}$ and $\underline{\alpha}$ such that $\underline{\alpha} < 0.5 < \overline{\alpha}$, then it is shifted upwards for $\underline{\alpha}$ and shifted downwards for $\overline{\alpha}$ as depicted in Figure A2. This implies that $\rho^*(\overline{\alpha}) < \bar{\rho}$ for $\overline{\alpha} > 0.5$ and $\rho^*(\underline{\alpha}) > \bar{\rho}$ for $\underline{\alpha} < 0.5$. □

A.7 | Proof of Proposition 3

Proof. By using (8)–(11), and (A1), we get

$$x^{c'} = \frac{\begin{array}{l} X\Big(\sigma^{r2}Xb''(\sigma^rR)(c'(\sigma^rR))^2+(\sigma^r-1)(b'(\sigma^rR))^2 \\ \Big((c'(\sigma^rR))^2+(\sigma^r+1)Xc''(\sigma^rR)\Big)\Big) \end{array}}{\begin{array}{l} R\Big(\sigma^rXb''(\sigma^rR)(c'(\sigma^rR))^2-(b'(\sigma^rR))^2 \\ \Big((c'(\sigma^rR))^2-(\sigma^r-1)Xc''(\sigma^rR)\Big)\Big) \end{array}} > 0. \tag{A18}$$

i. now follows from (2), (A18), and (A7).

I have shown in Lemma 2 that $\rho_R > 0$. Thus it follows from (3) that $x^{r'} < 0 \Rightarrow \pi^r_R > 0$. Inspecting (3) also shows that decreasing contributions are not necessary for higher payoffs: if higher benefits outweigh higher contributions, reformers still win. Differentiating (3) gives

$$\pi^r_R = b'(\rho)\rho_R - x^{r'}.$$

I can now insert (A7) and (A4) to get

$$\pi^r_R = -\frac{\begin{array}{l} \sigma^r\Big(-R(b'(\sigma^rR))^3(c'(\sigma^rR))^2+\sigma^rX^2b''(\sigma^rR)(c'(\sigma^rR))^2 \\ +X(b'(\sigma^rR))^2\Big((c'(\sigma^rR))^2+\sigma^rXc''(\sigma^rR)\Big)\Big) \end{array}}{\begin{array}{l} R\Big((b'(\sigma^rR))^2\Big((c'(\sigma^rR))^2-(\sigma^r-1)Xc''(\sigma^rR)\Big) \\ -\sigma^rXb''(\sigma^rR)(c'(\sigma^rR))^2\Big) \end{array}}$$

We see that the denominator is always positive so again the sign is determined by the numerator. Rearranging the numerator shows that

$$\begin{array}{l} \pi^r_R \gtreqless 0 \Leftrightarrow b''(\sigma^rR) \\ \qquad (b'(\sigma^rR))^2\Big(Rb'(\sigma^rR)(c'(\sigma^rR))^2-\sigma^rX^2c''(\sigma^rR) \\ \qquad -X(c'(\sigma^rR))^2\Big) \\ \qquad \gtreqless \dfrac{}{\sigma^rX^2(c'(\sigma^rR))^2}, \end{array} \tag{A19}$$

which proofs (ii). □

A.8 | Winner-takes-all contest

In the following, I study the alternative setup with the second stage of the game modeled as a winner-takes-all contest between the two lobby groups instead of a share contest. Then σ^r denotes the probability that the full reform proposal is implemented (instead of the share of the reform proposal certainly implemented). All other assumptions of the model are kept similar to the main body of the article. In case of a winner-takes-all contest, the lobbies maximize

$$\pi^c(x^c, x^r) = \sigma^r(-c(R)) - x^c \tag{A20}$$

and

$$\pi^r(x^c, x^r) = \sigma^r(b(R)) - x^r \tag{A21}$$

s.t. $\sigma^r = \phi^r(x^c, x^r)$, which leads to the first-order conditions

$$\frac{1}{-c(R)} = -\frac{x^r}{(x^c+x^r)^2} \tag{A22}$$

and

$$\frac{1}{b(R)} = \frac{x^c}{(x^c+x^r)^2}. \tag{A23}$$

If we assume linear benefits and costs from the reform, i.e. $b'(R) = b$ and $c'(R) = c$ we can rewrite these to

$$\frac{1}{c} = \frac{x^r}{(x^c+x^r)^2}R \tag{A24}$$

and

$$\frac{1}{b} = \frac{x^c}{(x^c + x^r)^2}R, \tag{A25}$$

which are exactly the first-order conditions (5) and (4) in case of linear benefits and costs. We can thus summarize

Corollary 1. *With linear benefits and costs from the reform, the share contest and the winner-takes-all contest lead to identical equilibrium rent-seeking efforts.*

From (A22) and (A23) we get the equilibrium efforts

$$x^r(R) = \frac{c(R)(b(R))^2}{(b(R) + c(R))^2} \tag{A26}$$

and

$$x^c(R) = \frac{(c(R))^2 b(R)}{(b(R) + c(R))^2}. \tag{A27}$$

Then, total rent-seeking efforts in case of a winner-takes-all contest are given by

$$X(R) = x^r(R) + x^c(R) = \frac{c(R)b(R)}{(b(R) + c(R))}. \tag{A28}$$

Differentiating these with respect to R shows that

$$X'(R) = \frac{c(R)^2 b'(R) + b(R)^2 c'(R)}{(b(R) + c(R))^2}, \tag{A29}$$

$$x^{c'}(R) = \frac{c(R)(c(R)(c(R) - b(R))b'(R) + 2b(R)^2 c'(R))}{(b(R) + c(R))^3}, \tag{A30}$$

and

$$x^{r'}(R) = \frac{b(R)(b(R)(b(R) - c(R))c'(R) + 2c(R)^2 b'(R))}{(b(R) + c(R))^3}. \tag{A31}$$

As both the denominator and the numerator are positive in (A29), $X'(R)$ is always positive. Further inspection of (A30) shows that $x^{c'}(R) < 0$ iff

$$c'(R) < \frac{(b(R) - c(R))c(R)b'(R)}{2b(R)^2}, \tag{A32}$$

i.e. if $b(R) > c(R)$ and $c'(R)$ is small enough. Rearranging the numerator of (A31) shows that $x^{r'}(R) < 0$ iff

$$c'(R) > \frac{2c(R)^2 b'(R)}{b(R)(c(R) - b(R))}, \tag{A33}$$

which implies that $c'(R)$ is large enough and $c(R) > b(R)$. Taken together, this shows that in case of a winner-takes-all contest either of the two individual equilibrium contributions can decrease with an increase of R, but this decrease is always more than compensated by an increase in the other lobbies equilibrium contributions.

The equilibrium probability of the reform to be implemented is given by

$$\sigma^r = \frac{x^r(R)}{X(R)} = \frac{b(R)}{b(R) + c(R)}, \tag{A34}$$

and

$$\frac{d\sigma^r}{dR} = \frac{c(R)b'(R) - b(R)c'(R)}{(b(R) + c(R))^2}, \tag{A35}$$

which is positive iff

$$c'(R) < \Gamma, \tag{A36}$$

with

$$\Gamma(R) := \frac{b'(R)c(R)}{b(R)}. \tag{A37}$$

We can summarize this by

Lemma 4. *In case of a winner-takes-all contest, the probability for the implementation of the reform increases with the level of the reform proposal iff* $c'(R) < \Gamma(R)$.

In case of the lottery contest the objective function of the policymaker is

$$\begin{aligned} B(R) &= \alpha(\pi^c(R) + \pi^r(R) + (1 - \alpha)X(R) \\ &= \alpha(\sigma^r(b(R) - c(R))) + (1 - 2\alpha)X(R) \end{aligned} \tag{A38}$$

and, using (A28), the first-order condition for the policymaker is given by

$$\frac{\begin{aligned} &b'(R)(2\alpha b(R)c(R) + \alpha b(R)^2 + (1 - 3\alpha)c(R)^2) \\ &+ (1 - 4\alpha)b(R)^2 c'(R) \end{aligned}}{(b(R) + c(R))^2} = 0. \tag{A39}$$

The denominator is always positive, so the first-order condition requires the numerator to be zero. For a policymaker that regards lobbying as neutral for society ($\alpha = 0.5$) the numerator simplifies and the first-order condition requires

$$\begin{aligned} &\frac{1}{2}((b(R)^2 + 2b(R)c(R) - c(R)^2)b'(R) - 2b(R)^2 c'(R)) \\ &= 0. \end{aligned} \tag{A40}$$

Rearranging gives

$$\begin{aligned} c'(R) &= b'(R)\frac{b(R)^2 + 2b(R)c(R) - c(R)^2)}{2b(R)^2} \\ &= b'(R)\left(\frac{1}{2} + \underbrace{\frac{c(R)}{b(R)} - \frac{1}{2}\left(\frac{c(R)}{b(R)}\right)^2}_{\leq \frac{1}{2}}\right) := \Gamma_2(R). \end{aligned} \tag{A41}$$

We therefore see, that the policymaker in equilibrium chooses a reform proposal so that $b'(R) > c'(R)$, i.e. a proposal below the level that would be chosen in absence of a lobbying contest (defined by $b'(R) = c'(R)$, (A13)).[13] This is due to the fact that in case of $\alpha = 0.5$ the policymaker maximizes the product of the probability of implementation and welfare in case of implementation, $\sigma^r(b(R) - c(R))$. While welfare in case of implementation is maximized at $b'(R) = c'(R)$, the fact that

$$\begin{aligned}\Gamma_2(R) - \Gamma(R) &= b'(R)\frac{b(R)^2 + 2b(R)c(R) - c(R)^2)}{2b(R)^2} \\ &\quad - \frac{b'(R)c(R)}{b(R)} \\ &= \frac{(b(R)^2 - c(R)^2)b'(R)}{2b(R)^2} > 0\end{aligned} \tag{A42}$$

shows that at the chosen level for the reform proposal, the probability of implementation decreases with increasing size of the reform proposal. The policymaker thus increases the probability of implementing a reform that leads to net welfare gains by lowering the reform proposal and related welfare gains in case of implementation. We can thus summarize

Proposition 4. *In case of a winner-takes-all contest, a policymaker that is neutral concerning lobby contributions chooses a reform proposal that is below the level chosen in absence of lobbying.*

Turning to the influence of preferences for lobby contributions, rearranging the numerator of (A39) shows, that the first-order condition requires

$$\begin{aligned}c'(R) &= \frac{b'(R)(2\alpha b(R)c(R) + \alpha b(R)^2 + (1 - 3\alpha)c(R)^2)}{(4\alpha - 1)b(R)^2} \\ &:= \Gamma_3(R).\end{aligned} \tag{A43}$$

Differentiating the RHS of this with respect to α gives

$$\frac{d\Gamma_3(R)}{d\alpha} = -\frac{(b(R) + c(R))^2 b'(R)}{(1 - 4\alpha)^2 b(R)^2} < 0. \tag{A44}$$

This means, a higher α implies a lower equilibrium $c'(R)$ as, at every point R, $\Gamma_3(R)$ is lower. Note that as the proposal level already goes towards infinity $R \to \infty$ for $\alpha \to 0.25$, for lower levels of α there is no internal solution. Thus, we can summarize that

Proposition 5. *If lobbying is regarded as harmful, the resulting equilibrium proposal is lower than in case of a policymaker that is neutral concerning contributions. If the policymaker favors lobby contributions, the reform proposal is higher than with a neutral policymaker.*

Finally, inspecting the payoff functions for the lobby-groups, we can differentiate them with respect to R, and, using (A30), (A31), and (A34), get

$$\begin{aligned}&\frac{d\pi^r(x^c(R), x^r(R))}{dR} \\ &= \frac{b(R)^2((b(R) + 3c(R))b'(R) - 2b(R)c'(R))}{(b(R) + c(R))^3},\end{aligned} \tag{A45}$$

which is positive iff

$$c'(R) < \frac{(b(R) + 3c(R))b'(R)}{2b(R)}, \tag{A46}$$

and

$$\begin{aligned}&\frac{d\pi^c(x^c(R), x^r(R))}{dR} \\ &= -\frac{2c(R)^3 b'(R) + b(R)^2(b(R) + 3c(R))c'(R)}{(b(R) + c(R))^3},\end{aligned} \tag{A47}$$

which is always negative. It follows that

Proposition 6. *In case of a winner-takes-all contest, (i) the conservative lobby is better off if lobby contributions are regarded as harmful to society than if lobbying is regarded as neutral. In case of a policymaker that favors lobby contributions it is worse off. (ii) The reformer lobby has the same payoff ranking if* $c'(R) > \frac{(b(R) + 3c(R))b'(R)}{2b(R)}$, *otherwise it is reversed.*