

Socially responsible lobbying

Saara Hämäläinen^a, Yi Zheng^{b, *}

^a University of Helsinki and Helsinki GSE, P.O. Box 17, FI-00014 University of Helsinki, Finland

^b Vilnius University, Faculty of Economics and Business Administration, Department of Economic Policy, Saulėtekio av. 9, Vilnius, 10222, Lithuania

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ABSTRACT

Our paper analyzes lobbying contests in which firms can enhance their competitiveness in the eyes of a decision-maker and stakeholders through both *traditional lobbying* (e.g., political contributions and information campaigns) and *responsible lobbying* (e.g., sustainability programs and consumer advocacy). We establish that increasing demand for various Corporate Social Responsibility (CSR) investments can incentivize firms to shift from traditional to responsible lobbying. Harnessing CSR for lobbying purposes obfuscates firm comparisons for the decision-maker and stakeholders, thereby reducing the intensity of lobbying competition and lowering equilibrium lobbying expenditures. This reallocation is generally welfare-improving and could occur even when traditional lobbying is somewhat more cost-efficient than responsible lobbying. Our results suggest that a transition to responsible lobbying—a “pro-consumer lobbying agenda”—can represent a move toward a more efficient lobbying standard.

Our policy priorities include sustainability, consumer preference, and community impact. When significant to our business interests, we may also advocate through lobbying and coalitions.

[The Coca-Cola Company's website (2024)]

1. Introduction

Lobbying that used to target mostly decision-makers is undergoing an adaptation. Especially large firms are nowadays increasingly involved in wide-reaching philanthropic pursuits, which bring the advantage of polishing their reputations among many stakeholders simultaneously. For instance, the leading lobby spenders in the food and beverage industry, *Coca-Cola* and *PepsiCo*, both have unique comprehensive Corporate Social Responsibility (CSR) strategies that encompass i. programs dedicated to waste reduction, water security, climate, agriculture, and healthy choices, and ii. various initiatives financed by their respective foundations and green bonds.¹ The expanding influence of NGOs entails that consumers, legislators, and regulators are all attentive to CSR. In this paper, we argue that CSR can thus contribute not only to a firm's marketing but also to its lobbying.

A special feature of social programs is that evaluating voluntary firm CSR initiatives is not as straightforward as juxtaposing conventional lobbying efforts.² The appeal of social programs to stakeholders can be elusive, making the return on CSR investments highly unpredictable. For example, as one part of its vast CSR program, *PepsiCo* has pledged to ensure that all packaging is recyclable, compostable, or biodegradable by 2025, while *Coca-Cola* has committed to incorporating a minimum of 50% recycled materials in

* Corresponding author.

E-mail addresses: saara.hamalainen@helsinki.fi (S. Hämäläinen), yi.zheng@helsinki.fi (Y. Zheng).

¹ See the most recent sustainability reports by Coca-Cola (2023) and PepsiCo (2020) and their latest ESG reports (Coca-Cola, 2022; PepsiCo, 2023).

² The Lobbying Disclosure Act (US) requires paid lobbyists to register (LD-1) and file reports on their lobbying (LD-2) and contributions (LD-203).

its packaging by 2030. Differentiation of firms' CSR targets is likely to obfuscate their comparative advantages, impeding objective comparison. Therefore, it remains unclear why firms diversify their CSR rather than compete on one clear-cut dimension. Furthermore, regarding CSR as a new lobbying strategy raises questions about its impact on other lobbying modes.

The purpose of this paper is to offer a framework to address these questions and reconcile the transition from traditional *L-lobbying* (e.g., political contributions and information campaigns) to responsible *C-lobbying* (i.e., sustainability programs and consumer advocacy). Towards this goal, we propose a Tullock contest model where effort is a weighted sum of L- and C-lobbying efforts. The weight parameter tracks the relative cost-efficiency of various lobbying efforts. We envision that the more direct impact of L-lobbying on decision-makers augments its cost-efficiency, whereas growing synergies in targeting consumers and politically influential NGOs elevate the cost-efficiency of C-lobbying. Since CSR programs require long-term commitment, a firm's C-lobbying choice predates its L-lobbying decision. To incorporate our idea that the payoffs of C-lobbying are less predictable than the effects of L-lobbying, we introduce the new assumption that the Tullock noise variable is decreasing in firms' combined C-lobbying. Investing in CSR thus renders the contest success function less responsive to firms' relative lobbying efforts, decreasing lobbying incentives and alleviating lobbying competition.

Regarding CSR as a noisy lobbying strategy opens up novel perspectives on recent trends in corporate lobbying. Our first significant observation is that a firm may prefer to forgo L-lobbying for C-lobbying even when CSR is less cost-efficient as a lobbying strategy. The rationale behind this strategic decision lies in the reduced competition within the CSR domain ("obfuscation effect"), which may allow a firm to commit to lower total lobbying spending by shifting towards C-lobbying ("substitution effect").

In the limit example where L- and C-lobbying are equally cost-efficient, we thus observe that no firm opts for the less-noisy L-lobbying approach. Instead, firms overwhelmingly allocate their lobbying to CSR, which dissuades further lobbying spending afterwards. This unexpected finding underscores the strategic advantage of prioritizing CSR—or, more generally, of employing more differentiated and obfuscated lobbying strategies; more transparent approaches require tangible gains in cost-efficiency. Our new findings indicate that firms have incentives to obfuscate lobbying processes, revealing that in the context of rent-seeking and lobbying, obfuscation can surprisingly have positive welfare effects.

Generally, we show that incorporating CSR into a firm's lobbying strategy yields two major benefits for the welfare: i. it allows for relaxed lobbying competition and reduced lobbying expenditure, and ii. it transfers lobbying spending from L- to C-lobbying. This reallocation improves welfare insofar as L-lobbying is more wasteful than C-lobbying—which it should be, insofar as CSR is regarded as socially beneficial. A transition can be triggered by higher demand for CSR by decision-makers and stakeholders.

To provide a comprehensive understanding of lobbying strategies under various conditions, our analysis covers scenarios with multiple symmetric firms and two asymmetric firms. In highly competitive markets with numerous firms, individual incentives to employ CSR for lobbying are subdued, as firms can strategically free-ride on rivals' C-lobbying efforts. Aggregate lobbying still increases. Conversely, in asymmetric markets where one of the firms holds a dominant position, incentives for C-lobbying are attenuated. If CSR investments still occur, they exacerbate allocation inefficiency by allowing the less efficient firm to win more frequently. In moderately asymmetric markets, the more efficient firm generally derives greater benefits from CSR through reduced lobbying expenditures.

A lobbying transition consistent with our theoretical predictions is evident in highly concentrated industries, where dominant firms like Coca-Cola have begun stressing their voluntary CSR commitments to policymakers.³ Data from the mandatory lobbying reports in the industry provide tentative support for the mechanism we describe, showing that the expansion of CSR programs in the 2010s coincides with subdued lobbying (Fig. 1). This declining trend is especially evident for Coca-Cola and the Consumer Brands Association, whereas for PepsiCo, no clear trend is discernible after a spike in 2009–10. While firms have no obligation to provide evidence on their voluntary CSR spending, experts attribute the decline in lobbying to a more consumer-oriented industry agenda.^{4,5}

Our analysis contributes to the literature sparked by Baron (2001), McWilliams and Siegel (2001), and Bagnoli and Watts (2003), who seek to understand CSR investments as a rational firm strategy, enhancing a firm's reputation or signaling the quality of its product (Feddersen and Gilligan, 2001; Siegel and Vitaliano, 2007). However, Besley and Ghatak (2007) argue that firms lack a comparative advantage in CSR due to a free-riding problem in private provision.⁶ We observe that incentives to supply CSR arise as a side-product of lobbying, despite free-riding. Further, our paper shows that the welfare effects of CSR depend on alternative competition strategies: CSR is welfare-improving in lobbying contests as it substitutes for more wasteful lobbying.

A broader lesson derived from our investigation is that firms gain an advantage by investing in CSR, which differentiates firms' political strategies and relaxes lobbying competition.⁷ This may help to reconcile the Tullock (2001) paradox, which questions why

³ In 2009, Coca-Cola, PepsiCo, and the American Beverage Association spent 38 million USD lobbying against a federal soda tax, which ultimately failed. A subsequent spike in lobbying expenditures between 2013 and 2015 for Coca-Cola and the American Beverage Association coincides with lobbying on 'marketing of beverage products'. Providing clear evidence on the use of CSR for lobbying purposes, Coca-Cola especially disclosed that it lobbied to 'highlight company and industry voluntary energy drink guideline programs to promote responsible marketing'. (Open Secrets, 2024).

⁴ "[M]oney targeted by the 10 biggest trade groups for lobbying has fallen. Much of the decline is tied to a sharp decrease from the Consumer Brands Association. The trade group attributes the reduction to an adoption of a 'pro-consumer agenda'." Food Dive (2021).

⁵ The 2010s witnessed a clear shift in attention to CSR from investors and the media, partly driven by the establishment of ESG (for Environmental, Social, and Governance) accounting frameworks. In 2015, the Paris Agreement further reinforced climate commitments, pressuring firms to align with global environmental targets, while the United Nations' 17 Sustainable Development Goals nudged firms to adopt broader CSR targets. For Coca-Cola and PepsiCo, in particular, the publishing of comprehensive annual sustainability reports on their websites began in 2016 and 2015, respectively.

⁶ The recognition of the public good nature of CSR dates back to Olson (1965) and Stigler (1974).

⁷ Bagnoli and Watts (2003) find that CSR is higher under Bertrand than Cournot competition. Bagnoli and Watts (2020) and Fernández-Kranz and Santaló (2010) find that more relaxed competition allows a firm to invest more in CSR via higher prices and green bonds.

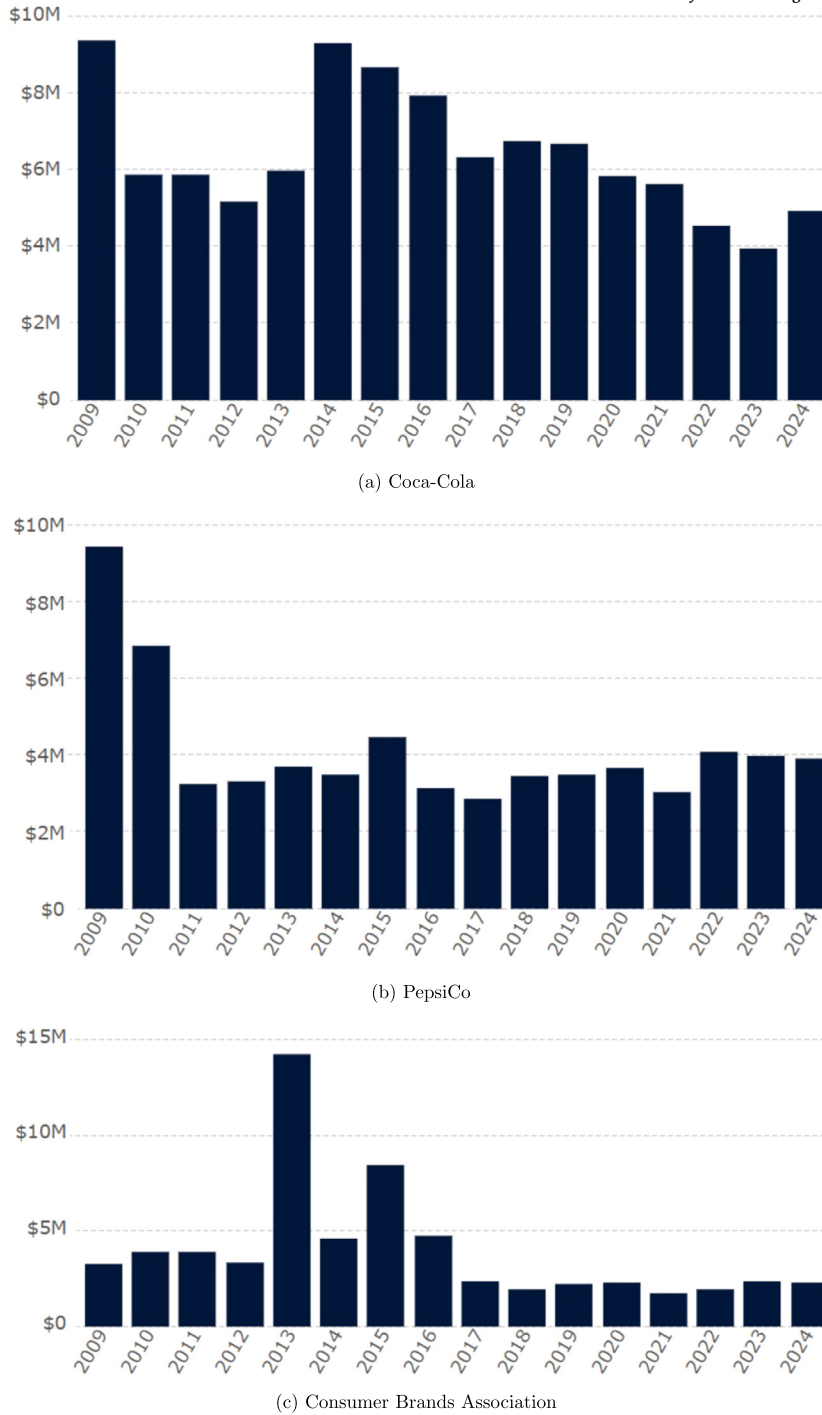


Fig. 1. Total lobbying spending in 2009-2024 (Open Secrets, 2024).

firms spend so little in lobbying for often substantial rents.⁸ Explanations have previously concentrated on, e.g., asymmetric payoffs (Hillman and Riley, 1989) and war of attrition -type competition (Riley, 1999). We find that it is optimal for firms to amplify the noise of a Tullock contest by CSR to decrease their lobbying costs.

⁸ Ansolabehere et al. (2003) pose a related question, asking why there is so little money in US political lobbying. Borisov et al. (2015); Servaes and Tamayo (2013) estimate that lobbying increases a firm's stock market value, suggesting that rents are not fully dissipated.

In the literature, noise is known to limit spending in a Tullock contest (Barut and Kovenock, 1998; Long, 2013). Specifically, Drugov and Ryvkin (2020) demonstrate that in a Lazear-Rosen environment, including the Tullock contest, a more dispersed noise parameter—instead of just higher risk—reduces equilibrium effort. Classic studies of noise in Tullock contests include Michaels (1988); Che and Gale (1997), and Wang (2010). The question is related to optimal contest design (Kirkegaard, 2012; Siegel, 2014; Haan, 2016). Letina et al. (2023) introduce endogenous noise in a contest as the designer can decide how prizes are allocated as a function of a possibly noisy signal about efforts. The crux of our paper is that noise is determined by the strategies of the firms, not by a designer.⁹

Our results align with those in the literature on endogenous risk-taking in tournaments, where each agent can voluntarily raise the variance of their performance (Hvide, 2002; Kräkel and Sliwka, 2004). Although this literature does not use Tullock contests, the economic mechanism whereby agents take greater risks to increase noise and thereby weaken effort competition is closely related. Evidence on noise-increasing risky strategies is given by Coles et al. (2018); Ozbeklik and Smith (2017) and Nieken and Sliwka (2010).

Our paper also shows, for the first time to our knowledge, that firms have incentives to obfuscate lobbying processes. CSR is an efficient lobbying strategy in our model because it enables a firm to differentiate from its rival. Differentiation alleviates competition, similarly to what happens in markets (Shaked and Sutton, 1982; Perloff and Salop, 1985). There is also a link to the burgeoning literature on strategic complexity in product markets (Ellison, 2005; Gabaix and Laibson, 2006; Carlin, 2009; Gamp and Krähmer, 2022). This obfuscation raises expected prices, with adverse effects on consumer welfare.¹⁰ Our paper shows that obfuscation is beneficial in contests because noise reduces lobbying. The explanation is that competition is non-productive in lobbying, unlike in markets.^{11,12}

The paper is organized as follows. The model is set up in Section 2. The analysis of a benchmark duopoly lobbying contest is presented in Sections 3.1 and 3.2. This is followed by an analysis of multifirm lobbying contests in Section 3.3 and of asymmetric lobbying contests in Section 3.4. Section 4 provides a concluding discussion. Longer proofs are delegated to the Appendix A. Micro-foundations of alternative model interpretations, and a brief analysis of contests with asymmetric information are developed in the Appendix B.

2. Model

We study two firms, $i, j = 1, 2$, in a lobbying contest. The winner of the contest will obtain the profit of T by securing its preferred legislation or regulation. The *decision-maker* (DM) who chooses the winner is attentive to lobbying but also considers the reputation of firms among *stakeholders* (SHs), such as voters, financiers, and colleagues. Any activities that enhance this reputation, hereafter simply referenced as *C-lobbying*, for CSR, can therefore boost traditional *L-lobbying*.

The model comprises two stages: in Stage 1, each firm simultaneously chooses its C-lobbying ($c_i \geq 0$), and in Stage 2, each firm simultaneously chooses its L-lobbying ($l_i \geq 0$). This extensive form captures the reality that CSR programs require long-term commitment, as building a positive reputation among stakeholders is a time-consuming gradual process. Total lobbying spending is denoted by $e_i = c_i + l_i$. Conditional on winning the contest, a firm's payoff equals

$$T - e_i = T - c_i - l_i.$$

The payoff conditional on losing in the lobbying contest is

$$-e_i = -c_i - l_i.$$

A firm's probability of winning the contest w_i (CSF, for contest success function) assumes the Tullock form (in Corchón and Serena (2018), noisy-logit)

$$w_i(f_i, f_j) = \begin{cases} \frac{f_i^r}{f_i^r + f_j^r} = \frac{1}{1 + \left(\frac{f_j}{f_i}\right)^r}, & \text{if } f_i^r + f_j^r \neq 0, \\ \frac{1}{2}, & \text{if } f_i^r + f_j^r = 0, \end{cases} \quad (1)$$

where a firm's effort to win the contest, $f_i = l_i + \alpha c_i$, depends on its L- and C-lobbying ($\alpha < 1$). The standard Tullock parameter, r , denotes the noise level of the contest. A smaller r implies that a firm who increases its effort level obtains a smaller increase in its likelihood of winning the contest. Therefore, a contest with a *smaller* r is said to be *noisier*. Here, the noise level of a contest is increasing in CSR: $\partial r / \partial c_j = \partial r / \partial c_j < 0$. We focus on a symmetric pure strategy (subgame perfect) Nash equilibrium of the above two-stage game.

2.1. Heterogeneity of lobbying efforts

Our model incorporates the possibility that L- and C-lobbying are not equally cost-efficient. One could argue that money directly spent on lobbyists is more effective in furthering a firm's political interests than investment in some good causes. The DM may face

⁹ Contests with endogenous entry (Gu et al., 2019) or alliances (Konishi and Pan, 2021) also feature endogenous payoffs.

¹⁰ But see Taylor (2017) and Gamp and Krähmer (2022), where obfuscation furthers screening and improves welfare.

¹¹ As known since Tullock (1967), the possibility of acquiring a monopoly by influencing public choice not only reduces welfare by alleviating competition ("Harberger triangle") but also generates losses because of wasteful lobbying ("Tullock square").

¹² To our knowledge, our paper is the first to consider firms' incentives to obfuscate lobbying processes. Only a single concurrent paper (Fremeth et al., 2022) touches upon this question, showing that larger industries have noisier political environments.

multiple competing demands and pay attention only to firms whose lobbyists approach it with well-tailored pitches. Another plausible scenario is that firms primarily invest in CSR to affect consumer demand, while acknowledging the favorable secondary effect of CSR on promoting their lobbying goals. For example, if consumers and voters are becoming more climate-friendly, investments in a cleaner production process may boost a firm's demand, while also enhancing its reputation with the DM, who depends on voter sentiment for re-election.

Both scenarios can be analyzed in a unified framework by allowing the lobbying effort $f_i = l_i + \alpha c_i$ to deviate from the lobbying cost $e_i = l_i + c_i$, where the novel parameter α tracks the relative cost-efficiency of L- and C-lobbying: Our assumption $0 < \alpha < 1$ allows the use of CSR for lobbying but maintains that L-lobbying is more efficient in this case.¹³ With more environmentally conscious consumers, the positive effect of CSR on consumer demand would be captured by an increase in α , reflecting more powerful C-lobbying efforts or, equivalently, lower effective costs of C-lobbying. Micro-foundations are developed in the Appendix B.¹⁴

Another distinction we introduce between L- and C-lobbying is that, although both advance a firm's prospects of winning, CSR investments are more difficult to juxtapose. Assessing the merits of different CSR activities or their wider appeal to SHs is not straightforward. The DM may thus be unsure which decision will be easier to defend later in front of SHs. This idea can be captured by assuming that r in (1) is a strictly decreasing function of C-lobbying $r := r(c_i, c_j)$, where $\frac{\partial r(c)}{\partial c_i} = \frac{\partial r(c)}{\partial c_j} < 0$ for all $c := (c_i, c_j)$. We thus suppose that greater investments in CSR introduce additional noise into CSF, rendering the choice of the winner less dependent on firms' relative efforts $\frac{f_i}{f_j}$. Contest noise function r is assumed to be continuously differentiable and symmetric in its arguments, and $0 < r(T, T) < r(0, 0) < 1$.¹⁵

2.2. Interpretation of lobbying contests

We provide four possible interpretations that fit the food and beverage industry.

Interpretation 1: Soda war. The traditional perspective on the model would be that the lobbyists are companies like Coca-Cola and PepsiCo, who compete through political contributions to federal candidates and political parties. Political contributions safeguard and advance business interests in an industry with significant regulatory oversight. Each firm aims to prevent its main opponent from gaining an edge by acquiring more influence among policymakers. Both seek to outspend their rival to expand their relative influence.

While both firms face pressure regarding their environmental impact, they may take different stances on specific regulations. Coca-Cola and PepsiCo have different vested interests and advantages in packaging and recycling, which could lead to conflicting lobbying efforts, particularly if regulations favor one company's strategy over the other. For example, if a new bill was proposed favoring bottle reuse programs (which Coca-Cola has invested in) over promoting biodegradable plastics (PepsiCo's focus), their interests would conflict.

In addition to these regulatory differences, Coca-Cola and PepsiCo have actively lobbied against local soda taxes, at times opposing each other's strategies. For instance, Coca-Cola has countered PepsiCo's attempts to position its portfolio as 'healthier'. Their lobbying efforts also extend to international trade, with Coca-Cola seeking to restrict PepsiCo's market access, while PepsiCo has pursued measures to limit Coca-Cola's dominance.¹⁶

Interpretation 2: Big soda. Another more modern interpretation of our model is that one side of the lobbyists consists of NGOs: for example, the Coca-Cola- and PepsiCo-supported Consumer Brands Association aligning on one side, and Greenpeace, Environmental Defense Fund (EDF), and World Wildlife Fund (WWF) on the other. Each side tries to steer a packaging or recycling bill to its preferred direction. While only firms' investments in good causes are formally recognized as CSR, NGOs also make various reputation-enhancing investments that promote societal goals, which could be seen as social responsibility contributions or CSR from their part.¹⁷

At first glance, there may appear to be a natural asymmetry between firms and NGOs, as NGOs have traditionally led the discussion by highlighting the harmful effects of plastic pollution, while firms have responded with countering investments in CSR. However, both sides need to maintain a positive public reputation to further their lobbying goals, which could be achieved by spending on CSR and engaging in various pro-social activities. In this sense, firms and NGOs' political strategies could be quite similar. The ongoing expansion of CSR programs by Coca-Cola and PepsiCo can be seen as an attempt to take the lead in shaping public opinion and influencing policy.

Interpretation 3: CSR in public procurement.

Coca-Cola and PepsiCo often compete for public contracts, such as those on vending machines or soda manufacturing, where the DM may prioritize socially responsible firms. Current procurement policies, exemplified by the European Commission's guidelines,

¹³ If $\alpha > 1$, a pure C-lobbying equilibrium arises.

¹⁴ This formulation yields a parsimonious model where differences in costs and effectiveness of l_i and c_i are embedded in parameter α . A more general setting, where $f_i = l_i + \gamma c_i'$ and $e_i = l_i + \beta c_i'$, gives our model for $c_i := \beta c_i'$ and $\alpha := \gamma \beta^{-1}$.

¹⁵ In a classic Tullock contest, a unique symmetric pure strategy equilibrium arises for $0 < r(c) < 1$. Multiple pure equilibria arise for $1 \leq r(c) < 2$ and a mixed equilibrium arises for $2 \leq r(c)$. In a symmetric mixed equilibrium, rents are fully dissipated and firms only apply L-lobbying if $r(T/2, T/2) > 2$ and $\alpha < 1$.

¹⁶ The Cola Wars in India between Coca-Cola and PepsiCo provide an example of fierce competition for market share ever since Coca-Cola re-entered the country in the early 1990s. Beyond aggressive marketing, both companies have engaged in significant lobbying efforts to promote their interests (Hartley, 2004).

¹⁷ Data from the Open Secrets (2024) database indicate that Coca-Cola, PepsiCo, and Consumer Brands Association, on one hand, and EDF and WWF, on the other, lobbied on various issues in 2022, including the Break Free From Plastic Pollution Act, the Recycling and Composting Accountability Act, and the National Bottle Bill. PepsiCo explicitly disclosed that it lobbied to '[h]ighlight the company's sustainability commitments', providing evidence of CSR being employed for lobbying.

increasingly reward firms for sustainability efforts.¹⁸ CSR investments can hence serve as a strategic tool for firms to improve their chances of winning tenders.

There are two key types of procurement settings to consider, where CSR plays a role. The first one is *Direct Purchasing Decisions* by contracting authorities. In this setting, firms compete by aligning their CSR strategies with the public procurement criteria, which incentivize firms to adopt sustainable practices and innovate responsibly. The goal is to encourage firms to embed CSR into their long-term business strategy.

The second relevant setting is *End User Purchasing Decisions* where a contracting authority selects a supplier, but the final purchase decisions are made by end users. For example, a municipality may award a contract for school portraits to a photographer, but parents who ultimately choose the photos are the actual decision-makers. In this scenario, firms' price and investment strategies are not only driven by the special procurement criteria but also by consumer preferences for sustainable products and services.

Interpretation 4: CSR in market competition.

This is perhaps most commonly held explanation for CSR. According the standard narrative, Coca-Cola and PepsiCo compete for consumers who consider both price and CSR—a component or indicator of product quality. Firms apply CSR to meet consumer demands for sustainability and to counter potential NGO criticism, which could provoke negative consumer reactions.

As demand for CSR increases and competition in this dimension intensifies, firms differentiate their CSR programs and integrate CSR more deeply into their brands. By fostering stronger brand loyalty, CSR can alleviate firm competition by making consumers more inclined to purchase from firms whose sustainability commitments are most closely aligned with their personal values.^{19,20}

Interpretations 1 and 2 represent the core of our analysis, focusing on the use of CSR for lobbying purposes. Interpretations 3 and 4 offer a more conventional view, where CSR is primarily aimed at shaping demand. These complementary interpretations are expanded on in Section 4 and micro-founded in the Appendix B. Altogether, our analysis shows that firms benefit from CSR in both market and non-market environments, revealing synergies across these arenas.

3. Equilibrium

We solve the model by backward induction, beginning in Section 3.1 from Stage 2, and proceeding in Section 3.2 to Stage 1. The analysis in Section 3.1 shows that C-lobbying choices uniquely determine the subsequent L-lobbying choices. We discuss two reasons why CSR may decrease traditional lobbying, called *substitution* and *obfuscation* effects. The following Section 3.2 derives the equilibrium and comparative statics of optimal L- and C-lobbying. It describes the conditions under which firms substitute L-lobbying for C-lobbying and when this is generally welfare improving.

3.1. Stage 2 equilibrium

Firms choose their C-lobbying c_i in Stage 1. When firms make L-lobbying decisions in Stage 2, the level of noise, $r(c)$, is hence fixed, and the C-lobbying component, αc_i , of a firm's lobbying effort, $f_i = l_i + \alpha c_i$, pre-determined. As a result, a firm's problem in Stage 2 is similar to that in a contest with additive head-starts (Franke et al., 2018).

The problem of a firm in Stage 2 is

$$\max_{l_i} \frac{T}{1 + \left(\frac{l_j + \alpha c_j}{l_i + \alpha c_i} \right)^{r(c)}} - l_i.$$

The first-order condition (2) is given by

$$T \frac{r(c) \left(\frac{f_j}{f_i} \right)^{r(c)}}{f_i \left(1 + \left(\frac{f_j}{f_i} \right)^{r(c)} \right)^2} - 1 = 0. \quad (2)$$

Because L-lobbying l_i increases total lobbying effort $f_i = l_i + \alpha c_i$ one for one, the problem of a firm in choosing its l_i is the same as the problem of a firm in choosing its f_i in a standard Tullock contest. The only exception is that $f_i = l_i + \alpha c_i$ is bounded from zero by αc_i because the C-lobbying component of total effort is already fixed in Stage 1. To characterize the equilibrium in this head-start contest, we first study a relaxed problem where f_i can take any value. Following the literature, we can show that a *symmetric (effort) solution* of (2) exists and remains unique for $0 < r(c) < 1$. Total lobbying effort in this symmetric solution to a standard Tullock contest is $f_i = f_j = f(c) := \frac{Tr(c)}{4}$.

¹⁸ The EU has published voluntary criteria for green public procurement (on Nov 12, 2019, for public space maintenance; on Oct 2, 2019, for food, catering services, and vending machines; etc.). Another example is the Guide to Socially Responsible Public Procurement by Ministry of Economic Affairs and Employment of Finland (2017). The US has several programs that promote environmentally-friendly procurement (environmentally preferable purchasing, green procurement program, etc.).

¹⁹ Nickerson et al. (2022) show that consumers reward with higher sales CSR initiatives that genuinely aim to limit the product's negative externalities, while CSR interpreted as greenwashing could hurt sales.

²⁰ For a long-term perspective, see 'Demystifying ESG: Its History & Current Status' (Forbes, 2022) and 'The New Age Of Corporate Social Responsibility: Beyond Checkbook Philanthropy' (Forbes, 2024).

Note that while each firm chooses the same *effort* in Stage 2 in this symmetric solution, their L-lobbying and C-lobbying components may differ if their Stage 1 decisions are different. The solution is thereby only symmetric in *effort*: $f_i = f_j$.

The symmetric solution $f_i = f_j = f(\mathbf{c})$ can be implemented if $\alpha \max\{c_i, c_j\} \leq f(\mathbf{c})$. Optimal L-lobbying is characterized by (2) through total effort, $l_i + \alpha c_i = f(\mathbf{c})$, which gives l_i as the residual: $l_i = f(\mathbf{c}) - \alpha c_i$. Thus, L- and C-lobbying are strategic substitutes, and firms choose higher L-lobbying when C-lobbying is lower or when C-lobbying is less cost-efficient. If $\alpha \max\{c_i, c_j\} > f(\mathbf{c})$, the symmetric solution cannot be implemented since at least one firm's C-lobbying effort surpasses the optimal effort level $f(\mathbf{c})$. Instead, the firm(s) whose C-lobbying effort exceeds $f(\mathbf{c})$ will abstain from L-lobbying while any other firm would choose a lower lobbying effort than in the symmetric solution.

Lemma 1. Suppose that C-lobbying in Stage 1 is $\mathbf{c} = (c_i, c_j)$.

- 1.1 If $\alpha c_i, \alpha c_j \leq f(\mathbf{c})$, then a unique equilibrium arises in Stage 2 where $l_i = f(\mathbf{c}) - \alpha c_i$.
- 1.2 If $\alpha c_i > f(\mathbf{c}) \geq \alpha c_j$, then a unique equilibrium arises in Stage 2 where $l_i = 0$ and $l_j \leq f(\mathbf{c}) - \alpha c_j$.
- 1.3 If $\alpha c_i, \alpha c_j > f(\mathbf{c})$, then a unique equilibrium arises in Stage 2 where $l_i = l_j = 0$.

Lemma 1 shows that C-lobbying decreases and crowds out L-lobbying. The commitments in CSR that firms make in Stage 1 define their optimal lobbying effort in Stage 2. This optimal effort decreases with the noisiness of the lobbying contest, driven by firms' investments in CSR. The intuition is that firms can relax lobbying competition by shifting its nexus to the noisier CSR domain. We call this negative effect of CSR on firms' total lobbying efforts the *obfuscation effect*. The obfuscation effect works through $\frac{\partial r(\mathbf{c})}{\partial c_i}$: a smaller $\frac{\partial r(\mathbf{c})}{\partial c_i} < 0$ implies that C-lobbying reduces the optimal effort level $f(\mathbf{c})$ more.

CSR investments additionally diminish traditional lobbying because a firm will only use L-lobbying if its optimal lobbying effort is not attained by its C-lobbying alone. This negative effect of CSR on lobbying effort is called the *substitution effect*. The substitution effect works through α : a higher cost-efficiency parameter α implies that C-lobbying replaces more L-lobbying. In asymmetric equilibria ($\alpha c_i > f(\mathbf{c}) \geq \alpha c_j$) with i as a CSR-leader and j as a CSR-laggard, the substitution effect is further reinforced by the CSR-laggard's willingness to accommodate the CSR-leader by reduced L-lobbying.

Why have firms not used CSR for the purpose of lobbying before?

The strengthening of obfuscation and substitution effects may suggest why firms now engage in C-lobbying but did so less before the mid-2010s:

First, the substitution effect becomes stronger if the cost-efficiency of C-lobbying relative to L-lobbying increases. The relative cost-efficiency of C-lobbying may have increased as DMs and SHs have become more sensitive to CSR with the rising influence of NGOs. Concurrently, the expansion of social media platforms has also made firms' CSR efforts more visible by significantly reducing communication costs, facilitating public engagement with firms, and allowing real-time feedback from different audiences, all of which contribute to leveraging the impact of CSR. For instance, when SHs resonate with a firm's posting about its CSR efforts, they can share this story within their own network, thus amplifying the reach at no additional cost to the firm.

Second, the obfuscation effect depends on the level of noise introduced by substituting L-lobbying with C-lobbying. Obfuscation technologies may also have improved over time as firms have learned how to present their CSR programs to DMs and SHs optimally. Today, online search is one of the main channels through which information about companies is obtained by various DMs and SHs. Ellison and Ellison (2009) and Ellison and Wolitzky (2012) suggest that firms respond to reduced costs of online search by intensifying obfuscation. In particular, sharing CSR success stories on social media allows a firm to highlight individual achievements, which can make it harder for audiences to comprehend the overall scale and impact of their efforts.

3.2. Stage 1 equilibrium

We move to study Stage 1. Lemma 2 shows that, for low enough values of CSR, a symmetric solution obtains, where firms employ the lobbying mode that minimizes their total lobbying costs. Thus, if the contest noise function is linear, $\frac{\partial r(c_i, c_j)}{\partial c_i} =: -\gamma$, a corner solution is a likely outcome. A firm will choose either L- or C-lobbying, but not both. Under concave or convex noise, both kinds of efforts can be applied simultaneously because the effect of CSR varies with scale.

Lemma 2. The subgame-perfect symmetric equilibrium of the lobbying contest is characterized by one of the following sets of conditions.

- 2.1 If $c_i = 0$, then $l_i = \frac{Tr(0,0)}{4} > 0$, $\alpha \leq 1 + \frac{\partial r(0,0)}{\partial c_i} \frac{T}{4}$, and $\alpha \leq 1 + \frac{T(r(c',0)-r(0,0))}{4c'}$ for $c' > 0$.
- 2.2 If $l_i = 0$, then $c_i = \frac{Tr(c_i, c_i)}{4\alpha} > 0$, $\alpha \geq 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$, and $\alpha \geq 1 + \frac{T(r(c', c_i)-r(c_i, c_i))}{4(c'-c_i)}$ for $c' < c_i$.
- 2.3 Otherwise, if $0 < c_i < \frac{Tr(c_i, c_i)}{4\alpha}$, c_i satisfies the condition $\alpha = 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$ and l satisfies the condition $l_i = \frac{Tr(c_i, c_i)}{4} - \alpha c_i$.

Proposition 1. Define auxiliary functions $\tilde{c}(c_i) := \frac{Tr(c_i, \bar{c})}{4\alpha}$, $\frac{\partial r(c_i, c_i)}{\partial c_i} := -\gamma(c_i)$, and $\frac{\Delta r}{\Delta c}(c_j, c_i) := -\frac{r(c_j, c_i)-r(c_i, c_i)}{c_j - c_i}$.

1. Suppose r is linear. There is a unique symmetric equilibrium for all $\alpha \neq 1 - \gamma \frac{T}{4}$. If $\alpha < 1 - \gamma \frac{T}{4}$, $c_i = 0 < l_i$ and, if $\alpha > 1 - \gamma \frac{T}{4}$, $c_i > 0 = l_i$.
2. Suppose r is concave. If $\alpha < 1 - \frac{\Delta r}{\Delta c}(\tilde{c}(\tilde{c}), 0) \frac{T}{4}$, a unique symmetric equilibrium exists with $c_i = 0 < l_i$, and, if $\alpha > 1 - \frac{\Delta r}{\Delta c}(0, \tilde{c}(\tilde{c})) \frac{T}{4}$, a unique symmetric equilibrium exists with $c_i > 0 = l_i$. Otherwise, multiple symmetric equilibria with i. $c_i = 0$, ii. $l_i = 0$, and iii. $c_i l_i > 0$ arise.
3. Suppose r is convex. If $\alpha \leq 1 - \gamma(0) \frac{T}{4}$, a unique symmetric equilibrium exists with $c_i = 0 < l_i$, whereas, if $\alpha \geq 1 - \gamma(\tilde{c}(\tilde{c})) \frac{T}{4}$, a unique symmetric equilibrium exists with $c_i > 0 = l_i$. Otherwise, a unique symmetric equilibrium where $\alpha = 1 - \gamma(c_i) \frac{T}{4}$ and $c_i l_i > 0$ arises.

Proposition 1 demonstrates that under linear noise $\frac{\partial r(c_i, c_j)}{\partial c_i} = -\gamma < 0$, the threshold for the cost-efficiency of C-lobbying relative to L-lobbying is $\bar{\alpha} = 1 - \gamma \frac{T}{4} < 1$. Hence, firms may partially or fully substitute from traditional L-lobbying to C-lobbying when the stronger societal preferences for CSR, combined with synergies in targeting the DM and SHs, turn CSR into a viable lobbying strategy. This substitution occurs even though C-lobbying is less efficient than L-lobbying, as noisy CSR investments relax competition among firms.

In other words, firms may shift to C-lobbying because it introduces more noise into the contests, reducing their incentives to invest further in L-lobbying. However, L-lobbying still remains the dominant lobbying mode if C-lobbying is a relatively poor substitute for L-lobbying. Comparative statics with respect to α and γ also highlight the improved potency of CSR as a lobbying effort (higher α) and the ability of CSR to alleviate lobbying competition (higher γ) as complementary explanations for a transition from L-lobbying to C-lobbying:

Corollary 1 (Comparative statics). *If r is linear, higher γ (α) decreases the threshold value of α (γ) for C-lobbying.*

A higher γ implies a stronger obfuscation effect (more lobbying noise per unit of C-lobbying) and a higher α indicates a stronger substitution effect (more lobbying effort per unit of C-lobbying).

Equilibrium derivation

To construct the equilibrium in Proposition 1, we consider firm i 's best response to a fixed c_j . Lemma 1 establishes that the nature of the equilibrium depends on whether

$$\max \{c_i, c_j\} \leq \frac{f(c)}{\alpha}. \quad (3)$$

A symmetric (effort) solution ($f_i = f_j$), arises if (3) is satisfied by c_i and c_j . Notably, symmetry only applies to firm effort, while firms may still set different c_i and l_i .

For any given c_j , the left-hand side of (3) is increasing in c_i while the right-hand side of (3) is decreasing in c_i . There is hence a unique cutoff $\hat{c}_i = \hat{c}_i(c_j)$ such that the symmetric solution arises for $c_i \leq \hat{c}_i(c_j)$ but fails to arise for $c_i > \hat{c}_i(c_j)$. Intuitively, investment in CSR makes the contest noisier, decreasing the optimal effort level, $f(c)/\alpha$, making further lobbying unsustainable.

In asymmetric solutions, firm's payoff depends on whether its own or its rival's C-lobbying exceeds $f(c)/\alpha$: If the rival's c_j is high ($c_j > \hat{c}_i$), firm j leads in CSR for $c_i \in (\hat{c}_i, c_j]$, while firm i leads for $c_i > c_j$ (Fig. 2a). If c_j is low ($c_j \leq \hat{c}_i$), firm i is a CSR-leader for any $c_i > \hat{c}_i$ (Fig. 2b). By Lemma 1, the payoffs for different lobbying profiles are summarized as follows:

$$\begin{cases} T/2 - c_i - (f(c) - \alpha c_i), & \text{for } c_i, c_j \leq f(c)/\alpha, & (a) \\ T/(1 + (f_j/\alpha c_i)^{r(c)}) - c_i, & \text{for } c_j \leq f(c)/\alpha < c_i, & (b) \\ T/(1 + (\alpha c_j/f_i)^{r(c)}) - c_i - (f_i - \alpha c_i), & \text{for } c_i \leq f(c)/\alpha < c_j, & (c) \\ T/(1 + (c_j/c_i)^{r(c)}) - c_i, & \text{for } f(c)/\alpha < c_i, c_j, & (d) \end{cases} \quad (4)$$

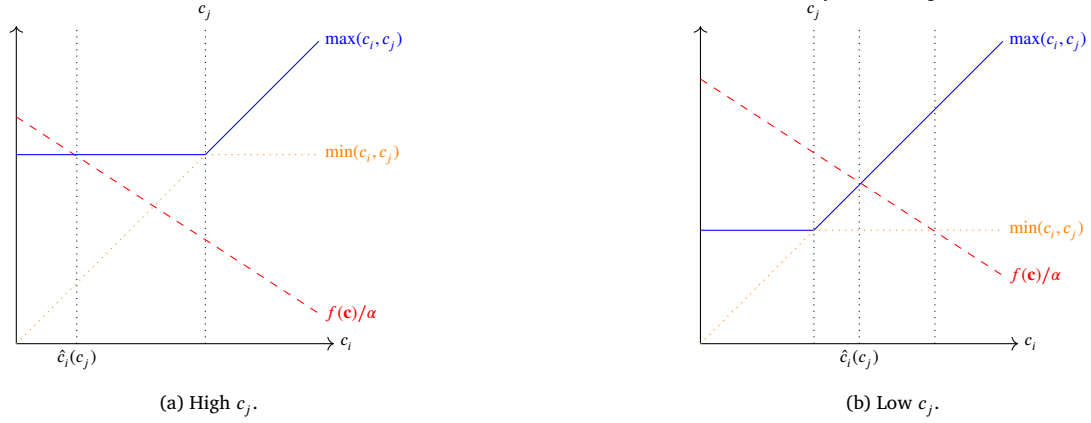
where $f_i, f_j \leq f(c) = \frac{Tr(c)}{4}$.

We first examine firms' best responses under the assumption that $c_i, c_j \leq f(c)/\alpha$, resulting in a symmetric effort solution in Stage 2. A firm's payoff is defined by (4a) and its derivative with respect to C-lobbying given by

$$-1 - \frac{T}{4} \frac{\partial r(c_i, c_j)}{\partial c_i} + \alpha. \quad (5)$$

A firm benefits from increasing CSR if $\alpha > 1 + \frac{\partial r(c_i, c_j)}{\partial c_i} \frac{T}{4}$, as C-lobbying decreases its total lobbying costs. Stronger C-lobbying therefore alleviates lobbying competition and serves as a viable substitute for L-lobbying. This case requires a positive obfuscation effect and a sufficiently strong substitution effect. Conversely, a firm benefits from decreasing CSR if $\alpha < 1 + \frac{\partial r(c_i, c_j)}{\partial c_i} \frac{T}{4}$. In this case, the low efficiency of CSR as a lobbying effort implies that the reduction in lobbying competition does not outweigh the higher total effort costs in C-lobbying. The substitution effect is not sufficiently strong.

Next, we consider the best responses of firms under the assumption that $c_i > f(c)/\alpha$, leading to an asymmetric effort outcome in Stage 2. Firm i 's payoff is given by (4b) if $c_j \leq f(c)/\alpha$ and by (4d) if $c_j > f(c)/\alpha$. Lemma 1 shows that firm i , the CSR-leader, engages in C-lobbying but not in L-lobbying. The problem for firm i is thus similar to a standard Tullock contest with only C-lobbying, except that C-lobbying is less efficient than L-lobbying and increases contest noisiness.

Fig. 2. The positions of threshold values $\hat{c}_i(c_j)$.

As $c_i > f(c)/\alpha$, firm i benefits from reducing its C-lobbying to lower its costs. Moreover, an increase in c_i or c_j increases noise, which benefits a firm with lower effort than its rival but harms a firm with higher effort. Thereby, firm j , the CSR-laggard, prefers to minimize its lag in CSR to amplify contest noise, while firm i , the CSR-leader, prefers to minimize its lead in CSR to diminish this noisiness. Altogether, these tendencies imply that any equilibrium must feature symmetric efforts.

Transition from L-lobbying to C-lobbying

Linear noise implies that the transition from L- to C-lobbying is abrupt as firms substitute from 100% of L-lobbying to 100% of C-lobbying when α passes $1 - \gamma \frac{T}{4}$. Under convex or concave noise, the transition could occur gradually. Under concave r , the intermediate value range of α supports multiple equilibria with different L- and C-lobbying and, under convex r , a smooth transition arises from L-lobbying to C-lobbying. Total lobbying costs gradually decrease with reduced spending in L-lobbying.

Convex (concave) r implies that additional investment in CSR has a lesser (greater) impact on alleviating contest competition. Convex r might arise, for instance, if the recognition of CSR in a procurement contest suddenly becomes mandatory, which could result in the outcome being influenced by minor variations in CSR. Alternatively, if the DM only encounters problems when comparing CSR initiatives that are sufficiently complex and comprehensive, we would be in the concave noise regime.

Welfare effects of transition to C-lobbying

For concreteness, the remaining paper focuses on linear noise r . In this case, a unique equilibrium arises, and, in contrast to convex and concave r , firms never engage in both L- and C-lobbying.

Corollary 2 (Welfare). *Relative to assuming that only L-lobbying is possible, allowing for C-lobbying will decrease firms' total lobbying expenditure, and increase the expected profits of firms.*

Fig. 3 exemplifies the reduction in lobbying effort (Fig. 3a) and the increase in expected profit (Fig. 3b) due to a transition from a pure L-lobbying regime to a pure C-lobbying regime.

Our welfare analysis suggests that the application of CSR for lobbying improves social welfare if one of the following conditions holds: L- and C-lobbying are equally wasteful from a social viewpoint, or C-lobbying is more beneficial or less wasteful than L-lobbying. Our results thus indicate that a transition from L-lobbying to C-lobbying can lead to a more socially beneficial lobbying standard, with less wasteful lobbying spending.

The positive welfare effects of a transition from L- to C-lobbying are stronger if CSR brings actual social benefits, as its recognition by the DM and SHs suggests. Additional positive welfare effects come from the firm side. Because C-lobbying is more relaxed, firms need to spend less on lobbying. Reduced costs might explain the adoption by the Consumer Brands Association of a “pro-consumer agenda” as discussed in the introduction.

3.3. Multiple firms

We next consider how intensified competition among firms influences the strategic choice between L- and C-lobbying.

In a larger contest among multiple firms, $N > 2$, the probability of winning the contest is

$$w_i(f_1, \dots, f_N) = \frac{f_i^r}{f_1^r + \dots + f_N^r},$$

while the lobbying costs and lobbying effort are still equal to $e_i = l_i + c_i$ and $f_i = l_i + \alpha c_i$.

Stage 2: L-lobbying. Following the reasoning laid out in Section 3.1 for two firms, the first-order condition of a firm's problem in choosing L-lobbying is

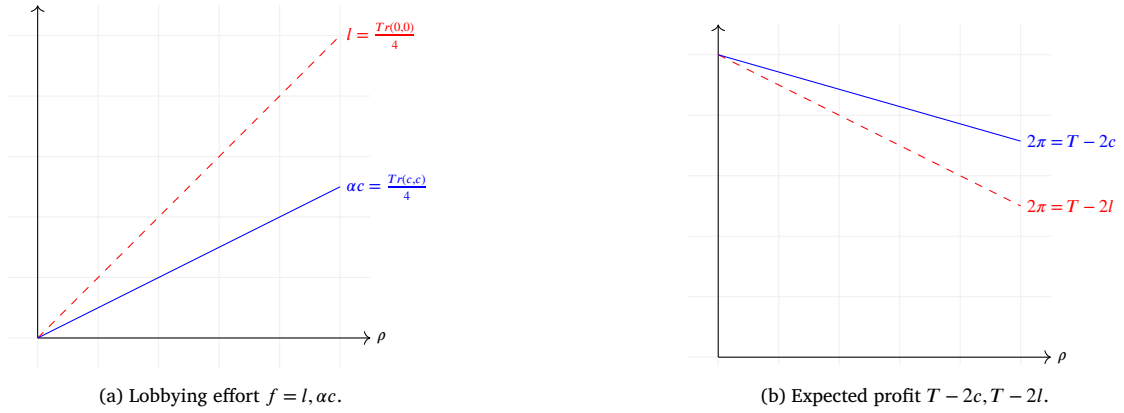


Fig. 3. Effort (f) and profits (2π) under L-lobbying (red, dashed) and C-lobbying (blue, solid) as a function of $\rho < 1$ in $r(c_i, c_j) = \rho - \gamma(c_i + c_j)$, for $T = 4$, $\alpha = 0.75$, and $\gamma = 0.5$. (For interpretation of the colors in the figure(s), the reader is referred to the web version of this article.)

$$-1 + T \frac{rf_i^{r-1}(f_1^r + \dots + f_N^r) - f_i^r rf_i^{r-1}}{(f_1^r + \dots + f_N^r)^2} = 0.$$

Consequently, the unique symmetric effort solution is characterized by $f_i = \dots = f_N = f = \frac{Tr(N-1)}{N^2}$, where $(N-1)/N^2$ is decreasing in $N > 2$ and $(N-1)/N^2 < 1/N$. We thus observe that a firm lobbies less in isolation when there are more firms in contests and a firm's likelihood of winning is smaller. However, because $(N-1)/N$ is increasing in $N > 1$, aggregate lobbying increases with intensified competition and a larger share of rents is dissipated.

Stage 1: C-lobbying. Adopting the methods described in Section 3.2 for two firms, the first-order condition of a firm's problem in choosing C-lobbying is

$$-1 + \frac{T(N-1)}{N^2}\gamma + \alpha = 0.$$

As $(N-1)/N^2$ is decreasing in $N > 2$, we can see that the threshold level of α for switching from L-lobbying to C-lobbying is higher with more firms. The explanation is that a firm's benefit from CSR decreases relatively when other firms also benefit from its CSR efforts, which alleviate competition among all firms. Due to the free-riding problem that arises, C-lobbying needs to be more noisy or cost-efficient to serve as an attractive substitute for L-lobbying.

Proposition 2. A unique symmetric effort equilibrium exists with more than two firms.

1. If $\alpha \leq 1 - \frac{T(N-1)}{N^2}\gamma$, $c_i = 0$ and $l_i = \frac{Tr(0,0)(N-1)}{N^2}$.
2. If $\alpha > 1 - \frac{T(N-1)}{N^2}\gamma$, $l_i = 0$ and $c_i = \frac{Tr(c_i, c_i)(N-1)}{N^2}$.

Corollary 3. Intensified competition among firms decreases incentives for C-lobbying.

Intuitively, investments in CSR can be regarded as a public good as they reduce competition for everyone (Besley and Ghatak, 2007). Free-riding incentives become stronger with more firms. Therefore, firms have less incentive to mitigate their lobbying competition through CSR in a contest with multiple firms where they can rely on other firms' CSR efforts. This observation provides a testable implication for future empirical analysis. Anecdotal evidence suggests that firms rely on CSR particularly in markets with a high degree of concentration. The food and beverage industry exemplifies this trend.

3.4. Asymmetric firms

In this section, we examine a lobbying contest between two asymmetric firms, where winning yields a payoff of T_1 for firm 1 and T_2 for firm 2, with $T_1 > T_2$. We refer to firm 1 as the more efficient firm because it benefits more from winning. This setting also captures the case where firms have different lobbying costs.²¹ Proposition 3 identifies four possible equilibrium scenarios: (i) neither firm invests in CSR, (ii) only the less efficient firm invests in CSR, (iii) only the more efficient firm invests in CSR, or (iv) both firms invest in CSR, with the more efficient firm making more substantial investments.

Proposition 3. There exist thresholds $0 < \alpha_1, \alpha_2 < 1$ such that a unique asymmetric equilibrium arises where

²¹ A firm's payoff under different winning payoffs, $T_i w_i - c_i$, is a positive linear transformation of its payoff under different lobbying costs, $w_i - \frac{1}{T_i} c_i$.

1. $c_1 = c_2 = 0$ and $l_1 = \omega_1(r(0, 0)) > l_2 = \omega_2(r(0, 0))$ if $\alpha < \alpha_1, \alpha_2$,
2. $c_1 = \omega_1(r(c_1, 0)) > c_2 = 0$ and $l_1 = 0 < l_2 = \omega_2(r(c_1, 0))$ if $\alpha_1 < \alpha < \alpha_2$,
3. $c_2 = \omega_2(r(0, c_2)) > c_1 = 0$ and $l_2 = 0 < l_1 = \omega_1(r(0, c_2))$ if $\alpha_2 < \alpha < \alpha_1$,
4. $c_1 = \omega_1(r(c_1, c_2)) > c_2 = \omega_2(r(c_1, c_2))$ and $l_1 = 0 = l_2$ if $\alpha_1, \alpha_2 < \alpha$.

Equilibrium derivation

Related contests have been investigated by Nti (1999), whose previous analysis corresponds with Stage 2 in our model, where firms choose L-lobbying. The first-order condition of a firm's problem is almost the same as in Section 3.1

$$-1 + T_i \frac{r(c) \left(\frac{f_i}{f_i} \right)^{r(c)}}{f_i \left(1 + \left(\frac{f_i}{f_i} \right)^{r(c)} \right)^2} = 0. \quad (6)$$

We can immediately see that assuming identical efforts $f_1 = f_2$ leads to different optimal efforts $f_1 = \frac{T_1 r(c)}{4} > f_2 = \frac{T_2 r(c)}{4}$ for firms 1 and 2, which gives a contradiction. Hence, optimal total efforts are asymmetric $f_1 > f_2$, characterized by

$$T_1 \frac{r(c) \left(\frac{f_2}{f_1} \right)^{r(c)}}{f_1 \left(1 + \left(\frac{f_2}{f_1} \right)^{r(c)} \right)^2} = T_2 \frac{r(c) \left(\frac{f_1}{f_2} \right)^{r(c)}}{f_2 \left(1 + \left(\frac{f_1}{f_2} \right)^{r(c)} \right)^2} = 1, \quad (7)$$

which gives

$$\frac{f_i}{T_i} = \frac{r(c)(x)^{r(c)}}{f_2(1+(x)^{r(c)})^2}, \text{ for } x = \frac{f_1}{f_2} = \frac{T_1}{T_2} > 0$$

As also previously demonstrated by Nti (1999), total efforts are thus proportional to firm valuations and given by

$$f_2 = T_2 \frac{r(c) \left(\frac{T_1}{T_2} \right)^{r(c)}}{\left(1 + \left(\frac{T_1}{T_2} \right)^{r(c)} \right)^2} =: \omega_2(r),$$

$$f_1 = T_1 \frac{r(c) \left(\frac{T_1}{T_2} \right)^{r(c)}}{\left(1 + \left(\frac{T_1}{T_2} \right)^{r(c)} \right)^2} =: \omega_1(r).$$

The analysis by Nti (1999) further indicates that a pure strategy equilibrium exists here given that $r < 1 + \left(\frac{T_2}{T_1} \right)^r$.

Our key novelty relative to Nti (1999) is that L-lobbying incentives in Stage 2 are influenced by C-lobbying decisions in Stage 1. Similar to symmetric payoff contests, C-lobbying crowds out L-lobbying and adds to the contest noise. For $x = \frac{T_1}{T_2} > 1$, the derivative of a firm's total lobbying effort, f_i , with respect to $r \in (0, 1)$ is given by

$$EF_i = \frac{\partial f_i}{\partial r} = T_i \frac{x^r(1+x^r+r(1-x^r)\ln x)}{(1+x^r)^3} > 0. \quad (8)$$

EF_i is positive if the condition

$$f(x, r) := 1 + x^r + r(1 - x^r) \ln x > 0 \quad (9)$$

holds; otherwise, EF_i is negative.

The ambiguous effect of noise on effort, EF_i , suggests that CSR can increase or decrease lobbying. A closer examination of (9) indicates that the increased noise introduced by C-lobbying reduces total lobbying effort when the two firms have similar efficiency levels ($x < \tilde{x}(r)$).²² However, when one firm is significantly more efficient ($x > \tilde{x}(r)$), C-lobbying leads to higher total lobbying effort for both firms. In each case, (8) shows that the effect is always more pronounced for the more efficient firm: $EF_1 > EF_2 > 0$ for $x < \tilde{x}(r)$, and $EF_1 < EF_2 < 0$ for $x > \tilde{x}(r)$. We provide an example with highly asymmetric firms to illustrate these effects in Fig. 4.

Remark 1. CSR investment reduces total lobbying effort in asymmetric contests if and only if one of the following two conditions is satisfied: (1) firms are not significantly different in terms of efficiency ($x < \tilde{x}(r)$), or (2) firms are quite different in efficiency, but the level of noise in the contest is sufficiently high ($r < \tilde{x}^{-1}(x)$).

²² The solution to $\tilde{x}$ is given in the Appendix A.

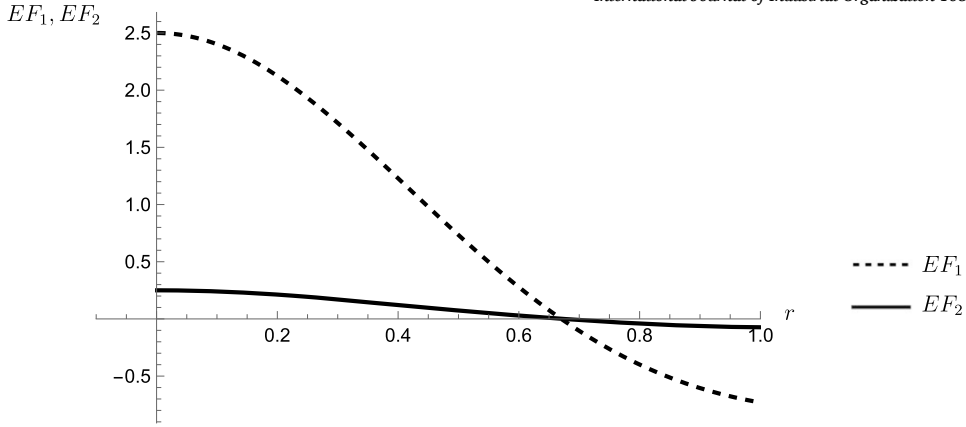


Fig. 4. The effect of r on the total lobbying effort for $T_1 = 10, T_2 = 1, r \in (0, 1)$.

Remark 1 identifies cases where CSR decreases total lobbying effort. If C-lobbying can effectively substitute for L-lobbying, these are also the cases in which CSR improves total welfare in asymmetric contests, assuming lobbying is wasteful. However, if firms are highly asymmetric (x is high), the noise level is relatively low (r is high), or C-lobbying is not very cost-efficient (α is low), the opposite outcome arises. In such cases, increasing CSR investment still amplifies noise in the contest, but it may also increase total lobbying or lobbying costs. Increased lobbying costs reduce incentive for making CSR contributions, particularly for the more efficient firm.

In Stage 1, a firm's problem in choosing its optimal C-lobbying can be written as

$$\max_{c_i} T_i \frac{1}{1 + \left(\frac{T_j}{T_i}\right)^{r(c)}} - c_i - (f_i - \alpha c_i).$$

While the analysis of optimal choice of CSR is almost identical to Section 3.2, a new feature is that a firm can influence both its total effort level and its probability of winning the contest through CSR. Since equilibrium effort is asymmetric, the probability of winning depends on x and r , whereas in a symmetric effort solution, each firm has an equal chance of winning $1/2$. The threshold value of α above which firms switch from L-lobbying to C-lobbying can be rewritten as

$$\alpha_i = 1 - T_i \frac{\partial w_i}{\partial r} \gamma + \frac{\partial f_i}{\partial r} \gamma = 1 + \gamma T_i E W_i - \gamma E F_i,$$

where $E F_i = \frac{\partial f_i}{\partial r}$ is the effect of (reduced) noise on the lobbying effort given by (8), and

$$E W_i = \frac{\partial w_i}{\partial r} = \frac{-1}{\left(1 + \left(\frac{T_j}{T_i}\right)^{r(c)}\right)^2} \left(\frac{T_j}{T_i}\right)^{r(c)} \ln\left(\frac{T_j}{T_i}\right) \quad (10)$$

is the effect of noise on the probability of winning.

To the more efficient firm 1, the effect of (reduced) noise on the probability of winning is

$$E W_1 = \frac{\partial w_1}{\partial r} = \frac{-1}{\left(1 + \left(\frac{1}{x}\right)^{r(c)}\right)^2} \left(\frac{1}{x}\right)^{r(c)} \ln\left(\frac{1}{x}\right) > 0$$

for any $r \in (0, 1)$, and $T_1 > T_2$ or equivalently $x > 1$.

We observe that $E W_1$ decreases with r and converges to 0^+ as r approaches 1, irrespective of x . The rate of decrease depends on the x — a higher x results in a faster decrease in $E W_1$. Meanwhile, to the less efficient firm 2, CSR investment has a positive effect on winning probabilities as $E W_2 < 0$ for any $r \in (0, 1)$ and $x > 1$. Fig. 5 shows how $E W_i$ changes with respect to r when T_1 and T_2 are set to be 2000 and 1, respectively.

In particular, when x is infinitely large, the limit of the effect of noise on the probability of winning approaches zero for both firms.

$$\lim_{x \rightarrow +\infty} E W_1 = \lim_{x \rightarrow +\infty} \frac{1}{\left(1 + \left(\frac{1}{x}\right)^{r(c)}\right)^2} \left(\frac{1}{x}\right)^{r(c)} \ln\left(\frac{1}{x}\right) \rightarrow 0^+, \text{ and } \lim_{x \rightarrow +\infty} E W_2 \rightarrow 0^-.$$

In other words, when firms differ significantly in efficiency, variations in the noise level have little effect on a firm's winning probability.

We observe that each firm's eagerness to expand CSR depends on two opposing effects. On the one hand, increased noise reduces the intensity of lobbying competition, which disadvantages the more efficient firm that invests more in winning the contest, while

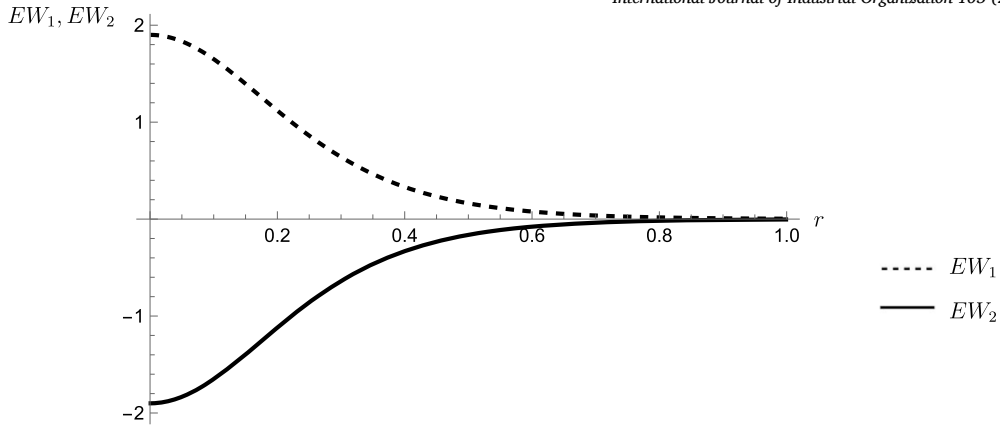


Fig. 5. The effect of r on the probability of winning for $T_1 = 2000, T_2 = 1, r \in (0, 1)$.

benefiting its rival, which invests less ($EW_1 > 0 > EW_2$). On the other hand, depending on the efficiency gap between the two firms, noise may disproportionately reduce the total lobbying of the more efficient firm, thereby lowering its lobbying costs more significantly than those of its rival ($EF_1 > EF_2 > 0$ for low x); the opposite case is also possible ($EF_1 < EF_2 < 0$ for high x).

Corollary 4. *CSR investments vary by firm and (x, r) :*

1. For $x < \tilde{x}(r)$, both firms have incentives for investing in CSR. Firm 1 benefits more through the reduction in lobbying costs whereas firm 2 benefits from its increased probability of winning.
2. For $x > \tilde{x}(r)$, only the less efficient may firm have incentives to adopt C-lobbying, as CSR increases its probability of winning; increasing total lobbying costs for $x > \tilde{x}(r)$ discourage CSR investment.

This positive effect of CSR on the winning probability of the less efficient firm creates a new welfare tradeoff between lower total lobbying costs and reduced allocation efficiency. Unlike in symmetric contests, where shifting from L-lobbying to C-lobbying generally improves welfare, in highly asymmetric markets, responsible C-lobbying may not always be welfare-enhancing compared to traditional L-lobbying. Yet, observable firm asymmetries are usually not a concern, as the DM can address them through mechanisms such as head-starts.

Overall, our analysis indicates that CSR is linked to firms' efficiency differences. In contests where T_i is privately observed, CSR investment may hence serve as a signal of quality or cost type. Proposition 3.4 shows that both firms engage solely in L-lobbying when $\alpha < \alpha_1, \alpha_2$ and switch entirely to C-lobbying when $\alpha > \alpha_1, \alpha_2$. Under unobserved types, firm decisions exhibit more inertia, allowing for pooling at L-lobbying for some $\alpha > \alpha_1, \alpha_2$ and at C-lobbying for some $\alpha < \alpha_1, \alpha_2$. This pooling could help explain the simultaneous expansion of CSR programs by companies like Coca-Cola and PepsiCo.²³

Our model assumes that the payoffs of winning, T_1 and T_2 , are observable. However, an extensive literature, following Potters and Van Winden (1992), examines scenarios where the DM seeks to implement the most efficient policy but faces asymmetric information about its effects on firms. Firms, in turn, attempt to communicate these effects but have incentives to exaggerate them. Our results suggest that both L- and C-lobbying can act as (costly) signaling mechanisms in lobbying contests, of which firms often choose the less costly option.

4. Conclusion

Our equilibrium analysis demonstrates that rising public interest in CSR can incentivize firms to switch from traditional L-lobbying to more responsible C-lobbying. We argue that, although C- and L-lobbying are substitutes, greater reliance on C-lobbying introduces more noise into the contest for influence, making success less sensitive to expenditure. This obfuscation can reduce spending and improve welfare, even when traditional L-lobbying is more cost-efficient. We hypothesize that the transition from L- to C-lobbying is ultimately demand-driven. If support for CSR wanes—for instance, due to a backlash against ‘woke’ policies—the momentum may shift. Our findings then predict that firms will revert to more traditional lobbying approaches, leading to increased influence spending. Alternatively, one firm (e.g., PepsiCo) can focus on more CSR-sensitive stakeholders and decrease lobbying, while the other firm (e.g., Coca-Cola) may lobby more if its stakeholders are less responsive to CSR. Future research should study why lobbying has remained persistent in certain industries, such as pharmaceuticals (Open Secrets, 2024).²⁴

²³ We explore signaling mechanisms further in the Appendix B.

²⁴ It is possible that this industry, lobbying heavily in drug pricing, is just lagging behind the trend since the industry is growing and less concentrated, with the main producers of active ingredients located in China and India and a clear imperative to prioritize patient health over waste reduction, etc.

We conclude by summarizing our findings for the four model interpretations given in Section 2.

Interpretation 1: Soda war

This is the traditional perspective on the model, where lobbyists are competing firms. Our analysis suggests that when companies like Coca-Cola and PepsiCo engage in responsible C-lobbying—such as each promoting its preferred plastic reduction plan—their need for traditional L-lobbying against regulations diminishes (substitution effect). Moreover, a comparison of Coca-Cola's and PepsiCo's CSR programs reveals significant differences (Forbes, 2023), despite both firms receiving “medium risk” ESG ratings from Morningstar Sustainalytics (2024). This differentiation in CSR can weaken the competitive pressure to lead on environmental responsibility (obfuscation effect), potentially discouraging further sustainability investments. However, attempts to influence policy through diversified recycling initiatives may still be socially preferable to lobbying outright against, say, the Plastic Pollution Act. This can increase market welfare. Fig. 1 shows that Coca-Cola's and PepsiCo's lobbying efforts subsided in the 2010s.

Interpretation 2: Big soda

In this alternative model interpretation, the lobbyists consist of beverage companies on one side and environmental organizations on the other. Anecdotal evidence (Unearthed, 2017) and lobbying data (Open Secrets, 2024) suggest that, in the 2010s, Big Soda opened a new front in its lobbying against environmental groups—particularly on issues like bottle deposit return systems (DRS)—by emphasizing its voluntary environmental initiatives.²⁵ Our results predict that such differentiation and obfuscation of environmental policy targets tend to reduce lobbying efforts. Fig. 1 shows a decline in lobbying conducted by Coca-Cola, PepsiCo, and the Consumer Brands Association. Similarly, data indicate that Greenpeace and other environmental groups have reduced their lobbying expenditure (Open Secrets, 2024). Our model explains this by the declining effectiveness of environmentalist lobbying in the face of renewed corporate agendas, especially as both Coca-Cola and PepsiCo have pledged to reduce plastic waste.²⁶

Interpretation 3: CSR in public procurement

In this third model interpretation, Coca-Cola and PepsiCo compete for a contract with a public procurement officer. According to TendersGo (2023), a tender search engine, both companies ranked among the top 10 in securing public tenders in Europe by total contract value in the food and beverage industry in 2021 and 2023. Given the European Commission (2021) *Guide to taking account of social considerations in public procurement*, these firms' comprehensive CSR initiatives are likely to enhance their prospects of winning public contracts. At the same time, our results on responsible public procurement, developed in the Appendix B, suggest a potential downside: If the weight placed on CSR initiatives is sufficiently high, competition in the main price dimension becomes more relaxed—raising concerns about the efficient use of public funds and the optimality of mechanisms like scoring auctions for promoting CSR. Welfare tradeoffs may be industry-specific and the administrative costs of verifying firms' CSR claims substantial.

Interpretation 4: CSR in market competition

This is the fourth interpretation of our model, micro-founded in the Appendix B, where Coca-Cola and PepsiCo compete for a consumer who cares about price and CSR. The presence of CSR introduces more noise into the comparison between firms' products, thereby decreasing the price elasticity of demand. As with CSR applied in public procurement, our results suggest that competition in the CSR dimension is likely to reduce competition in the price dimension, harming consumers through increased prices.

CRedit authorship contribution statement

Saara Hämäläinen: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Conceptualization. **Yi Zheng:** Writing – review & editing, Writing – original draft, Visualization, Formal analysis, Conceptualization.

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Appendix A

A.1. Proof of Lemma 1

The first-order condition of a firm's objective function with respect to l_i is

$$\frac{rT \left(\frac{f_i}{f_i} \right)^r}{f_i \left(1 + \left(\frac{f_i}{f_i} \right)^r \right)^2} - 1 = 0,$$

while the second-order condition of the same function with respect to l_i is

²⁵ According to the Greenpeace journal Unearthed (2017), Coca-Cola argued in 2015 that a DRS scheme would “cause expense and inconvenience to consumers, particularly vulnerable people; damage business and existing recycling and anti-littering initiatives; and increase carbon emissions and environmental impact.” In 2016, Coca-Cola stated: “We support recovery and recycling of our packaging and we want to help find ways to ensure that less of it is littered and ends up in the sea. [I]n some cases, we have believed a different approach could be more effective and more sustainable than DRS.”

²⁶ These firms still top the list of the world's biggest plastic polluters (Break Free From Plastic, 2023).

$$-\frac{rT\left(\frac{f_i}{f_i}\right)^r}{f_i^2\left(1+\left(\frac{f_j}{f_i}\right)^r\right)^3}\left(1+r+(1-r)\left(\frac{f_j}{f_i}\right)^r\right) < 0,$$

where $f_i = l_i + \alpha c_i$ and $r = r(\mathbf{c})$ for $(\mathbf{c}) = (c_i, c_j)$. The second-order condition is satisfied for $r < 1$.

Step 1. Unique continuous best responses.

We can easily see that the objective function is continuous in $(l_i, l_j; c_i, c_j)$, and r , for positive effort $f_i, f_j > 0$. The negative second derivative also shows that the objective function is strictly concave in l_i for $r < 1$. By Berge's theorem of maximum, the best response $l_i^*(l_j)$ therefore defines a continuous function of $(l_j; c_i, c_j)$, and r .

Step 2. Symmetric L- and C-lobbying.

If $c_i = c_j > 0$, the best response functions $l_i^*(l_j)$ and $l_j^*(l_i)$ are symmetric and continuous. Thus, a symmetric L-lobbying equilibrium where $l_i = l_j$ and $f_i = f_j$ exists by Kakutani's fixed point theorem.

Step 3. Symmetric effort equilibria.

The symmetric effort solution $f_i = f_j = f$ is given by

$$f = \frac{Tr\left(\frac{f}{f}\right)^r}{\left(1+\left(\frac{f}{f}\right)^r\right)^2} = \frac{Tr}{4}.$$

This solution is denoted by $f(\mathbf{c})$. As $f(\mathbf{c})$ is the unique solution to the first- and second-order conditions, symmetric total efforts $f = f(\mathbf{c})$ characterize the equilibrium when $\alpha c_i, \alpha c_j \leq f(\mathbf{c})$: if $c_i = c_j$, then $l_i = f(\mathbf{c}) - \alpha c_i = l_j = f(\mathbf{c}) - \alpha c_j$, whereas, if $c_i > c_j$, then $l_i = f(\mathbf{c}) - \alpha c_i < l_j = f(\mathbf{c}) - \alpha c_j$.

When $\alpha c_i = \alpha c_j > f(\mathbf{c})$, $l_i = l_j = 0$ defines the symmetric equilibrium, whose existence was suggested above by Kakutani's fixed point theorem. As

$$\alpha c_i = \alpha c_j > \frac{Tr}{4},$$

both firms have incentives to reduce their total effort as much as possible. A corner solution therefore arises where firms choose zero L-lobbying.

Step 4. Asymmetric effort equilibria.

If $\alpha c_i > f$ or $\alpha c_j > f$, the optimal effort l_i can be either an interior solution or a corner solution to a firm's problem.

In an interior solution where $l_i > 0$, a firm's best response satisfies the condition

$$f_i = \frac{Tr\left(\frac{f_i}{f_i}\right)^r}{\left(1+\left(\frac{f_j}{f_i}\right)^r\right)^2}.$$

In a corner solution where $l_i = 0$, a firm's best response satisfies the requirement

$$f_i \geq \frac{Tr\left(\frac{f_i}{f_i}\right)^r}{\left(1+\left(\frac{f_j}{f_i}\right)^r\right)^2}.$$

Because the function $\frac{x}{(1+x)^2}$ is increasing for $x < 1$ and decreasing for $x > 1$, its maximum value is given by $\frac{1}{4}$. As a result, the optimal effort $f_i^*(f_j)$ never lies above $f(\mathbf{c}) = \frac{Tr}{4}$ in an interior solution. If $\alpha c_i > f(\mathbf{c})$, the best response of firm j is thus $f_j^*(f_i) \leq f(\mathbf{c})$ and the best response of firm i to this $f_i^*(f_j^*) \leq f(\mathbf{c})$. In summary, we find that $l_i = 0$ and $l_j \leq \min\{f(\mathbf{c}) - \alpha c_j, 0\}$ if $\alpha c_i > f(\mathbf{c})$. $\square$

A.2. Proof of Lemma 2

Step 1—Necessity.

As $0 < \frac{Tr(T,T)}{4} < \frac{Tr(0,0)}{4} < \frac{T}{4}$, equilibrium lobbying is positive. As a result, if $c_i = 0$, then $l_i > 0$ and, if $l_i = 0$, then $c_i > 0$.

Case 1. If $c_i = 0$, then $l_i = \frac{Tr(0,0)}{4} > 0$, and $\alpha \leq 1 + \frac{\partial r(0,0)}{\partial c_i} \frac{T}{4}$.

An incentive to increase $c_i = 0$ in Stage 1 arises if $\alpha > 1 + \frac{\partial r(0,0)}{\partial c_i} \frac{T}{4}$ and an incentive to change l_i in Stage 2 arises unless $l_i = \frac{Tr(0,0)}{4}$.

If $\alpha > 1 + \frac{Tr(c',0) - r(0,0)}{4c'}$ for $c' > 0$, a profitable deviation in Stage 1 from $c_i = 0$ to $c_i = c' > 0$ exists, decreasing total lobbying costs.

Case 2. If $l_i = 0$, then $c_i = \frac{Tr(c_i, c_i)}{4\alpha} > 0$, and $\alpha \geq 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$.

An incentive to increase $l_i = 0$ in Stage 2 arises unless $c_i \geq \frac{Tr(c_i, c_i)}{4\alpha}$, and an incentive to reduce $c_i = \frac{Tr(c_i, c_i)}{4\alpha}$ in Stage 1 arises if $\alpha < 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$. If $\alpha < 1 + \frac{Tr(c', c_i) - r(c_i, c_i)}{4(c' - c_i)}$ for $c' < c_i$, a profitable deviation in Stage 1 from c_i to c' exists that decreases total lobbying costs.

Case 3. If $0 < c_i < \frac{Tr(c_i, c_i)}{4\alpha}$, c_i satisfies the condition $\alpha = 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$ and l_i satisfies the condition $l_i = \frac{Tr(c_i, c_i)}{4} - \alpha c_i$.

As $0 < c_i < \frac{Tr(c_i, c_i)}{4\alpha}$, an incentive to change c_i arises unless $\alpha = 1 + \frac{\partial r(c_i, c_i)}{\partial c_i} \frac{T}{4}$ and an incentive to change l_i arises unless $l_i = \frac{Tr(c_i, c_i)}{4} - \alpha c_i$.

Step 2—Sufficiency.

Item 2.1. Suppose $c_i > f(c)/\alpha \geq c_j$.

The CSR-leader's payoff is given by (4b)

$$T \frac{1}{1 + \left(\frac{f_j}{\alpha c_i}\right)^{r(c_i, c_j)}} - c_i,$$

and the first-order condition is

$$T \underbrace{\frac{r\left(\frac{f_j}{\alpha c_i}\right)^r}{c_i \left(1 + \left(\frac{f_j}{\alpha c_i}\right)^r\right)^2}}_{\frac{\partial w_i}{\partial f_i} \frac{\partial f_i}{\partial c_i}} + \underbrace{(-1)}_{\frac{\partial e_i}{\partial c_i}} + T \underbrace{\frac{-\left(\frac{f_j}{\alpha c_i}\right)^r \log\left(\frac{f_j}{\alpha c_i}\right) \frac{\partial r(c)}{\partial c_i}}{\left(1 + \left(\frac{f_j}{\alpha c_i}\right)^r\right)^2}}_{\frac{\partial w_i}{\partial r} \frac{\partial r}{\partial c_i}} = 0$$

The sum of the first two terms is negative as $c_i > f(c)/\alpha = \frac{Tr}{4\alpha} > f(c) = \frac{Tr}{4}$. The last term is also negative because $\log\left(\frac{f_j}{\alpha c_i}\right) \frac{\partial r(c)}{\partial c_i} > 0$.

A CSR-leader thus prefers to decrease its C-lobbying at least until $c_i = \frac{Tr}{4}$.

Item 2.2. Suppose $c_i \geq c_j > f(c)/\alpha$.

The CSR-leader's payoff is given by (4b)

$$T \frac{1}{1 + \left(\frac{c_j}{c_i}\right)^{r(c_i, c_j)}} - c_i,$$

and the first-order condition is

$$T \underbrace{\frac{r\left(\frac{c_j}{c_i}\right)^r}{c_i \left(1 + \left(\frac{c_j}{c_i}\right)^r\right)^2}}_{\frac{\partial w_i}{\partial f_i} \frac{\partial f_i}{\partial c_i}} + \underbrace{(-1)}_{\frac{\partial e_i}{\partial c_i}} + T \underbrace{\frac{-\left(\frac{c_j}{c_i}\right)^r \log\left(\frac{c_j}{c_i}\right) \frac{\partial r(c)}{\partial c_i}}{\left(1 + \left(\frac{c_j}{c_i}\right)^r\right)^2}}_{\frac{\partial w_i}{\partial r} \frac{\partial r}{\partial c_i}} = 0$$

The sum of the first two terms is negative as $c_i > f(c)/\alpha = \frac{Tr}{4\alpha} > f(c) = \frac{Tr}{4}$. The last term is similarly negative as $\log\left(\frac{f_j}{\alpha c_i}\right) \frac{\partial r(c)}{\partial c_i} > 0$.

A CSR-leader thus prefers to decrease its C-lobbying at least until $c_i = \frac{Tr}{4}$.

Jointly, Item 2.1 and Item 2.2 show that a CSR-leader prefers to decrease its C-lobbying, at least, until the level of $c_i = f(c)/\alpha$, entailing that a symmetric effort equilibrium arises.

Remark. If $\alpha > 1$ (unlike we assume), then $\alpha > 1 + \frac{\partial r(c)}{\partial c_i} \frac{T}{4}$ for any c . As a result, firms only apply C-lobbying. Optimal symmetric C-lobbying satisfies the fixed point condition $c = f = \frac{Tr(c, c)}{4}$. This case where $\alpha > 1$ (C-lobbying is more efficient) differs from our earlier case $\alpha \leq 1$ (L-lobbying is more efficient) by firms' ability to commit to their total lobbying effort already in Stage 1. Namely, when $\alpha > 1$, a firm knows that by setting $c = f(c)(> f(c)/\alpha)$, it can commit not to L-lobby in Stage 2 as L-lobbying is less efficient. Instead, when $\alpha < 1$, a firm would need to choose a higher C-lobbying $c = f(c)/\alpha(> f(c))$ to commit not adding more efficient L-lobbying in Stage 2. $\square$

Proof of Proposition 1

Proposition 1 follows almost directly from Lemmas 1 and 2.

1. When r is linear, for all c_i , $\frac{\partial r(c_i, c_j)}{\partial c_i} = -\gamma$ is constant and negative by assumption.

If $\alpha < 1 - \gamma \frac{T}{4}$, by Lemma 2.1, we find a symmetric equilibrium where $c_i = 0$ and $l_i > 0$.

If $\alpha > 1 - \gamma \frac{T}{4}$, by Lemma 2.2, we find a symmetric equilibrium where $l_i = 0$ and $c_i > 0$.

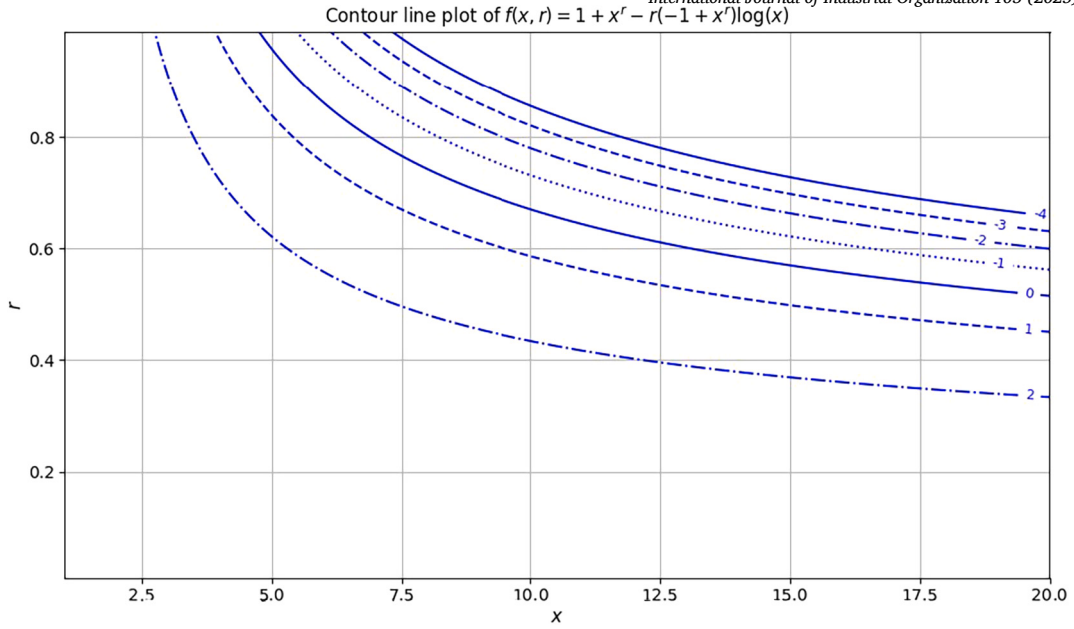
Next, denote by $\tilde{c}(\tilde{c})$ the unique value satisfying the fixed point condition $c_i = \tilde{c}(c_i)$.

2. When r is concave, and the assumption is that r is decreasing in c_i , we have $-\gamma(c_i) < -\frac{\Delta r}{\Delta c}(c', c_i) < -\frac{\Delta r}{\Delta c}(c', 0) < -\gamma(0) < 0$, where $0 < c' < c_i = \tilde{c}(\tilde{c})$.

If $\alpha < 1 - \frac{\Delta r}{\Delta c}(c', 0) \frac{T}{4} (< 1 - \gamma(0) \frac{T}{4})$, by Lemma 2.1, we find a unique equilibrium where $c_i = 0$ and $l_i > 0$.

If $\alpha > 1 - \frac{\Delta r}{\Delta c}(c', c_i) \frac{T}{4} (> 1 - \gamma(c_i) \frac{T}{4})$, by Lemma 2.2, we find a unique equilibrium where $l_i = 0$ and $c_i > 0$.

Otherwise, if $\alpha \in [1 - \frac{\Delta r}{\Delta c}(c', c_i), 1 - \frac{\Delta r}{\Delta c}(c', 0)]$, multiple equilibria exist where $c_i = 0$ or $l_i = 0$ by Lemmas 2.1 and 2.2. By Lemma 2.3, and the continuity of $\gamma(c_i)$, an equilibrium satisfying the fixed point condition $\alpha = 1 - \gamma(c_i) \frac{T}{4}$ exists, where $0 < c_i < \frac{Tr(c_i, c_i)}{4\alpha}$ and $l_i = \frac{Tr(c_i, c_i)}{4} - \alpha c_i > 0$.

Fig. 6. The effect of r on EF_i .

3. When r is convex, and the assumption is that r is decreasing in c_i , we have $-\gamma(0) < -\frac{\Delta r}{\Delta c}(c', 0) < -\frac{\Delta r}{\Delta c}(c', c_i) < -\gamma(c_i) < 0$, where $0 < c' < c_i (= \tilde{c}(\tilde{c}))$.

If $\alpha < 1 - \gamma(0)\frac{T}{4} (< 1 - \frac{\Delta r}{\Delta c}(c', 0)\frac{T}{4})$, by Lemma 2.1, we find a unique equilibrium where $c_i = 0$ and $l_i > 0$.

If $\alpha > 1 - \gamma(c_i)\frac{T}{4} (> 1 - \frac{\Delta r}{\Delta c}(c', c_i)\frac{T}{4})$, by Lemma 2.2, we find a unique equilibrium where $l_i = 0$ and $c_i > 0$.

Otherwise, by Lemma 2.3, a unique equilibrium satisfying the fixed point condition $\alpha = 1 - \gamma(c_i)\frac{T}{4}$ exists, where $0 < c_i < \frac{Tr(c_i, c_i)}{4\alpha}$ and $l_i = \frac{Tr(c_i, c_i)}{4} - \alpha c_i > 0$. $\square$

A.3. Proof of Proposition 2

Key parts of the proof are sketched in the main text. Proposition 2 is an immediate extension of Proposition 1 to multiple firms. $\square$

A.4. Proof of Proposition 3

Key parts of the proof are sketched in the main text. Proposition 3 is an extension of Proposition 1 to asymmetric firms.

To derive the change in lobbying effort $EF_i = \frac{\partial f_i}{\partial r}$, we differentiate $\frac{f_i}{T_i} = (rx^r)/(1+x^r)^2$ with respect to r , which gives

$$(x^r(1+x^r-r(-1+x^r)\log(x)))/(1+x^r)^3$$

The contour lines of function $f(x, r) = 1 + x^r - r(-1 + x^r)\log(x)$, which gives the sign of EF_i , are shown in Fig. 6.

Solution for $\tilde{x}$:

By letting r approach 1^- and solving the condition (9) as an equality,

$$r(-1+x^r)\ln x = 1+x^r,$$

we find a unique real solution for $\tilde{x}$ in the range of $(1, \infty)$, located at

$$x \approx 4.68050.$$

That is, for all $x < \tilde{x} = 4.68050$, $EF_i > 0$ regardless of the value of r .

Furthermore, as r approaches 0^+ , the inequality (9) always holds since

$$-r(-1+x^r)\ln x + 1+x^r$$

approaches 2, regardless of the value of x , and consequently, $EF_i > 0$. $\square$

Appendix B

B.1. Micro-foundations

In our model, the size of the prize is fixed at T , lobbying effort is $f_i = l_i + \alpha c_i$ and the cost of lobbying is $e_i = l_i + c_i$. By introducing the transformation $C_i = \alpha c_i$, our model gives $f_i = l_i + \alpha c_i = l_i + C_i$ and $e_i = l_i + c_i = l_i + \alpha^{-1} C_i$. Our assumption of $\alpha < 1$ thus entails either that C-lobbying is less effective than L-lobbying or that C-lobbying is more costly than L-lobbying.

To emphasize the idea that C-lobbying is used for both lobbying and marketing, we could also allow the profit of the winner, T , to be increasing in C-lobbying, by assuming that $\frac{\partial T(c_i, c_j)}{\partial c_i} > 0$. This additional beneficial effect of CSR would encourage firms to C-lobby more than in our basic model. Optimal total effort is increasing in T . Thus, also L-lobbying might increase.

The specific assumption that T is proportional to c_i ,

$$c_i T w_i - c_i - l_i,$$

entails that the profit of the winner is proportional to

$$T w_i - 1 - \frac{l_i}{c_i}.$$

Lobbying costs would thus be increasing in L-lobbying and decreasing in C-lobbying.

In consequence, the first-order condition of a firm's problem of choosing L-lobbying would turn into

$$\frac{Tr\left(\frac{f_i}{f_i}\right)^r}{f_i\left(1 + \left(\frac{f_j}{f_i}\right)^r\right)^2} - \frac{1}{c_i} = 0,$$

with the potential to change C- and L-lobbying from strategic substitutes into strategic complements.

B.1.1. Interpretation 3: CSR in public procurement

The DM who is in charge of public procurement considers both prices and firms' CSR investments. Differentiated CSR efforts introduce additional uncertainty into the decision making process. Applying a version of the Stahl (1989) model, where firms' prices follow the distribution F , the profit of a firm can be written as

$$\pi_i = \left(\delta(c_i, c_j)(1 - F(p_i)) + (1 - \delta(c_i, c_j))\frac{1}{2} \right) p_i - c_i.$$

With probability δ , the DM chooses the firm with the lowest price offer and, with probability $1 - \delta$, the DM chooses between the firms at random. We assume that higher CSR efforts increase the likelihood of a random choice, $\frac{\partial \delta(c_i, c_j)}{\partial c_i} < 0$.

Prices are chosen in Stage 2 and CSR levels fixed in Stage 1. The analysis of Stahl (1989) shows that there is a unique symmetric mixed price equilibrium in a model where δ is fixed. For any CSR, the equilibrium yields a firm the profit of

$$\pi_i = (1 - \delta(c_i, c_j))\frac{1}{2} - c_i$$

By differentiating the profit function with respect to c_i we obtain the following first-order condition for optimal CSR decision

$$-\frac{\partial \delta(c_i, c_j)}{\partial c_i} \frac{1}{2} - 1 = 0,$$

indicating that firms have incentives to make investments in CSR to relax price competition in procurement if $\frac{\partial \delta(c_i, c_j)}{\partial c_i} < 2$.²⁷

B.1.2. Interpretation 4: CSR in market competition

When consumers care about CSR investments, a firm's profit can be expressed as follows

$$\pi_i(p_i, c_i) = p_i d_i(p_i, p_j; c_i, c_j) - c_i$$

where the demand d_i depends on market prices as well as firms' costly CSR investments.

When CSR investments are low, most consumers buy from the firm that charges the lower price. When CSR investments are high, the firms are more differentiated in the eyes of consumers. Hence, CSR investments dampen price competition by making firms more differentiated.

²⁷ A related working paper, available from the authors upon request, provides a fuller study.

By assuming, similarly to Anderson and De Palma (1992), that a firms' demand follows the multinomial logit model

$$d(p_i, p_j; \mathbf{c}) = \frac{\exp\left(\frac{a-p_i}{\mu}\right)}{\exp\left(\frac{a-p_i}{\mu}\right) + \exp\left(\frac{a-p_j}{\mu}\right)},$$

where μ denotes the degree of product differentiation, the model becomes quite similar to our original contest model.

The idea that CSR investments make firms more differentiated can be captured by assuming that $\frac{\partial \mu(c_i, c_j)}{\partial c_i} > 0$. For $\mu \rightarrow 0$, all consumers buy from the firm who offers the lowest price. For $\mu \rightarrow \infty$, consumers choose the firm at random.

Prices are chosen at Stage 2 by solving the problem

$$\max_{p_i} p_i \frac{\exp\left(\frac{a-p_i}{\mu}\right)}{\exp\left(\frac{a-p_i}{\mu}\right) + \exp\left(\frac{a-p_j}{\mu}\right)}$$

As demonstrated by Anderson and De Palma (1992), the unique duopoly equilibrium price is given by

$$p_i = p_j = 2\mu = 2\mu(c_i, c_j).$$

The demand of each firm is thus one half in the simplest model version without an option of not buying.

CSR is chosen at Stage 1, solving the problem

$$\max_{c_i} 2\mu(c_i, c_j) \frac{1}{2} - c_i.$$

The first-order condition can be expressed as

$$\frac{\partial \mu(c_i, c_j)}{\partial c_i} - 1 = 0.$$

Similarly to our Tullock contest model, we can thus see that firms have incentives to make investments in CSR until the marginal revenue product of CSR equals its marginal cost. The incentive arises because CSR furthers product differentiation and, thus, alleviates price competition.

The model can be enriched by assuming that demand is increasing in investment in CSR. In the more general version of the multinomial logit-model, market demand depends on the value of the outside option, V_0 .

$$d(p_i, p_j; \mathbf{c}) = \frac{\exp\left(\frac{a-p_i}{\mu}\right)}{\exp\left(\frac{V_0}{\mu}\right) + \exp\left(\frac{a-p_i}{\mu}\right) + \exp\left(\frac{a-p_j}{\mu}\right)}.$$

To allow for changes in demand, we introduce the assumption that investments in CSR render not buying relatively less attractive, which would show up in the lower value of the outside option: $\frac{\partial V_0(c_i, c_j)}{\partial c_i} < 0$.

Now, as demonstrated by Anderson and De Palma (1992) for this case, the unique duopoly equilibrium price $p_i = p_j = p$, chosen at Stage 2, is given by the fixed point condition

$$p = \frac{\mu}{1 - \frac{1}{2 + \exp\left(\frac{V_0 - a + p}{\mu}\right)}}.$$

There exists no closed form solution for market price. However, the analysis of Anderson and De Palma (1992, pp. 57-58) allows to discuss the effect of higher μ , that would arise from stronger CSR efforts, chosen at Stage 1.

If $V_0 - a + p > 0$, not buying is relatively attractive. Anderson and de Palma demonstrate that differentiation then increases demand for any prices. Increased diversity makes the demand less elastic. Prices and profits thus increase in μ . In this case, a firm has thus a double incentive to invest in CSR, firstly, to increase market demand (as $\frac{\partial V_0(c_i, c_j)}{\partial c_i} < 0$) and, secondly, to make the demand less elastic (as $\frac{\partial \mu(c_i, c_j)}{\partial c_i} > 0$).

If $V_0 - a + p < 0$, buying is relatively more attractive. Anderson and de Palma then demonstrate that differentiation encourages more consumers not to buy, reducing market demand. While the effect is not clear *a priori*, they show that prices and profits increase in μ . Therefore, a firm again gains from CSR through stronger differentiation (as $\frac{\partial \mu(c_i, c_j)}{\partial c_i} > 0$) and possibly also benefits from higher demand (as $\frac{\partial V_0(c_i, c_j)}{\partial c_i} < 0$).

B.2. Unobservable types

Next, we assume that the value of winning T_i is private information to the firm. For simplicity, let T_i take one of two values, T_h (high type) or T_l (low type), where $T_h > T_l$. We denote the probability of a high type by $p_h > 0$ and that of a low type by $p_l = 1 - p_h > 0$.

Four value pairs (T_1, T_2) could arise: (T_h, T_h) , (T_h, T_l) , (T_l, T_h) , and (T_l, T_l) . Propositions 2 and 3 describe equilibrium behavior when firm values are common knowledge. Because C-lobbying is different in each case, firms may use CSR to signal their values T_i .

In general, firms' Stage 1 C-lobbying strategies can be either *pooling* (i.e., both types choose the same CSR) or *separating* (i.e., high type chooses higher CSR; the opposite is infeasible). The contest information structure is therefore endogenous, similarly to those explored under L-lobbying only, for example, by Kovenock et al. (2015) and Wu and Zheng (2017).

For simplicity, we allow for two C-lobbying strategies, low c_l and high c_h , where $c_l < c_h$. We construct equilibria assuming that out-of-equilibrium beliefs assign probability one to high (low) type if a firm deviates by choosing higher (lower) CSR than what is prescribed by the equilibrium.

Pooling equilibria

There are two possible pooling equilibria: both types choose c_l and both firms choose c_h in Stage 1. In each case, types remain private at Stage 2 where L-lobbying decision is made. Competition is obviously more intensive in the first equilibrium where C-lobbying choices are low. Malueg and Yates (2004) show that in a contest with private values the equilibrium is given by

$$f_l = rT_l \left(\frac{1}{4}\sigma + \frac{\left(\frac{T_h}{T_l}\right)^r}{\left(1 + \left(\frac{T_h}{T_l}\right)^r\right)^2} (1 - \sigma) \right), \quad (\text{B.1})$$

$$f_h = rT_h \left(\frac{\left(\frac{T_h}{T_l}\right)^r}{\left(1 + \left(\frac{T_h}{T_l}\right)^r\right)^2} (1 - \sigma) + \frac{1}{4}\sigma \right), \quad (\text{B.2})$$

where the new parameter σ describes correlation between types ($\sigma = 1$ under perfect correlation and $\sigma = 1/2$ under independent values). Similar to the results of Nti (1999) on asymmetric contests, Malueg and Yates (2004) thereby observe that, in symmetric pure equilibria of symmetric contests with private values, each firm spends a constant fraction of the value of winning in lobbying,

$$\kappa = \frac{f_l}{T_l} = \frac{f_h}{T_h},$$

irrespective of what this private valuation T_i is. Malueg and Yates (2004) also find that the fraction κ of value that firms dissipate in lobbying increases in symmetry T_l/T_h and correlation σ but, related to the topic we study, the effect of noise on total lobbying spending remains ambiguous. However, if T_l/T_h and σ are not 'too low', noise tends to decrease spending, i.e., $\frac{\partial \kappa}{\partial r} > 0$. We focus on this case here.

We investigate a firm's incentives to deviate in CSR in a way that reveals its type. Hurley and Shogren (1998) describe equilibrium spending when one firm is privately informed about its value but the other firm's value is publicly observed.

The best-response of the informed rival is given by

$$f_{ij} = rT_i \left(\frac{\left(\frac{f_j}{f_{ij}}\right)^r}{\left(1 + \left(\frac{f_j}{f_{ij}}\right)^r\right)^2} \right), \quad (\text{B.3})$$

where f_{ij} denotes the effort of type i against type j .

The best-response of the uninformed firm is still

$$f_i = rT_i \left(\frac{\left(\frac{f_{ii}}{f_i}\right)^r}{\left(1 + \left(\frac{f_{ii}}{f_i}\right)^r\right)^2} \sigma + \frac{\left(\frac{f_{ji}}{f_i}\right)^r}{\left(1 + \left(\frac{f_{ji}}{f_i}\right)^r\right)^2} (1 - \sigma) \right), \quad (\text{B.4})$$

where f_{ij} denotes the effort of type i against type j .

Malueg and Yates (2004) show further that, under positively correlated types, revealing one's type intensifies expected competition among firms. No firm has thus incentives for deviating from pooling at high C-lobbying, c_h . However, in our model a deviation from c_l to c_h has the additional effect of relaxing competition. We thus conjecture that, if the thresholds for the high and low type are $0 < \alpha_h < \alpha_l < 1$ in an asymmetric lobbying contest, then the thresholds for pooling at c_l are above α_h and α_l and the thresholds for pooling at c_l are above α_h as firms hesitate from deviating from pooling.

Data availability

No data was used for the research described in the article.

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