ESG RECHERCHE

DOCUMENT DE TRAVAIL / WORKING PAPER

No. 2017-04

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Octobre 2017

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Abstract

Policymakers face time and resource constraints in investigating issues and formulating policies. How do these constraints affect information transmission by informed but biased interest groups? We study this question using a model in which interest groups lobby a policymaker by offering verifiable, policy-relevant information. The policymaker is limited in 1) his ability to verify or scrutinize the information offered by the interest groups (*access constraint*), and 2) the number of issues he can reform (*agenda constraint*). We show that when the policymaker faces an access constraint, but no agenda constraint, equilibrium lobbying by an interest group may signal its information only imperfectly. In particular, an interest group may lobby the policymaker even when it has unfavorable information, hoping that, due to the access constraint, the policymaker will not verify its information and, taking the costly act of lobbying as a signal of favorable information, reform its issue. We call such lobbying behavior 'overlobbying'. We show that imposing an agenda constraint can improve information transmission by curbing overlobbying. We identify circumstances in which an agenda constraint improves the ex ante expected welfare of the policymaker and of each interest group, thereby generating a Pareto improvement.

Key words. Lobbying; information; access; agenda constraint; Pareto improvement.
Subject classification. D72; D78; D83.

"HYPERACTIVITY is not a virtue in a legislature. Winston Churchill thought Parliament should meet for no more than five months a year. Texas enjoys relative freedom from red tape partly because its state legislature meets only every other year. If the European Parliament sat only once every two years, the continent's regulation-infested economy might well be healthier." [from the Economist (2014)]

"We need time to reflect on the law, time to write it, time to discuss it and to vote it; time as well to ensure of the right conditions for its implementation. To wish that our institutions are more efficient does not mean sacrificing to the cult of speed, it is rather to give back the priority to outcomes. Let's put an end to legislative proliferation ... I am aware of the constraints you face, the lack of resources, the lack of staff, the lack of space go in part against the objective of efficiency that I put forward." [from President Macron's speech to the Congress, July 3rd 2017–*Authors' translation from French*]

1 Introduction

Lobbying of policymakers by special interests is pervasive under a diverse range of political systems around the world. Each year millions of dollars are spent on lobbying activities (for instance, according to the Center for Responsive Politics, in the year 2016 there were in the US 11,186 registered lobbyists and $3.15 bn were spent on lobbying). The offices of lobbying firms are an integral fixture of the political power centres around the world, be it D.C., Brussels or Canberra. Critiques sometimes attribute a politician's advocacy/opposition of a certain piece of legislation to his/her cozy relationship with one or the other lobby. It is therefore no surprise that the nature, extent and impact of lobbying are topics of popular debate as well as of extensive scrutiny among scholars.

While the popular imagination often paints lobbying as an attempt to seek rents, special favors or exemptions in exchange for money or other lures, a political economy literature treats lobbying as an activity that, either directly or indirectly, transmits policy relevant information from interest groups to policymakers.[1] For instance, the act of lobbying by an interest group can serve as a signal of the availability of favorable information, which in turn induces the policymaker to grant the interest group access so that the information may be obtained and verified.

This paper contributes to the literature on informational lobbying by understanding how time/resource constraints affect policy making when a policy-

[1] For empirical evidence on informational lobbying and lobbying influence see, among others, Gawande, Maloney and Montes-Rojas (2009), Tovar (2011), Belloc (2015), and Kang (2016).

maker is responsible for addressing multiple issues.[2] We consider two types of constraints: an *access constraint*, i.e., a constraint on the policymaker's ability to verify or scrutinize the information provided to him by different interest groups, and an *agenda constraint*, i.e., a constraint on the number of issues that can be reformed by the policymaker in a given term. We seek to understand the effect of these two constraints on information transmission and on welfare.

The existence of time and resource constraints in policymaking is clearly illustrated by the above quote from President Macron's speech. That such constraints force policymakers to prioritize issues and limit the extent to which information regarding them can be verified is also documented extensively in the literature. An influential empirical study in this vein is Jones and Baumgartner (2005) titled 'The Politics of Attention: How government Prioritizes Problems'. In the preface the authors write (viii-ix):

> "[P]olicymakers are constantly bombarded with information of varying uncertainty and bias, not on a single matter, but on a multitude of potential policy topics. The process by which information is prioritized for action, and attention allocated to some problems rather than others is ... a process by which a political system processes diverse incoming information streams. Somehow these diverse streams must be attended to, interpreted, and prioritized."

Similarly, Bauer, Dexter and De Sola Pool (1963; 405) writes: "The decisions most constantly on [a Congressman's] mind are not how to vote, but what to do with his time, how to allocate his resources, and where to put his energy."Hall (1996; 24) reports a legislative assistant saying: "He [the Congressman] had a conflict, but the point is that members always have conflicts. They have to be in two places at once, so they have to choose: Which issue is more important to me?"

To capture the policymaking environment described above, we propose a game-theoretical model in which a policymaker (hereafter, PM) is responsible to making policy on multiple issues. On each issue, he must decide whether to implement a 'reform' or to keep the 'status quo'. The PM's optimal policy on each issue depends on the issue-specific state of the world, about which the PM is uninformed.

On each issue there is an interest group (hereafter, IG) which prefers its issue to be reformed, irrespective of the state of the world. Each IG has *verifiable* evidence about the state of the world for its issue of concern, and can lobby the PM at a cost. We can think of the act of lobbying as taking different forms: the IGs may hire professional lobbyists to obtain access to the PM and present their information; alternatively, the IGs may commission a policy paper detailing the available information and send it to the PM; or, as yet another option, the IGs may hold information sessions or run awareness campaigns wherein policy relevant information is disseminated.

[2] Multiple issues can be thought of either as distinct issues (e.g., same sex marriage, immigration), or as a set of competing public projects (e.g., different infrastructure projects that can be funded).

Whichever form lobbying takes, in order for the PM to learn with certainty the state of the world, he must grant 'access' to the IG. Granting access means spending time or resources (e.g., of his staff or by hiring an independent expert) in scrutinizing or auditing the information presented by the IG. The specific activities may involve holding meetings with the IGs, questioning them at Congressional hearings, reading their report, scrutinizing their claims by seeking further evidence, and so on.

We model the *access constraint* as a limit on the number of IGs that the PM can grant access to. We model the *agenda constraint* as a limit on the number of issues on which reform can be implemented. In our baseline model we assume there are two issues but the PM can grant access to only one IG. We consider two possibilities: one, where the PM can reform both issues; and two, where the PM can reform only one issue. We refer to the former case as one where there is *no agenda constraint*, and to the latter case as one where there is an *agenda constraint*. Later on, we extend our analysis to the more general case of multiple issues. Our model makes several interesting points regarding the nature of informational lobbying in the presence/absence of constraints on agenda and access.

First, we characterize the equilibria of the games with and without agenda constraint, and study the extent to which lobbying can transmit policy relevant information to the PM. Intuitively, lobbying provides the PM information via two channels, a direct channel and an indirect one, which correspond, respectively, to the transmission of hard and soft information. The granting of access whereby the PM verifies an IG's evidence on the relevant state of the world constitutes the direct channel. On the other hand, the signaling potential of lobbying acts as the indirect channel: since lobbying is costly and since there is a chance that the PM will grant the IG access and verify the evidence, it is relatively more attractive for an IG to lobby when it has favorable information than when it has unfavorable information. Hence, the act of lobbying by an IG can serve as a signal that it has favorable information. The extent to which lobbying can serve as a signal of the true state of the world depends on two factors: one, the cost of lobbying; and two, the extent to which the PM is able, via access, to 'discipline' the IGs to lobby truthfully, i.e., lobby if and only if they have favorable information. We find that the latter factor depends on the agenda constraint. When the cost of lobbying is sufficiently high, or when the PM can discipline the IGs—which happens when there is a constraint on the agenda—we obtain a separating equilibrium wherein each IG lobbies if and only if it has favorable information. In this case, the PM gets fully informed. However, if the lobbying cost is low or the PM's access strategy does not adequately act as a disciplining mechanism, which happens when there is no constraint on the agenda, then we get a semi-separating equilibrium, in which IGs 'overlobby', i.e., lobby with a positive probability even when they have unfavorable information.

Second, we show that in the presence of an access constraint, the imposition of an agenda constraint can improve information transmission. Specifically, in our baseline model, there is a range of lobbying costs for which the unique equilibrium of the game without agenda constraint involves overlobbying, whereas any equilibrium of the game with agenda constraint involves truthful lobbying. Note that the presence of an agenda constraint also has its costs, since it limits the choice set of the PM, precluding him from reforming all issues. Hence, the net effect of an agenda constraint is ambiguous. However, we identify a range of parameters values for which the imposition of an agenda constraint improves not only the ex ante expected welfare of the PM, but also the ex ante expected welfare of each IG, thereby generating a Pareto improvement.[3]

The tactics employed by lobby groups, suggestive of overlobbying behavior, have been documented by scholars. For instance, in examining the evidence submitted by the alcohol industry to the Scottish policymakers, McCambridge, Hawkins and Holden (2014; 201) finds that "Documentary submissions to the Scottish Government consultation failed to engage with the research literature in any depth, although made no shortage of claims about it. Unsubstantiated claims were made about the adverse effects of unfavored policy proposals and advocacy of policies favored by industry was not supported by the presentation of evidence."[4] Schlozman and Tierney's (1986; 246) seminal study finds that "in presenting information to Congress, organizations avoid outright misrepresentation but attempt to place the facts in a favorable light."

Thus, it appears to be the case that a proper verification of the information provided by the IGs might have led the PM to conclude that the 'true state of the world' did not merit implementing a reform. That the IGs still provide such information to make self-serving claims is indicative of the access constraint, i.e. a lack of resources or expertise on the part of the PM. This issue is also well documented in the literature. In particular, Drutman and Teles (2015), in an Atlantic Monthly article titled 'Why Congress Relies on Lobbyists Instead of Thinking for Itself', observe that "Given limited time and nearly unlimited demands, policymakers have to choose who and what to pay genuine attention to." Later in the piece they write "Lacking their own capacity, government will have no other choice but to increasingly turn to them [i.e., lobbies] for help. And lacking their own knowledge, policymakers will have an even harder time evaluating these analyses and suggestions on anything other than quantity and volume."[5]

The second main finding of our model, viz., in the presence of an access constraint the imposition of an agenda constraint can improve information trans-

[3] Note that increasing lobbying costs can be another way to reduce IGs' incentives to overlobby and improve information transmission. However, unlike the imposition of an agenda constraint, an increase in lobbying costs makes IGs worse off and cannot therefore be Pareto-improving.

[4] Other studies that find similar examples of overlobbying by lobby groups representing different sectors include, White and Bero (2010): tobacco, pharmaceutical, lead, vinyl chloride, and silicosis-generating industries, and Nestle (2016): food and beverages.

[5] Other contexts where overlobbying-like behavior arises include the case of insurance claims following a natural disaster (see http://www.claimsjournal.com/news/national/2016/05/19/270950.htm). In this case it is observed that some people file excessive claims anticipating that claims investigators, due to increased workload, may not be able to closely scrutinize all claims.

mission, provides an informational rationale for lawmakers to institute rules that limit their legislative activity (such as a restriction on the sitting time of a legislature or the number of bills passed per year). This rationale is in line with the above-cited quote from President Macron, for whom limiting legislative activity would free time and resources for lawmakers to make better-informed policy choices. Our model identifies one possible channel through which this can happen, namely, improved information transmission by IGs. This informational rationale differs from, but complements, the standard rationale for limiting legislative activity, a rationale suggested in the above-cited quote from the Economist (2014), namely, that limiting legislative activity reduces wasteful rent seeking and bureaucratic red tape.

In a supplementary online appendix, we consider a series of extensions to the baseline model analyzed in the paper. We show that our results extend in a natural way to a setting with an arbitrary finite number of issues. Specifically, we consider the general case where there are I issues, access can be granted only to K IGs, and reform can be implemented only on N issues, where $1 \leq K \leq N \leq I$. In that model we show that given an access constraint, there exists a level of agenda constraint for which the PM gets perfectly informed in equilibrium and which can lead to a Pareto improvement relative to the case with no agenda constraint.

Also, we show that the setting we consider, in which the set of IGs is exogenous, is consistent with the equilibrium of a more general game with endogenous formation of IGs, where interests on both issues can decide independently to form as IGs at a cost. We further show that our result of Pareto-improving agenda constraint is 1) robust to relaxing our baseline assumption that granting access to a first IG is costless to the PM, but 2) depends on the PM having initial beliefs that are biased against reforming issues.

The remainder of the paper is organized as follows. Section 2 reviews the most relevant literature. Section 3 presents our baseline model, which Section 4 analyzes. Section 5 concludes. All proofs are in the appendix. A supplementary online appendix provides an illustrative numerical example and studies various extensions to our baseline model.

2 Related literature

The innovation of our paper is to study the nature and effectiveness of informational lobbying when the PM is faced with both access and agenda constraints. None of the papers mentioned below (and, to our knowledge, no other existing paper) examine the implications of these two constraints being simultaneously present.

Potters and van Winden (1992), Ainsworth (1993) and Lohmann (1993, 1995) are early contributions that model IGs' influence on policymaking via a combination of cheap talk and costly signaling. Austen-Smith and Wright (1992) and Rasmusen (1993) were among the first papers to develop the lobbying-and-access model of the type considered in this paper. A key difference with our paper is that they study policymaking over a single issue; by contrast, our paper, motivated by the evidence cited earlier, looks at the case a PM faced with multiple issues (each represented by an IG), who must decide which issues to address. Our paper further differs from Austen-Smith and Wright (1992) and Rasmusen (1993) in that they take as given the cost for the PM to verify the information of an IG, whereas we endogenize it by taking account of the access constraint. More specifically, awarding access to an IG and verifying its information has, in our setting, an opportunity cost that corresponds to the value of the information the PM could obtain by instead granting access and verifying the information of another IG.

Our paper is related to a strand of literature in which a PM chooses how to allocate scarce time and resources (e.g., Holmstrom and Milgrom (1991), Daley and Snowberg (2011)). Especially relevant for our paper are Esteban and Ray (2006), and Cotton and Dellis (2016).[6] Both papers consider a model in which a PM faces a multi-issue policy choice with agenda constraint. As in our paper, they find that IG influence can lead to inefficient policymaking. However, the source of inefficiency is different across these papers: in Esteban and Ray (2006) it is the two-dimensional information asymmetry; in Cotton and Dellis (2016) it is the effect that IGs' information collection has on the PM's own information collection decision; and in our paper it is the overlobbying by IGs that is induced by a combination of access constraint and information asymmetry. Moreover, our paper finds the possibility for the agenda constraint to be Pareto improving, a result that does not obtain in the other two papers.

Milgrom (1981) and Milgrom and Roberts (1986) consider persuasion games, in which a special interest endowed with information seeks to influence a decision maker by choosing which pieces of information to convey truthfully to the decision maker and which pieces to withhold from him.[7] Lagerlöf (1997) considers a persuasion game in which an IG chooses to collect verifiable information and whether to reveal or withhold it from a PM. Like us, Lagerlöf identifies a possibility for a Pareto improvement. However, the nature and the source of the Pareto improvement differ from ours. In Lagerlöf (1997) the source of the Pareto improvement lies in: 1) the PM's inability to observe directly the information collection decision of the IG, resulting in the IG collecting on average too much information; and 2) the PM caring about the IG's payoff. In this context, banning informational lobbying has the potential to generate a Pareto improvement. By contrast, our PM knows that IGs are informed (although he does not

[6] Ellis and Groll (2014) extends Cotton and Dellis' framework by allowing IGs to make legislative subsidies that relax the agenda constraint of the PM.

[7] Brocas and Carrillo (2007), Brocas, Carrillo and Palfrey (2012), Kamenica and Gentzkow (2011), and Gul and Pesendorfer (2012) are relatively recent papers presenting models in which a special interest decides how much public information to produce before a decision maker takes an action. Beyond considering a policy choice on a single issue, these papers differ from ours in that they consider settings where the produced information is public and, therefore, symmetric. In our setting, information is private to the IGs and, therefore, asymmetric. (In an extension to their baseline model, Gul and Pesendorfer introduce information asymmetry by considering the case where the party deciding how much information to produce is actually informed about the state of the world.)

know the information they have) and does not care about IGs' payoffs. In our paper, the source of the Pareto improvement lies instead in the precision of the information contained in each IG's lobbying decision. Introducing a constraint on the agenda can improve the informational content of lobbying decisions and, in circumstances we identify below, generate a Pareto improvement.[8]

Our paper is related to the literature on the role of competition among information providers on the quality of decision making. Using the framework of persuasion games, Gentzkow and Kamenica (2017) examines the conditions under which more competition–either an increase in the number of senders or a decrease in their preference alignment–affects the amount of information produced. In a similar vein, Shin (1998) and Dewatripont and Tirole (1999) show that two adverserial senders generate more information than one sender. While these papers study multiple senders competing to influence the PM on an issue, our paper studies competition *between* issues which arises due to the access and agenda constraints. More closely related to our paper, Boleslavsky and Cotton (2017) considers a Bayesian persuasion game in which two senders, advocating two different projects, produce information about the quality of their respective project. Like us, Boleslavsky and Cotton show that limiting the number of projects the decision maker can undertake can lead to better-informed choices. However, their paper differs from ours in three important ways. First, limiting the number of projects cannot generate a Pareto improvement in their setting. Second, information is symmetric in their setting, while it is asymmetric in ours. Third, the improvement in information provision comes from two different sources. In Boleslavsky and Cotton (2017) it comes from the competition between senders that limiting the number of projects creates. By contrast, in our setting it comes from the change in the value of information for the PM.

Our paper is also related to a small literature on lobbying and access. Austen-Smith (1995, 1998) and Cotton (2009, 2012) consider models in which IGs make monetary contributions, not in exchange for policy favors, as considered in many papers on IG influence, but instead in the hope of securing access and presenting their information to the PM.[9] One key difference between those

[8] Bennedsen and Feldmann (2002, 2006), Yu (2005) and Dahm and Porteiro (2008a, 2008b) are other papers on IG influence that adopt the framework of persuasion games. These papers differ from ours in several important ways. First, they all consider a single IG which can always get access and convey its information if it chooses to do so, thereby ignoring the constraint on access which is at the heart of our analysis. Second, Bennedsen and Feldmann (2002) considers policymaking in a legislative assembly, not by a single PM as we do. Third, Yu (2005), Bennedsen and Feldmann (2006), and Dahm and Porteiro (2008a, 2008b) all study the IG's choice between conveying information and/or making monetary contributions in exchange for policy favors. The possibility for monetary contributions is absent from our setting. Also related to our paper is Fishman and Hagerty (1990), which shows how imposing restrictions on which verifiable signals a sender can disclose to a decision maker can lead to better information transmission. While Fishman and Hagerty (1990) shares with our paper the result that the imposition of constraints can lead to better information transmission, the two papers differ in many ways, first of all in the nature of the constraints and the side (sender or receiver/decision maker) on which the constraints are imposed.

[9] Langbein (1986), Wright (1990), and Ansolabehere, Snyder and Tripathi (2002), among others, provide evidence consistent with the idea that monetary contributions by IGs serve to buy access, with the purpose of presenting information to lawmakers. Kalla and Broockman

papers and ours is that in our setting IGs make no monetary contributions to the PM, while in those papers IGs make monetary contributions to the PM in the hope of securing access. Thus, while access has only an informational value in our setting, it has a monetary value in those papers. Dellis and Oak (2017) considers a model of IG access, and studies how information provision by IGs depends on whether the PM enjoys subpoena power or not, i.e., can grant or 'force' access to any IG or only to lobbying IGs (or, alternatively, can produce information on his own or can only verify the information provided by IGs). The key difference between this paper and the present one lies in the institutional feature under investigation: agenda constraint in the present paper, subpoena power in Dellis and Oak (2017).

3 Baseline model

We develop our argument using a simple model of access. In the supplementary online appendix we generalize our argument and investigate the robustness of our conclusions.

We consider a PM who must choose policy on two issues, indexed by $i = 1, 2$. We denote a policy by $p = (p_1, p_2)$, where $p_i \in \{0, 1\}$ is the policy on issue i. Policy $p_i = 1$ corresponds to the adoption of a reform project or the realization of a discrete public investment on issue i. Policy $p_i = 0$ corresponds to keeping the status quo.

There are two possible states of the world on each issue. We denote the state on issue i by $\theta_i \in \{0, 1\}$. State $\theta_i = 1$ corresponds to circumstances in which the PM benefits from reforming issue i. State $\theta_i = 0$ corresponds to circumstances in which the PM benefits from keeping the status quo on this issue. States are independent across issues. The realized state for issue i, θ_i, is unknown to the PM, but its distribution is common knowledge:

$$\theta_i = \begin{cases} 1 & \text{with probability } \pi_i \in \left(0, \frac{1}{2}\right) \\ 0 & \text{with probability } 1 - \pi_i. \end{cases}$$

Given state $\theta = (\theta_1, \theta_2)$, the PM gets utility from policy $p = (p_1, p_2)$

$$U(p, \theta) = \alpha \cdot u_1(p_1, \theta_1) + u_2(p_2, \theta_2)$$

where $\alpha > 1$ represents the importance of issue 1 relative to issue 2,[10] and

$$u_i(p_i, \theta_i) = \begin{cases} 1 & \text{if } p_i = \theta_i \\ 0 & \text{otherwise} \end{cases}$$

represents the PM's utility over policy p_i. Hence, for each issue i, the PM prefers that the policy p_i coincides with the realized state θ_i, which makes information on θ_i valuable for the PM.

(2016) provides field experimental evidence that campaign contributions facilitate access to PMs.

[10] Assuming $\alpha > 1$ is made to simplify exposition. Our main result (Proposition 2) is qualitatively robust to allowing for $\alpha = 1$.

There are two IGs, each one advocating a separate issue. Given policy $p = (p_1, p_2)$, the IG advocating issue i (henceforth, IG_i) gets utility $v_i(p) = p_i$, meaning that IG_i seeks to maximize the probability that $p_i = 1$, regardless of state θ_i.

Each IG_i has verifiable evidence about θ_i, and decides whether to lobby the PM. If IG_i decides to lobby, it bears a utility cost $f_i \in (0, 1)$ and, if granted access by the PM, must reveal θ_i.[11,12] Lobbying costs, f_is, are common knowledge. The PM faces a time constraint that prevents him from granting access to more than one IG.[13] This access constraint generates an endogenous, opportunity cost for the PM of granting access to an IG; this cost corresponds to the value of information the PM could obtain by granting access to the other IG.

We are interested in studying the implications of a second constraint, namely, a constraint on the agenda.[14] For this purpose, we shall compare two games, one in which the PM is not constrained on his agenda and can reform both issues if he wishes to, and another game in which the PM is constrained on his agenda and can reform only one issue. We denote by $N \in \{1, 2\}$ the maximum number of issues the PM can reform. We call N-game the game in which the PM can choose to reform any number of issues up to N.

The policymaking process has four stages. At stage 0 Nature chooses the state for each issue i, and reveals it to IG_i. The realization of the state for issue i, θ_i, is private information to IG_i. At stage 1 IGs decide simultaneously whether or not to lobby the PM. At stage 2 the PM observes IGs' lobbying decisions, and then chooses to which IG, if any, he grants access. If IG_i is granted access, it must reveal θ_i to the PM. Finally, at stage 3 the PM chooses policy. We now

[11] Lobbying costs can be interpreted as the costs for an IG of hiring lobbyists or as the (opportunity) costs of allocating some of the IG's resources to the preparation of a policy paper that will be presented to the PM. Note that our conclusions would be qualitatively similar if lobbying costs were campaign contributions that would enter directly into the PM's payoff and which would allow the IG to buy access, but not to directly buy policy, provided the PM would care enough about policy relative to campaign contributions. Likewise, our conclusions would be qualitatively similar with costless lobbying and a penalty f_i that IG_i must bear in state $\theta_i = 0$ when it lobbies and is granted access (e.g., f_i would be a reputation cost).

[12] Thus, when granted access, an IG cannot hide or distort evidence. For example, in some countries witnesses must take an oath before testifying in front of a legislative committee. Notice that our results would be similar if an IG could withhold, but not alter, evidence since in equilibrium an IG with favorable evidence would choose to reveal it with probability one when granted access (Milgrom and Roberts (1986)).

[13] In our setting, the access constraint is necessary for the agenda constraint to be Pareto-improving. This is because an equilibrium would otherwise exist in which IGs lobby truthfully (i.e., each IG_i lobbies when $\theta_i = 1$, and abstains from lobbying when $\theta_i = 0$) when there is no agenda constraint. A constraint on the agenda would therefore impose a cost (by restricting the choice set of the PM), without generating a benefit (by improving information transmission). In this context, the PM could never gain from the introduction of an agenda constraint.

[14] For example, a budget constraint may prevent the PM from realizing all public investment projects; he must then choose which one, if any, of the two investment projects he will realize. Alternatively, a time constraint may prevent the PM from addressing every single issue landing on his desk, forcing him to leave at least one of the two issues unadressed. Jones and Baumgartner (2005) and Baumgartner et al. (2009), among others, provide detailed accounts of agenda constraints faced by lawmakers.

describe the structure of each stage, working backwards.

3.1 Stage 3: Policy choice

By the time the PM chooses policy, he has observed IGs' lobbying decisions and the realized state for the issue advocated by the IG that was granted access (if any). We denote IG$_i$'s lobbying decision by ℓ_i, where $\ell_i = 1$ if IG$_i$ has lobbied and $\ell_i = 0$ otherwise. We denote the PM's access decision with respect to IG$_i$ by a_i, where $a_i = 1$ if the PM has granted access to IG$_i$, and $a_i = 0$ otherwise. Given profiles of lobbying and access decisions, $\ell = (\ell_1, \ell_2)$ and $a = (a_1, a_2)$, the PM forms belief $\beta_i(\ell_i, a_i; \theta_i)$ that $\theta_i = 1$, using Bayes' rule whenever possible. To lighten notation, we write β_i as a shorthand for $\beta_i(\ell_i, a_i; \theta_i)$ when this does not create confusion.

A policy strategy for the PM is a mapping

$$\rho : \{0,1\}^2 \times \{0,1\}^2 \to [0,1]^2$$

where $(\rho_1, \rho_2)(\ell, a)$ specifies the probability that the PM chooses policy $p_1 = 1$ and policy $p_2 = 1$, respectively. To further lighten notation, we omit θ as argument of ρ, and omit N as argument of all strategies.

The PM maximizes his expected utility with the following policy strategy: 1) when $N = 2$,

$$\rho_i(\ell, a) \begin{cases} = 1 & \text{if } \beta_i > 1/2 \\ \in [0,1] & \text{if } \beta_i = 1/2 \\ = 0 & \text{if } \beta_i < 1/2; \end{cases}$$

and 2) when $N = 1$,

$$\rho_i(\ell, a) \begin{cases} = 1 & \text{if } \beta_i > 1/2 \text{ and } \left(\beta_i - \frac{1}{2}\right) \cdot \alpha_i > \left(\beta_{-i} - \frac{1}{2}\right) \cdot \alpha_{-i} \\ \in [0,1] & \text{if } \beta_i \geq 1/2 \text{ and } \left(\beta_i - \frac{1}{2}\right) \cdot \alpha_i \geq \left(\beta_{-i} - \frac{1}{2}\right) \cdot \alpha_{-i} \\ = 0 & \text{otherwise} \end{cases}$$

with the restriction that $\sum_{i=1}^{2} \rho_i(\ell, a) \leq 1$, where $\alpha_1 = \alpha$ and $\alpha_2 = 1$.

Thus, when there is no agenda constraint ($N = 2$) the PM adopts the reform on issue i if he believes $\theta_i = 1$ is more likely than $\theta_i = 0$. When there is an agenda constraint ($N = 1$) the PM reforms issue i if, again, he believes that $\theta_i = 1$ is more likely than $\theta_i = 0$ and, moreover, the expected utility gain from reforming issue i exceeds the expected utility gain from reforming the other issue. The latter implies that when $N = 2$ the PM's policy choice on issue i depends on his belief (and thus on his information) on θ_i only, while when $N = 1$ it depends on his beliefs (and thus on his information) on both θ_1 and θ_2.

3.2 Stage 2: Access

The PM chooses whether to grant access to an IG and, if so, which one. We consider a situation where the PM can grant access to an IG only if it lobbies.[15]

[15] Dellis and Oak (2017) studies information provision by IGs depends on whether the PM has subpoena power or not (or, equivalently, whether the PM can grant access to all IGs or

By the time the PM takes his access decision, he has observed the lobbying decisions of the two IGs. Given IG_i's lobbying decision ℓ_i, the PM forms belief $\beta_i^{Acc}(\ell_i)$ that $\theta_i = 1$, where the superscript *Acc* stands for access stage. To lighten notation we write β_i^{Acc} as a shorthand for $\beta_i^{Acc}(\ell_i)$ when this does not create confusion.

An access strategy for the PM is a mapping

$$\gamma : \{0,1\}^2 \rightarrow [0,1]^2$$

where $(\gamma_1, \gamma_2)(\ell)$ specifies the probability that the PM grants access to, respectively, IG_1 and IG_2, given a profile of lobbying decisions $\ell = (\ell_1, \ell_2)$.

If neither IG lobbied, we have $\gamma_1(0,0) = \gamma_2(0,0) = 0$ since the PM cannot grant access to any of them. If only one IG lobbied, the PM grants access to that IG: $\gamma_1(1,0) = \gamma_2(0,1) = 1$ and $\gamma_1(0,1) = \gamma_2(1,0) = 0$. Finally, when the two IGs lobbied (i.e., $\ell = (1,1)$), the PM chooses an access strategy that solves

$$\begin{cases} \max\limits_{(\gamma_1,\gamma_2)\in[0,1]^2} & EU(\gamma_1, \gamma_2 \mid \rho) \\ \text{s.t.} & \gamma_1 + \gamma_2 = 1 \end{cases}$$

where

$$EU(\gamma_1, \gamma_2 \mid \rho) \equiv \sum_{i=1}^{2} \left[\gamma_i \cdot W_i(\rho) + (1-\gamma_i) \cdot Z_i(\rho)\right] \cdot \alpha_i$$

is the PM's expected utility at the access stage. $W_i(\rho)$ denotes the probability with which the PM believes he will choose $p_i = \theta_i$ *if he grants access to* IG_i, and $Z_i(\rho)$ denotes the same probability *if he grants access to* IG_{-i}. The expressions for $W_i(\rho)$ and $Z_i(\rho)$ are given in the supplementary online appendix. We define $X_i(\rho) \equiv W_i(\rho) - Z_i(\rho)$ as the increase in the probability that the PM will choose $p_i = \theta_i$ by granting access to IG_i.

The PM's access strategy when both IGs lobbied is given by

$$\gamma_i(1,1) \begin{cases} = 1 & \text{if } X_i(\rho) \cdot \alpha_i > X_{-i}(\rho) \cdot \alpha_{-i} \\ \in [0,1] & \text{if } X_i(\rho) \cdot \alpha_i = X_{-i}(\rho) \cdot \alpha_{-i} \\ = 0 & \text{if } X_i(\rho) \cdot \alpha_i < X_{-i}(\rho) \cdot \alpha_{-i} \end{cases}$$

with the restriction that $\sum_{i=1}^{2} \gamma_i(1,1) = 1$. Thus, when both IGs lobbied, the PM grants access to the IG which information has the higher expected value for him.

3.3 Stage 1: Lobbying

A lobbying strategy for IG_i is a mapping

$$\lambda_i : \{0,1\} \rightarrow [0,1]$$

where $\lambda_i(\theta_i)$ specifies the probability that IG_i lobbies in state θ_i.

only to lobbying IGs).

IG$_i$ chooses a lobbying strategy that solves for each θ_i

$$\max_{\lambda_i(\theta_i)\in[0,1]} Ep_i\left(\lambda_i\left(\theta_i\right), \lambda_{-i}, \gamma, \rho\right) - \lambda_i\left(\theta_i\right) \cdot f_i$$

where $Ep_i\left(\lambda_i\left(\theta_i\right), \lambda_{-i}, \gamma, \rho\right)$ is the probability that $p_i = 1$.

We say that IG$_i$ *lobbies truthfully* if $\lambda_i\left(\theta_i\right) = \theta_i$ for each θ_i, i.e., IG$_i$ lobbies when it has favorable information ($\theta_i = 1$) and abstains from lobbying when it has unfavorable information ($\theta_i = 0$).[16] We say that IG$_i$ *overlobbies* if $\lambda_i\left(1\right) = 1$ and $\lambda_i\left(0\right) \in (0, 1)$, i.e., IG$_i$ lobbies when it has favorable information and randomizes between lobbying and not lobbying when it has unfavorable information.

3.4 Equilibrium

The solution concept is Perfect Bayesian equilibrium. Roughly speaking, an equilibrium consists of a strategy profile $\left(\lambda\left(\cdot\right), \gamma\left(\cdot\right), \rho\left(\cdot\right)\right)$ and a system of beliefs $\left(\beta^{Acc}\left(\cdot\right), \beta\left(\cdot\right)\right)$ such that: 1) the strategy profile is sequentially rational given the system of beliefs; and 2) the beliefs are obtained from the strategies using Bayes' rule whenever possible.

An equilibrium exists in each of the two games, the $N = 1$-game and the $N = 2$-game. In case of equilibrium multiplicity, we shall consider most informative equilibria, a standard refinement in the literature.[17] It is worth noting that our main result (Proposition 2) is qualitatively robust to dispensing with this refinement. This is easily seen in the case where $\pi_1 = \pi_2$ and $f_1 = f_2$, since in the region of the parameters space where an agenda constraint is Pareto-improving, there is a unique equilibrium in the $N = 2$-game (Lemma 1.2) and a unique equilibrium outcome in the $N = 1$-game (Lemma 2.2). Dispensing with this refinement could therefore only trigger a (weak) expansion of the region of the parameters space in which an agenda constraint is Pareto-improving.

3.5 Extensions

We have made a series of assumptions in order to make our argument as simple as possible. In a supplementary online appendix we generalize our argument along several dimensions and investigate the robustness of our conclusions. First, we have assumed there are only two issues. In an extension to our baseline model we show that our results generalize to a setting where there is an arbitrary finite number of issues $I \geq 2$, the PM can grant access only to K IGs, and can reform only N issues, with $1 \leq K \leq N \leq I$. Second, we have assumed that the set of IGs is exogenously given. In an extension to our baseline model, we

[16] Observe that the opposite strategy (i.e., $\lambda_i\left(\theta_i\right) = 1 - \theta_i$ for each θ_i) cannot be part of an equilibrium since lobbying is costly.

[17] To make clear where this refinement has some bite, when characterizing equilibria, we shall write: 1) "an equilibrium exists in which ...", when we make use of this refinement; and 2) "a unique equilibrium exists..." or "in any equilibrium ..." when we do not use this refinement.

endogenize the set of IGs by adding a preliminary stage at which each IG decides whether to organize or, equivalently, whether to acquire information about the realized state for its issue.[18] Third, we have assumed it is costless for the PM to grant access to one IG. In an extension to our baseline model, we show that our result of a Pareto-improving agenda constraint is robust to introducing an additional, exogenous cost $c > 0$ that the PM must bear when he grants access to one IG. Fourth, we have assumed the PM is ex ante biased against reforms (i.e., $\pi_i < 1/2$ for each i). In an extension to our baseline model, we show that an agenda constraint is no longer Pareto-improving when $\pi_i > 1/2$ for at least one issue i. This happens because at least one player bears the cost of a more constrained choice set for the PM, without getting any benefit (from the elimination of the negative externality an IG_i imposes on itself when $\pi_i < 1/2$).

4 General results

We now proceed with the analysis of our baseline model. First, we describe the (most informative) equilibria in the two games, the $N = 1$-game and the $N = 2$-game. Second, we compare equilibrium information transmission in the two games. Finally, we identify the region of the parameters space where an agenda constraint is Pareto-improving.

4.1 Equilibrium sets

4.1.1 Game with no agenda constraint

We start by considering the $N = 2$-game. As noted above, in this game the policy choice on issue i depends on the PM's belief on that issue only, $\beta_i(\ell_i, a_i; \theta_i)$. Given this observation, and to lighten notation, we shall write $\rho_i(\ell_i, a_i)$ in place of $\rho_i(\ell, a)$.

Our first lemma describes equilibria of this game.[19]

Lemma 1 *Consider the $N = 2$-game.*

1. *If $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$, an equilibrium exists in which $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i.*

[18] Also, in the baseline model, all IGs are pro-reform, i.e., always want their issue to be reformed. This assumption naturally applies to a funding agency that has to decide how to allocate a given budget across competing projects, and each potential recipient only cares about whether its project gets funded. In an extension (available from the authors upon request) we provide a microfoundation for assuming only pro-reform IGs, showing it is consistent with the equilibrium of a more general game with endogenous formation of IGs, in which there are two IGs per issue, one pro-reform and one pro-status-quo, and in which each IG starts by deciding whether to organize.

[19] In an effort to save space, in this and the next lemma we shall abstain from reporting the complete profiles of equilibrium strategies and beliefs. We shall only report those elements that are sufficient to determine equilibrium policy outcomes and payoffs. The proofs in the appendix contain the complete profiles.

2. *If* $\frac{\pi_1 f_1+\pi_2 f_2}{\pi_1\pi_2}<1$*, there is a unique equilibrium. In this equilibrium, we have for* $i=1,2$

$$\begin{cases} \lambda_i(1)=1 \ \&\ \lambda_i(0)=\frac{\pi_i}{1-\pi_i}\frac{1}{2\alpha_i-1}, \text{ where } \alpha_1=\alpha \ \&\ \alpha_2=1 \\ \gamma_2(1,1)=1-\gamma_1(1,1)=\frac{f_1}{2\pi_2} \\ \rho_i(0,0)=0,\ \rho_1(1,0)=1,\ \rho_2(1,0)=\frac{\pi_2\cdot(2\alpha-1)\cdot f_2}{\pi_1\alpha\cdot(2\pi_2-f_1)} \ \&\ \rho_i(1,1)=\theta_i \\ \beta_i(0,0;\theta_i)=\beta_i^{Acc}(0)=0 \ \&\ \beta_1(1,0;\theta_i)=\beta_1^{Acc}(1)>\frac{1}{2}=\beta_2(1,0;\theta_i)=\beta_2^{Acc}(1). \end{cases}$$

Thus, equilibrium truthful lobbying (i.e., $\lambda_i(\theta_i)=\theta_i$ for each θ_i and each i) can be supported in the $N=2$-game if and only if lobbying is sufficiently costly (in the sense $\frac{\pi_1 f_1+\pi_2 f_2}{\pi_1\pi_2}\geq 1$). To see why, suppose both IGs lobby truthfully. At the access stage, the PM believes $\theta_i=1$ (resp. $\theta_i=0$) if he observes IG_i lobbying (resp. not lobbying). For truthful lobbying to be supported in equilibrium, IG_i must not want to deviate to lobby when $\theta_i=0$. If IG_i does not lobby, it cannot be granted access, and the PM believes $\theta_i=0$ and chooses $p_i=0$. If IG_i lobbies when $\theta_i=0$, the PM chooses $p_i=1$ if and only if he grants access to the other IG, IG_{-i}, meaning the PM cannot verify IG_i's evidence and bases his choice of p_i on IG_i's lobbying decision. This event occurs with probability $\pi_{-i}\cdot\gamma_{-i}(1,1)$, viz. the probability that IG_{-i} lobbies (here equal to π_{-i}) and is granted access (here $\gamma_{-i}(1,1)$). Thus, IG_i does not deviate to lobby when $\theta_i=0$ if and only if the expected gain from lobbying does not exceed its cost, i.e., $\pi_{-i}\cdot\gamma_{-i}(1,1)\leq f_i$. Recalling $\gamma_1(1,1)+\gamma_2(1,1)=1$, this condition is satisfied for both IGs if and only if

$$\gamma_1(1,1)\in\left[1-\frac{f_1}{\pi_2},\frac{f_2}{\pi_1}\right].$$

This interval is non-empty if and only if $\frac{\pi_1 f_1+\pi_2 f_2}{\pi_1\pi_2}\geq 1$.

In case lobbying is sufficiently costly to support equilibrium truthful lobbying (case 1 of lemma 1), lobbying decisions reveal θ and the PM chooses policy $p=\theta$.

In case lobbying is not sufficiently costly to support equilibrium truthful lobbying (case 2 of lemma 1), a unique equilibrium exists. In this equilibrium each IG overlobbies.[20] An IG randomizes between lobbying and not lobbying only if it is indifferent between these two actions. If an IG_i overlobbies, it gets zero payoff whenever it does not lobby; this is because $\beta_i^{Acc}(0)=0$ since IG_i abstains from lobbying only when $\theta_i=0$, which induces the PM to choose $p_i=0$. This means that IG_i must get zero expected payoff when it lobbies in state $\theta_i=0$. In other words, IG_i lobbies in state $\theta_i=0$ up to the point where, in expectation, the whole rent from overlobbying is dissipated.

In the case of IG_2, the dissipation of the overlobbying rent imposes two requirements. One is that the PM must be indifferent between choosing $p_2=1$ and $p_2=0$ when IG_2 lobbies but is not granted access. This happens if and only

[20] Equilibrium overlobbying has also been found in other signalling models where there is a single issue and the benefit from lobbying is bigger when information is favorable than when information is unfavorable (e.g., see Potters and van Winden (1992), Austen-Smith and Wright (1992), Rasmusen (1993)).

if $\beta_2^{Acc}(1) = 1/2$, which pins down a value for $\lambda_2(0)$. The second requirement is that the PM randomizes in a precise way between $p_2 = 1$ and $p_2 = 0$, which pins down a value for $\rho_2(1,0)$.

In the case of IG_1, the dissipation of the overlobbying rent imposes that, when both IGs lobby, the PM randomizes in a precise way between granting access to IG_1 and granting access to IG_2. This pins down a value for $\gamma_1(1,1)$. Moreover, the PM randomizes on access if and only if the value of the information he expects to get from IG_1 is the same as the value of the information he expects to get from IG_2, i.e., $X_1(\rho) \cdot \alpha = X_2(\rho)$. The expected value of the information from IG_2 equals 1/2 (since $\beta_2^{Acc}(1) = 1/2$ and $\alpha_2 = 1$). The expected value of the information from IG_1 equals $\left[1 - \beta_1^{Acc}(1)\right] \cdot \alpha$. The condition $\left[1 - \beta_1^{Acc}(1)\right] \cdot \alpha = 1/2$ pins down a value for $\beta_1^{Acc}(1)$ and, in turn, for $\lambda_1(0)$. Furthermore, we can infer from this equality that $\beta_1^{Acc}(1) > 1/2$ (since $\alpha > 1$), which implies $\rho_1(1,0) = 1$.

4.1.2 Game with agenda constraint

Our second lemma describes equilibrium lobbying strategies of the $N = 1$-game.

Lemma 2 *Consider the $N = 1$-game.*

1. *If $f_2 > 1 - \pi_1$, an equilibrium exists in which lobbying strategies are given by*
$$\begin{cases} \lambda_1(\theta_1) = \theta_1 \text{ for each } \theta_1 \\ \lambda_2(\theta_2) = 0 \text{ for each } \theta_2. \end{cases}$$
Moreover, in any equilibrium, lobbying strategies are given by
$$\begin{cases} \lambda_i(\theta_i) = \theta_i \text{ for each } \theta_i \\ \lambda_{-i}(\theta_{-i}) = 0 \text{ for each } \theta_{-i} \end{cases}$$
for some $i \in \{1,2\}$.

2. *If $f_2 \leq 1 - \pi_1$, an equilibrium exists in which $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. If in addition $f_i < 1 - \pi_i$ for each i, then in any equilibrium lobbying strategies are given by $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i.*

Thus, equilibria of the $N = 1$-game involve truthful lobbying when lobbying is not too costly (case 2 of lemma 2). To understand the intuition, suppose that both IGs lobby truthfully. In this case, lobbying decisions perfectly reveal θ, which renders the PM indifferent between granting access to one or the other IG. The PM can then follow a strategy that prioritizes issue 1, i.e., that grants access to IG_1 whenever it lobbies and that adopts $p_1 = 1$ if and only if IG_1 reveals $\theta_1 = 1$.

Given this strategy of the PM, IG_1 does not want to deviate from truthful lobbying. To see this, note that when IG_1 does not lobby, the PM believes $\theta_1 = 0$ ($\beta_1^{Acc}(0) = 0$) and chooses $p_1 = 0$.

1. When $\theta_1 = 1$, IG_1 does not want to deviate to not lobby since it would then get $p_1 = 0$, while it gets $p_1 = 1$ when it lobbies (since it is then awarded access with probability one, reveals $\theta_1 = 1$ and, given $\alpha > 1$, the PM chooses policy $p = (1, 0)$.)

2. When $\theta_1 = 0$, IG_1 does not want to deviate to lobby since IG_1 would be granted access and would have to reveal $\theta_1 = 0$, leading the PM to choose $p_1 = 0$, the same policy choice as when IG_1 does not lobby. Since lobbying is costly, IG_1 is better off not lobbying.

Likewise, IG_2 does not want to deviate from truthful lobbying. This happens because IG_2 is awarded access when the PM considers the possibility of adopting $p_2 = 1$. More specifically, when IG_2 does not lobby, the PM believes $\theta_2 = 0$ ($\beta_2^{Acc}(0) = 0$) and chooses $p_2 = 0$.

1. When $\theta_2 = 0$, IG_2 does not want to deviate to lobby since the PM considers adopting $p_2 = 1$ only when IG_1 does not lobby (in which case the PM believes $\theta_1 = 0$). To see this, suppose IG_2 were to deviate to lobby. Either IG_1 has favorable information, in which case it lobbies, is granted access, and the PM chooses policy $p = (1, 0)$. Or IG_1 has unfavorable information, in which case it does not lobby, the PM grants access to IG_2 which has then to reveal $\theta_2 = 0$, and the PM chooses policy $p = (0, 0)$. In both cases $p_2 = 0$, exactly as when IG_2 does not lobby. Since lobbying is costly, IG_2 is better off not lobbying.

2. When $\theta_2 = 1$, if IG_2 lobbies, it gets $p_2 = 1$ with probability $1 - \pi_1$, i.e., when $\theta_1 = 0$ and IG_1 does not lobby. IG_2 does not want to deviate to not lobby if and only if $f_2 \leq 1 - \pi_1$, i.e., the expected gain from lobbying is at least as large as the lobbying cost.

Observe that truthful lobbying implies that, in equilibrium, the PM chooses $p = (1, 0)$ when $\theta = (1, 1)$, and $p = \theta$ otherwise.

In case lobbying is sufficiently costly for IG_2 (case 1 of lemma 2), only one IG lobbies in equilibrium. Being the only lobbying IG, it lobbies truthfully since it expects to be granted access whenever it lobbies.[21]

4.1.3 Summing up

To sum up, when lobbying costs are sufficiently low, lobbying is truthful in every equilibrium of the $N = 1$-game, while IGs overlobby in the unique equilibrium of the $N = 2$-game. The key difference between these two games lies in the possibility that the agenda constraint offers the PM to better 'discipline' the lobbying behavior of IGs by following a strategy where he adopts $p_i = 1$ only if

[21] If $f_2 > 1 - \pi_1$, an equilibrium exists in which IG_2 is the one IG lobbying (i.e., IG_1 abstains from lobbying, while IG_2 lobbies truthfully). However, this equilibrium requires restrictive out-of-equilibrium beliefs. In the rest of the paper we shall focus on the equilibrium where IG_1 lobbies truthfully and IG_2 abstains from lobbying.

IG_i lobbies and reveals $\theta_i = 1$ when granted access. In the $N = 2$-game, the PM cannot follow such a strategy since he would want to deviate and choose $p_{-i} = 1$ when both IGs lobby and he grants access to IG_i, not to IG_{-i}. When lobbying is not too costly, IG_{-i} would then want to deviate to lobby when $\theta_{-i} = 0$, implying truthful lobbying cannot be supported.

4.2 Comparing information transmission

In this section we compare equilibrium information transmission in the two games. For this purpose, we compare the PM's equilibrium posterior beliefs as described in (the proofs of) the two lemmata. We write β_i^N as the PM's equilibrium posterior belief that $\theta_i = 1$ in the N-game. We measure the PM's information about θ_i using $\left|\beta_i^N - 1/2\right|$, where $|x|$ is the absolute value of x. This quantity varies between 0 and 1/2. When the PM is perfectly *un*informed about θ_i, we have $\beta_i^N = 1/2$, in which case $\left|\beta_i^N - 1/2\right| = 0$. When the PM is perfectly informed about θ_i, we have $\beta_i^N \in \{0, 1\}$, in which case $\left|\beta_i^N - 1/2\right| = 1/2$.

Proposition 3 *We have:*

1. *If $f_2 > 1 - \pi_1$, then*

$$\begin{cases} \left|\beta_1^{N=2} - 1/2\right| = \frac{1}{2} = \left|\beta_1^{N=1} - 1/2\right| \\ \left|\beta_2^{N=2} - 1/2\right| = \frac{1}{2} > \left|\beta_2^{N=1} - 1/2\right|. \end{cases}$$

2. *If $f_2 \in \left[\pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right), 1 - \pi_1\right]$, then for each i*

$$\left|\beta_i^{N=2} - 1/2\right| = \frac{1}{2} = \left|\beta_i^{N=1} - 1/2\right|.$$

3. *If $f_2 < \pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right)$, then for each i*

$$\left|\beta_i^{N=2} - 1/2\right| \leq \frac{1}{2} = \left|\beta_i^{N=1} - 1/2\right|,$$

with a strict inequality for some θ.

Thus, when lobbying is sufficiently costly for IG_2 (case 1 of proposition 1), the PM gets better informed about θ when $N = 2$ than when $N = 1$. The reverse is true when lobbying is sufficiently cheap for IG_2 (case 3 of proposition 1): the PM gets better informed when $N = 1$ compared to when $N = 2$. In intermediate cases, the PM gets perfectly informed whether $N = 1$ or $N = 2$.

To understand this result, observe that when $N = 2$ the PM is the better informed the *more* costly lobbying is. This is because a higher lobbying cost helps discipline IGs and prevents overlobbying. By contrast, when $N = 1$ the

PM is the better informed the *less* costly lobbying is. This is because a lower lobbying cost helps induce IG_2 to lobby (truthfully) and prevents insufficient lobbying (in the form of IG_2 abstaining from lobbying). The key features underlying this difference between $N = 1$ and $N = 2$ are that an IG's incentives to lobby 1) decrease with the lobbying cost, and 2) are stronger when $N = 2$ than when $N = 1$.

When $N = 1$, the PM can support truthful lobbying by acting 'lexicographically', awarding access priority to IG_1 and adopting $p_1 = 1$ if and only if IG_1 reveals $\theta_1 = 1$. When lobbying is not too costly, the two IGs lobby truthfully and the PM gets perfectly informed about θ. As the lobbying cost increases, the net gain of lobbying for IG_2 decreases, up to a point where it becomes negative. Once a threshold is crossed (viz. $1 - \pi_1$), IG_2 stops lobbying, and the PM no longer gets informed about θ_2.

When $N = 2$, the PM cannot follow the same strategies as when $N = 1$. This is because when $N = 2$, the PM can choose to reform both issues, something he cannot do when $N = 1$. When lobbying is costly, even a small probability of being granted access is sufficient to 'discipline' an IG, deterring it from deviating from truthful lobbying. As lobbying becomes less costly, the probability of being granted access must become higher in order to still deter an IG from deviating to lobby when it has unfavorable information. Once a threshold is crossed (viz. $\pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right)$), it is no longer possible to 'discipline' IGs; IGs overlobby, and the PM is no longer perfectly informed about θ.

To sum up, the PM gets better informed 1) in the $N = 1$-game, when lobbying costs are low, and 2) in the $N = 2$-game, when lobbying costs are high.

4.3 Pareto-improving agenda constraint

In this section, we identify the region of the parameters space where an agenda constraint is Pareto-improving.

Proposition 4 *Let EU_k^N denote the equilibrium ex ante expected payoff of player $k \in \{1, 2, PM\}$ in the N-game. We have $EU_k^{N=1} \geq EU_k^{N=2}$ for each player $k \in \{1, 2, PM\}$, with at least one strict inequality, if and only if*

$$\frac{\alpha \pi_1 f_1 + (2\alpha - 1) \cdot \pi_2 f_2}{\pi_1 \pi_2} \leq 1.$$

To understand this result, observe that an agenda constraint imposes a cost by limiting the choice set of the PM. The introduction of an agenda constraint can therefore generate a Pareto improvement only if it creates a benefit that counterbalances this agenda constraint cost. In our setting, the benefit must be coming from better information transmission. We already know from proposition 1 that an agenda constraint leads in equilibrium to a better informed PM only when lobbying costs are sufficiently low (case 3 of proposition 1). We can therefore restrict attention to this case when searching for a Pareto-improving agenda constraint.

We start by observing that IG_1 is ex ante as well off with as without agenda constraint. This is true for each state θ_1. Specifically,

1. when $\theta_1 = 1$, IG_1 lobbies with probability one and gets $p_1 = 1$ in both games.
2. when $\theta_1 = 0$, in the $N = 1$-game IG_1 does not lobby and gets $p_1 = 0$. In the $N = 2$-game, IG_1 overlobbies up to the point where it is indifferent between lobbying and not lobbying. In each game IG_1's expected payoff is equal to zero.

Hence, IG_1's equilibrium ex ante expected payoff is the same in both games.

We continue by observing that IG_2 is ex ante better off with an agenda constraint than without.[22] On the one hand, the agenda constraint creates a cost for IG_2 since the PM prioritizes issue 1, implying IG_2 can get $p_2 = 1$ only when $\theta_1 = 0$. On the other hand, the agenda constraint eliminates a negative externality that IG_2 imposes on itself by overlobbying. To see this, consider each state θ_2, one at a time.

1. When $\theta_2 = 0$, IG_2 gets zero expected payoff whether $N = 1$ or $N = 2$. The logic is the same as for IG_1 when $\theta_1 = 0$.
2. Consider now the case where $\theta_2 = 1$.

   In the $N = 1$-game, IG_2 gets $p_2 = 1$ with probability $1-\pi_1$, i.e., when $\theta_1 = 0$. This reflects the agenda constraint cost imposed on IG_2. Specifically, IG_2 can get its reform adopted only when the PM does not want to adopt the reform on issue 1.

   In the $N = 2$-game, IG_2's overlobbying behavior when $\theta_2 = 0$ induces the PM to adopt $p_2 = 1$ with probability less than one when both IGs lobby and the PM grants access to IG_1, not to IG_2. In other words, IG_2's overlobbying behavior creates a negative externality on its $\theta_2 = 1$-self by undermining the PM's belief that $\theta_2 = 1$ when IG_2 lobbies but is not granted access.

   The condition stated in proposition 2 is necessary and sufficient for the overlobbying externality cost to exceed the agenda constraint cost for IG_2.

It remains to consider the PM. On the one hand, the agenda constraint reduces the set of feasible policy choices, imposing a cost on the PM. On the other hand, the PM gets better informed about θ when $N = 1$ compared to when $N = 2$, since the agenda constraint allows the PM to curb IGs' overlobbying behavior. In this region of the parameters space, the informational benefit exceeds the agenda constraint cost, implying that the PM is ex ante strictly better off with agenda constraint than without.[23]

[22] IG_2 is indifferent if and only if the condition stated in proposition 2 holds with an equality. It is strictly better off whenever the condition holds with a strict inequality.

[23] We compare equilibrium ex ante expected payoffs in the $N = 1$-game with those in the $N = 2$-game. It is important to observe that the existence of a Pareto-improving agenda

5 Conclusion

We develop a model of informational lobbying and access in which a PM faces multiple issues he can reform. A key feature of our model is that the PM faces resource constraints which limit his ability to provide access to IGs and may also restrict his ability to reform all issues. We characterized the equilibrium of the lobbying game and showed that while the act of lobbying can signal pro-reform information, it may not do so perfectly. In particular, when the lobbying costs are not high, an IG may want to lobby the PM even when it has unfavorable information in the hope that the PM is unable to verify the information provided. We then showed that the presence of an agenda constraint can improve information transmission by making the disciplining role of access more effective. Indeed, in some cases the imposition of an agenda constraint generates a Pareto improvement. Thus, we provide a new rationale for limiting the scope of decision making power of government (what the Economist (2014) article quoted above called 'legislative hyperactivism' and what President Macron called 'legislative proliferation'). The traditional understanding, in line with the quote from the Economist (2014) article, is based not on information transmission but rather on wasteful rent seeking and bureaucratic red tape brought by new legislation. Our work, however, suggests that even when this source of inefficiency is absent, the welfare of the PM as well as the welfare of each IG can be improved by constraining the agenda due to an improvement in information transmission. Our work provides a theoretical foundation for President Macron's rationale for limiting legislative activity, namely, that policymakers would get more time to investigate issues and make more efficient policy choices.

We extend our model to a more general case of several issues and show that one can find an optimal level of agenda constraint which leads to equilibrium in which the PM is fully informed. We show that our result of Pareto-improving agenda constraint generalizes to a case where granting access to even only one IG is costly for the PM. Finally, we show that our model is compatible with a more general model in which IGs are endogenously formed or information is endogenously acquired by IGs.

One can extend this line of research into several promising areas. First, it might be interesting to run a field or laboratory experiment in order to test the theoretical predictions presented in this paper. Second, it would be interesting to endogenize the agenda and access constraints faced by the PM. For instance, one could allow the PM to optimally allocate his available time between access and policymaking. Alternatively, one could allow IGs to provide legislative subsidies, seeking to relax the agenda and access constraints. One could also endogenize the lobbying cost incurred by the IGs via an all-pay auction. Here the magnitude of lobbying cost incurred could potentially signal the precision

constraint holds as well with intermediate expected payoffs (i.e., expected payoffs at stage 1, once each IG knows the realized state for the issue it is associated with). This is because in state $\theta_i = 0$, IG$_i$ gets zero expected payoff in both games. So, all differences in IGs' ex ante expected payoffs are associated with expected payoffs in state $\theta_i = 1$. For the PM, ex ante and interim expected payoffs are the same.

of available information. We leave these extensions for future work.

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6 Appendix

Proof of Lemma 1. We start by stating IG$_i$'s lobbying problem. We denote the probability that IG$_i$ lobbies by $\delta_i \equiv \pi_i \lambda_i(1) + (1-\pi_i)\lambda_i(0)$. We denote the probability that IG$_i$ is granted access when it lobbies by $\Gamma_i \equiv \delta_{-i} \cdot \gamma_i(1,1) + (1-\delta_{-i})$.

Given that the state for its issue is θ_i, IG$_i$ chooses $\lambda_i(\theta_i)$ that solves

$$\max_{\lambda_i(\theta_i)\in[0,1]} \quad Ev_i(\lambda_i(\theta_i))$$

where

$$Ev_i(\lambda_i(\theta_i)) = \lambda_i(\theta_i) \cdot [\Gamma_i \cdot \rho_i(1,1) + (1-\Gamma_i)\cdot \rho_i(1,0) - f_i] + (1-\lambda_i(\theta_i)) \cdot \rho_i(0,0).$$

We prove that an equilibrium in which $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i exists if and only if $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$. To see this, let $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. It follows that $\beta_i(\ell_i, 0) = \rho_i(\ell_i, 0) = \ell_i$ for each ℓ_i, and $\beta_i(1,1) = \rho_i(1,1) = \theta_i$. Moreover, $\delta_i = \pi_i$ and $\Gamma_i = \pi_{-i} \cdot \gamma_i(1,1) + (1-\pi_{-i})$.

The necessity part follows because $\lambda_i(0) = 0$ requires

$$\frac{dEv_i}{d\lambda_i(0)} \leq 0 \Leftrightarrow 1 - \Gamma_i - f_i \leq 0.$$

We then get that

$$\begin{cases} \frac{dEv_1}{d\lambda_1(0)} \leq 0 \Leftrightarrow \gamma_1(1,1) \geq 1 - \frac{f_1}{\pi_2} \\ \frac{dEv_2}{d\lambda_2(0)} \leq 0 \Leftrightarrow \gamma_1(1,1) \leq \frac{f_2}{\pi_1}. \end{cases}$$

Hence $\gamma_1(1,1) \in \left[1 - \frac{f_1}{\pi_2}, \frac{f_2}{\pi_1}\right]$. This interval is non-empty if and only if $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$.

The sufficiency part follows straightforwardly by setting $\gamma_1(1,1) \in \left[1 - \frac{f_1}{\pi_2}, \frac{f_2}{\pi_1}\right]$ (which is possible given that $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$ and $X_i(\rho) = 0$ for each i) and observing that $\frac{dEv_i}{d\lambda_i(1)} = 1 - f_i > 0$ (which implies $\lambda_i(1) = 1$).

We prove part (2) of the statement. Suppose that $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. We proceed in several steps.

First, we establish that $\beta_i^{Acc}(0) < 1/2$, implying $\rho_i(0,0) = 0$ for each i. We proceed by contradiction. Assume that $\beta_i^{Acc}(0) \geq 1/2$ for some i. Since $\pi_i < 1/2$, it must be that either $\lambda_i(0) > \lambda_i(1)$ or $\lambda_i(1) = \lambda_i(0) = 1$. In either case, $\lambda_i(0) > 0$, $\lambda_i(0) \geq \lambda_i(1)$ and $\pi_i < 1/2$ imply $\beta_i^{Acc}(1) < 1/2$ and, therefore, $\rho_i(1,0) = 0$. It follows that $\frac{dEv_i}{d\lambda_i(0)} = -f_i - \rho_i(0,0) < 0$, which contradicts $\lambda_i(0) > 0$.

Second, we establish that $\delta_i > 0$ for each i. We proceed by contradiction. Assume that $\lambda_i(1) = \lambda_i(0) = 0$ for some i. It follows that $\beta_i^{Acc}(0) = \pi_i < 1/2$ and $\rho_i(0,0) = 0$. Moreover, we have $\Gamma_{-i} = 1$, implying $\lambda_{-i}(\theta_{-i}) = \theta_{-i}$ for each θ_{-i}. It follows that $\delta_{-i} = \pi_{-i}$, $\Gamma_i \geq 1 - \pi_{-i}$ and $X_{-i}(\rho) = 0$. At the same time, $\lambda_i(1) = 0$ requires

$$\frac{dEv_i}{d\lambda_i(1)} \leq 0 \Leftrightarrow \Gamma_i + (1 - \Gamma_i) \cdot \rho_i(1,0) \leq f_i.$$

There are three possible cases.

1. $\beta_i^{Acc}(1) \in (0,1)$, which implies $X_i(\rho) > 0$. Since $X_{-i}(\rho) = 0$, we get $\Gamma_i = 1$ and, therefore, $\frac{dEv_i}{d\lambda_i(1)} = 1 - f_i > 0$.

2. $\beta_i^{Acc}(1) = 1$, which implies $\rho_i(1,0) = 1$. Again, we get $\frac{dEv_i}{d\lambda_i(1)} = 1 - f_i > 0$.

3. $\beta_i^{Acc}(1) = 0$, which implies $\rho_i(1,0) = 0$. Since $\Gamma_i \geq 1 - \pi_{-i}$, we get $\frac{dEU_i}{d\lambda_i(R)} \geq 1 - \pi_i - f_i > 0$, the strict inequality since $\pi_{-i} < 1/2$ and $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. It follows that $\frac{dEv_i}{d\lambda_i(1)} > 0$.

In all three cases, $\frac{dEv_i}{d\lambda_i(1)} > 0$ contradicts $\lambda_i(1) = 0$.

Third, we establish that for each i, $\beta_i^{Acc}(1) \geq 1/2$ and, therefore, $\lambda_i(1) > \lambda_i(0)$. Assume by way of contradiction that $\beta_i^{Acc}(1) < 1/2$ for some i. It follows that $\rho_i(1,0) = 0$ and, therefore, that

$$\frac{dEv_i}{d\lambda_i(0)} = -f_i - \rho_i(0,0) < 0.$$

The strict inequality implies $\lambda_i(0) = 0$. Since we have shown above that $\delta_i > 0$, we must then have $\lambda_i(1) > 0$. Together $\lambda_i(1) > 0$ and $\lambda_i(0) = 0$ imply $\beta_i^{Acc}(1) = 1$, a contradiction. Hence $\beta_i^{Acc}(1) \geq 1/2$ for each i. Given $\delta_i > 0$ and $\pi_i < 1/2$, $\beta_i^{Acc}(1) \geq 1/2$ requires $\lambda_i(1) > \lambda_i(0)$.

Fourth, we establish $[\lambda_i(1) - \lambda_i(0)] < 1$ for each i. Assume by way of contradiction that $\lambda_i(1) = 1$ and $\lambda_i(0) = 0$ for some i. It follows that $X_i(\rho) = 0$. Moreover, $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$ implies $[\lambda_{-i}(1) - \lambda_{-i}(0)] < 1$. Two cases are possible:

1. $\lambda_{-i}(0) = 0$ and $\lambda_{-i}(1) \in (0,1)$. In this case, we have $\beta_{-i}^{Acc}(1) = 1$, which implies $\rho_{-i}(1,0) = 1$. It follows that $\frac{dEv_{-i}}{d\lambda_{-i}(1)} = 1 - f_{-i} > 0$, contradicting $\lambda_{-i}(1) < 1$.

2. $\lambda_{-i}(0) > 0$. In this case, we have $\beta_{-i}^{Acc}(1) < 1$, which implies $X_{-i}(\rho) > 0$. Since $X_i(\rho) = 0$, we get $\Gamma_{-i} = 1$ and $\frac{dEv_{-i}}{d\lambda_{-i}(0)} = -f_{-i} < 0$, contradicting $\lambda_{-i}(0) > 0$.

Hence $[\lambda_i(1) - \lambda_i(0)] < 1$ for each i.

Fifth, we establish $\beta_1^{Acc}(1) > 1/2$ and $\beta_2^{Acc}(1) = 1/2$.

We start by establishing that $\beta_i^{Acc}(1) = 1/2$ for some i. Assume by way of contradiction that $\beta_i^{Acc}(1) > 1/2$ for each i. It follows that $\rho_i(1,0) = 1$, implying $\lambda_i(1) = 1$ and $\lambda_i(0) \in (0,1)$. The latter requires

$$\frac{dEv_i}{d\lambda_i(0)} = 0 \Leftrightarrow 1 - \Gamma_i = f_i.$$

Moreover, $\delta_i > \pi_i$. From the condition that $1 - \Gamma_i = f_i$ for each i, we get

$$\Gamma_1 + f_1 = \Gamma_2 + f_2 \Rightarrow \gamma_1(1,1) = \frac{\delta_2 + (f_2 - f_1)}{\delta_1 + \delta_2}.$$

At the same time, $1 - \Gamma_2 = f_2$ implies $\gamma_1(1,1) = f_2/\delta_1$. Taken together the two expressions for $\gamma_1(1,1)$ imply $\frac{\delta_1 f_1 + \delta_2 f_2}{\delta_1 \delta_2} = 1$. The contradiction follows since $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$ and $\delta_i > \pi_i$ for each i. Hence $\beta_i^{Acc}(1) = 1/2$ for some i.

We continue by establishing $\beta_2^{Acc}(1) = 1/2$. Assume by way of contradiction that $\beta_2^{Acc}(1) > 1/2$. It follows from above that $\beta_1^{Acc}(1) = 1/2$, implying $X_1(\rho) = \frac{1}{2} > X_2(\rho)$. Since $\alpha > 1$, we get $\Gamma_1 = 1$, implying $\frac{dEv_1}{d\lambda_1(0)} = -f_1 < 0$. It follows that $\lambda_1(0) = 0$ which, together with $\delta_1 > 0$, implies $\lambda_1(1) > 0$ and $\beta_1^{Acc}(1) = 1$, a contradiction. Hence $\beta_2^{Acc}(1) = 1/2$, implying $X_2(\rho) = 1/2$.

It remains to establish $\beta_1^{Acc}(1) > 1/2$ and $\rho_1(1,0) = 1$. Assume by way of contradiction that $\beta_1^{Acc}(1) = 1/2$. It follows that $X_1(\rho) = 1/2$. Since $X_2(\rho) = 1/2$ and $\alpha > 1$, we get $\Gamma_1 = 1$, implying $\frac{dEv_1}{d\lambda_1(0)} = -f_1 < 0$ and, therefore, $\lambda_1(0) = 0$. This, together with $\delta_1 > 0$, implies $\lambda_1(1) > 0$ and $\beta_1^{Acc}(1) = 1$, a contradiction. Hence $\beta_1^{Acc}(1) > 1/2$, implying $\rho_1(1,0) = 1$.

Sixth, we establish $\lambda_i(1) = 1$ for each i. This is obvious for IG_1 since $\rho_1(1,0) = 1$ implies $\frac{dEv_1}{d\lambda_1(1)} = 1 - f_1 > 0$. It remains to consider IG_2. Assume by way of contradiction that $\lambda_2(1) \in (0,1)$. Observe that $\beta_2^{Acc}(1) = 1/2$, together with $\delta_2 > 0$ and $\pi_2 < 1/2$, implies $\lambda_2(0) \in (0,1)$. Given $\lambda_2(\theta_2) \in (0,1)$ for each θ_2, it must be that

$$\begin{cases} \frac{dEv_2}{d\lambda_2(1)} = 0 \Leftrightarrow \Gamma_2 + (1 - \Gamma_2) \cdot \rho_2(1,0) = f_2 \\ \frac{dEv_2}{d\lambda_2(0)} = 0 \Leftrightarrow (1 - \Gamma_2) \cdot \rho_2(1,0) = f_2. \end{cases}$$

These two equalities can be satisfied simultaneously only if $\Gamma_2 = 0$, which is possible only if $\delta_1 = 1$, contradicting $\lambda_1(1) > \lambda_1(0)$.

Seventh, we determine $\lambda_i(0)$ for each i. Observe that $\beta_i^{Acc}(1) = \pi_i / [\pi_i + (1-\pi_i)\lambda_i(0)]$. For IG$_2$, we have $\beta_2^{Acc}(1) = 1/2$, which implies $\lambda_2(0) = \pi_2/(1-\pi_2) \in (0,1)$. For IG$_1$, we have $\beta_1^{Acc}(1) > 1/2$, which implies $\rho_1(1,0) = 1$. Together $[\lambda_1(1) - \lambda_1(0)] < 1$, $\lambda_1(1) = 1$ and $\lambda_1(1) > \lambda_1(0)$ imply $\lambda_1(0) \in (0,1)$. For $\lambda_i(0) \in (0,1)$ for each i, it must be that $\gamma_i(1,1) \in (0,1)$ and, therefore, that $X_1(\rho)\cdot\alpha = X_2(\rho)$. Since $X_1(\rho) = 1 - \beta_1^{Acc}(1)$ and $X_2(\rho) = 1/2$, this equality implies $\lambda_1(0) = \frac{\pi_1}{1-\pi_1}\frac{1}{2\alpha-1} \in (0,1)$.

Eight, and last, it remains to determine $\gamma_i(1,1)$ and $\rho_i(1,0)$ for each i. Recall that the expected probability that IG$_i$ is granted access if it lobbies is given by $\Gamma_i \equiv \delta_{-i}\cdot\gamma_i(1,1) + (1-\delta_{-i})$. Given $\lambda_{-i}(1) = 1$ and $\lambda_{-i}(0) = \frac{\pi_{-i}}{1-\pi_{-i}}\frac{1}{2\alpha_{-i}-1}$ (where $\alpha_1 = \alpha$ and $\alpha_2 = 1$), we have $\delta_{-i} = \frac{2\pi_{-i}}{2-\frac{1}{\alpha_{-i}}}$. Moreover, since $\lambda_i(0) \in (0,1)$ for each i, it must be that for each i,

$$\frac{dEv_i}{d\lambda_i(0)} = 0 \Leftrightarrow (1-\Gamma_i)\cdot\rho_i(1,0) = f_i.$$

Plugging the above expressions in this equality, we get for each i,

$$\gamma_{-i}(1,1)\cdot\rho_i(1,0) = \frac{2-\frac{1}{\alpha_{-i}}}{2\pi_{-i}}f_i.$$

We know from step 5 that $\rho_1(1,0) = 1$. It follows that the above equality for $i=1$ yields $\gamma_2(1,1) = \frac{f_1}{2\pi_2} \in (0,1)$. In turn, and knowing that $\gamma_1(1,1) = 1-\gamma_2(1,1)$, the above equality for $i=2$ yields $\rho_2(1,0) = \frac{\pi_2(2\alpha-1)f_2}{\pi_1\alpha(2\pi_2-f_1)} \in (0,1)$. ■

Proof of Lemma 2. We start by stating IG$_i$'s lobbying problem. Given θ_i, IG_i chooses $\lambda_i(\theta_i)$ that solves

$$\max_{\lambda_i(\theta_i)\in[0,1]} Ev_i(\lambda_i(\theta_i))$$

where

$$\begin{aligned} Ev_i(\lambda_i(\theta_i)) = {} & \lambda_i(\theta_i)\cdot[\delta_{-i}\cdot\gamma_i\cdot\rho_i(1,1;1,0) + (1-\gamma_i)\cdot[\pi_{-i}\cdot\lambda_{-i}(1)\cdot\rho_i(1,1;0,1) \\ & + (1-\pi_{-i})\cdot\lambda_{-i}(0)\cdot\rho_i(1,1;0,1)] + (1-\delta_{-i})\cdot\rho_i(1,0;1,0) - f_i] \\ & + (1-\lambda_i(\theta_i))\cdot \\ & [\pi_{-i}\cdot\lambda_{-i}(1)\cdot\rho_i(0,1;0,1) + (1-\pi_{-i})\cdot\lambda_{-i}(0)\cdot\rho_i(0,1;0,1) + (1-\delta_{-i})\cdot\rho_i(0,0;0,0)], \end{aligned}$$

with $\rho_i(\ell_i, \ell_{-i}; a_i, a_{-i})$ and γ_i as a shorthand for $\gamma_i(1,1)$.

We prove that when $f_2 > (1-\pi_1)$, an equilibrium exists in which $\lambda_1(1) = 1$ and $\lambda_1(0) = \lambda_2(1) = \lambda_2(0) = 0$. In this case, $\delta_1 = \pi_1$ and $\delta_2 = 0$. Moreover, $\beta_1^{Acc}(1) = 1$, $\beta_1^{Acc}(0) = 0$ and $\beta_2^{Acc}(0) = \pi_2$. We can infer from these beliefs that

$$\begin{cases} \rho_1(1,1;0,1) = 1 \\ \rho_1(0,\cdot;0,\cdot) = \rho_2(0,\cdot;0,\cdot) = \rho_2(1,1;1,0) = 0 \\ \rho_1(1,\cdot;1,0) = \theta_1 \\ \rho_2(1,0;1,0) = \theta_2 \text{ and } \rho_2(1,1;0,1) \le 1-\theta_1. \end{cases}$$

Let $\beta_2^{Acc}(1)$ take any value in $[0,1]$. Also, let $\rho_2(1,1;0,1) \in [0, 1-\theta_1]$ be consistent with $\beta_2^{Acc}(1)$. It follows that $X_1(\rho)\cdot\alpha = X_2(\rho) = 0$ (since IG_1 lobbies if and only if $\theta_1 = 1$), and γ_i can take any value in $[0,1]$ (with the restriction that $\gamma_1 + \gamma_2 = 1$). We then get

$$\begin{cases} \frac{dEv_1}{d\lambda_1(1)} = 1 - f_1 > 0 \text{ and } \frac{dEv_1}{d\lambda_1(0)} = -f_1 < 0 \\ \frac{dEv_2}{d\lambda_2(1)} = (1-\pi_1) - f_2 < 0 \text{ and } \frac{dEv_2}{d\lambda_2(0)} = -f_2 < 0, \end{cases}$$

which is consistent with the lobbying strategies.

We continue by proving that when $f_2 > 1 - \pi_1$, in any equilibrium we have $\lambda_i(1) = 1$ and $\lambda_i(0) = \lambda_{-i}(1) = \lambda_{-i}(0) = 0$ for some i.

First, we observe that $\lambda_i(1) \geq \lambda_i(0)$ and $\lambda_i(0) < 1$ for each i. To see this, assume by way of contradiction that $\lambda_i(0) \in (\lambda_i(1), 1]$ or $\lambda_i(1) = \lambda_i(0) = 1$. In both cases, $\lambda_i(0) > 0$ and $\beta_i^{Acc}(1) < 1/2$. It follows that $\frac{dEv_i}{d\lambda_i(0)} = -f_i < 0$, which contradicts $\lambda_i(0) > 0$.

Second, we establish that together $\lambda_1(\theta_1) = \theta_1$ for each θ_1 implies $\lambda_2(\theta_2) = 0$ for each θ_2. Given $\lambda_1(\theta_1) = \theta_1$ for each θ_1, we have $\delta_1 = \pi_1$. Moreover, $\beta_1^{Acc}(1) = 1$ and $\beta_1^{Acc}(0) = 0$ which, together with $\alpha > 1$, imply $\rho_1(1,1;0,1) = 1$. It follows that

$$\frac{dEv_2}{d\lambda_2(0)} \leq \frac{dEv_2}{d\lambda_2(1)} = (1-\pi_1) - f_2 - (1-\pi_1)\cdot\rho_2(0,0;0,0) < 0,$$

which implies $\lambda_2(\theta_2) = 0$ for each θ_2.

Third, we establish that $[\lambda_1(1) - \lambda_1(0)] < 1$ implies $\lambda_1(\theta_1) = 0$ for each θ_1, and $\lambda_2(\theta_2) = \theta_2$ for each θ_2. There are three cases to consider:

1. $\underline{\lambda_1(1) = 1}$. In this case, $\lambda_1(0) \in (0,1)$ and $\delta_1 < 1$. It follows that $\beta_1^{Acc}(1) < 1$. Moreover, $\beta_1^{Acc}(0) = 0$, which implies $\rho_1(0,\cdot;0,\cdot) = 0$ and $\rho_2(1,0;1,0) = \theta_2$. We then get

   $$\begin{cases} \frac{dEv_2}{d\lambda_2(1)} = \delta_1\cdot\gamma_2\cdot\rho_2(1,1;1,0) + (1-\gamma_2)\cdot(1-\pi_1)\cdot\lambda_1(0)\cdot\rho_2(1,1;0,1) + (1-\delta_1) - f_2 \\ \frac{dEv_2}{d\lambda_2(0)} = (1-\gamma_2)\cdot(1-\pi_1)\cdot\lambda_1(0)\cdot\rho_2(1,1;0,1) - f_2. \end{cases}$$

   Given $f_2 > (1-\pi_1)$, we have $\frac{dEv_2}{d\lambda_2(0)} < 0$ and, therefore, $\lambda_2(0) = 0$. It must then be that $\lambda_2(1) > 0$ since otherwise $\frac{dEv_1}{d\lambda_1(0)} = -f_1 < 0$, which would contradict $\lambda_1(0) > 0$. But $\lambda_2(1) > 0 = \lambda_2(0)$ implies that $\beta_2^{Acc}(1) = 1$ and, together with $\beta_1^{Acc}(1) < 1$, that $X_2(\rho) < X_1(\rho)\cdot\alpha$. But then $\gamma_1 = 1$ and, again $\frac{dEv_1}{d\lambda_1(0)} = -f_1 < 0$, contradicting $\lambda_1(0) > 0$.

2. $\underline{\lambda_1(1) \in (0,1)}$. We first observe that $\lambda_1(0) = 0$. We already know that $\lambda_1(0) < 1$. Assume by way of contradiction that $\lambda_1(0) \in (0,1)$. It must then be that $\frac{dEv_1}{d\lambda_1(1)} = \frac{dEv_1}{d\lambda_1(0)} = 0$, or $\delta_2\gamma_2 = 1$. The latter requires $\delta_2 = 1$, which we already know cannot be. Hence $\lambda_1(0) = 0$. Given $\lambda_1(1) > \lambda_1(0) = 0$ and $\pi_1 < 1/2$, we get $\beta_1^{Acc}(1) = 1$ and $\beta_1^{Acc}(0) < 1/2$

and, therefore, $\rho_1(1,1;0,1) = 1$ and $\rho_1(0,\cdot;0,\cdot) = 0$. It follows that $\frac{dEv_1}{d\lambda_1(1)} = 1 - f_1 > 0$, which contradicts $\lambda_1(1) < 1$.

3. $\underline{\lambda_1(1) = 0.}$ Since $\lambda_1(1) \geq \lambda_1(0)$, we then have $\lambda_1(0) = 0$. It follows that $\beta_1^{Acc}(0) = \pi_1 < 1/2$ and, therefore, $\rho_1(0,\cdot;0,\cdot) = 0$. Moreover, $\frac{dEv_2}{d\lambda_2(0)} \leq -f_2 < 0$, which implies $\lambda_2(0) = 0$. It follows that $\beta_2^{Acc}(0) < 1/2$ and, therefore, $\rho_2(0,\cdot;0,\cdot) = 0$. We then get $\frac{dEv_2}{d\lambda_2(1)} = 1 - f_2 > 0$, which implies $\lambda_2(1) = 1$.

We now prove that when $f_2 \leq 1-\pi_1$, an equilibrium exists in which $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. In this case, $\delta_i = \pi_i$. Moreover, $\beta_i^{Acc}(\ell_i) = \ell_i$ for each ℓ_i and each i, from which it follows that:

1. $X_1(\rho) \cdot \alpha = X_2(\rho)$, implying we can let $\gamma_1 = (1-\gamma_2) \in \left(1 - \frac{f_1}{\pi_2}, 1\right]$;
2. $\rho_i(1,1;0,1) = 1$ if $\theta_{-i} = 0$,
3. $\rho_i(0,\cdot;0,\cdot) = 0$; and
4. $\rho_1(1,1;1,0) = \theta_1$ and $\rho_1(1,1;0,1) = 1$.

It follows that $\frac{dEv_i}{d\lambda_i(1)} \geq 0$ and $\frac{dEv_i}{d\lambda_i(0)} < 0$ for each i, which is consistent with $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. The construction of the equilibrium is completed by letting the remaining access and policy choice strategies be as specified in section 3.

It remains to prove that when $f_i < 1 - \pi_i$ for each i, in any equilibrium we have $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. We proceed via a sequence of seven steps.

First, we show that $\beta_i^{Acc}(0) < 1/2$ for each i. Assume by way of contradiction that $\beta_i^{Acc}(0) \geq 1/2$ for some i. This is possible only if either $\lambda_i(1) < \lambda_i(0)$ or $\lambda_i(1) = \lambda_i(0) = 1$. In either case, $\beta_i^{Acc}(1) < 1/2$ and $\frac{dEv_i}{d\lambda_i(0)} \leq -f_i < 0$, which contradicts $\lambda_i(0) > 0$.

Second, we show that $\lambda_i(1) \geq \lambda_i(0)$ for each i. Assume by way of contradiction that $\lambda_i(1) < \lambda_i(0)$ for some i. This implies $\beta_i^{Acc}(1) < 1/2$. We get a contradiction following the same argument as in the first step.

Third, we show that $\lambda_i(0) < 1$ for each i. Assume by way of contradiction that $\lambda_i(0) = 1$ for some i. Since we already know that $\lambda_i(1) \geq \lambda_i(0)$, we have $\lambda_i(1) = \lambda_i(0) = 1$ and, therefore, $\beta_i^{Acc}(1) = \pi_i < 1/2$. Again, we get a contradiction following the same argument as in the first step.

Fourth, we show that $\lambda_i(1) > 0$ for each i. Assume by way of contradiction that $\lambda_i(1) = 0$ for some i. Since we already know that $\lambda_i(1) \geq \lambda_i(0)$, we have $\lambda_i(1) = \lambda_i(0) = 0$ and, therefore, $\delta_i = 0$. Since $\beta_i^{Acc}(0) < 1/2$, we then get $\lambda_{-i}(\theta_{-i}) = \theta_{-i}$ for each θ_{-i}. But then $\frac{dEv_i}{d\lambda_i(1)} \geq (1-\pi_i) - f_i > 0$, which contradicts $\lambda_i(1) = 0$.

Fifth, we show that $\lambda_i(1) > \lambda_i(0)$ for each i. We already know from the second step that $\lambda_i(1) \geq \lambda_i(0)$ for each i. Assume by way of contradiction that $\lambda_i(1) = \lambda_i(0)$ for some i. Also, we know from the fourth step that $\lambda_i(1) > 0$. It follows that $\beta_i^{Acc}(1) = \pi_i < 1/2$, and the same argument as in the first step applies. Observe that this step implies $\delta_i \in (0,1)$ for each i.

Sixth, we show that $\lambda_i(1) = 1$ for each i. Assume by way of contradiction that $\lambda_i(1) < 1$ for some i. We already know from the fifth step that $\lambda_i(1) > \lambda_i(0)$. It follows that $\lambda_i(1) \in (0,1)$ and, therefore, that $\frac{dEv_i}{d\lambda_i(1)} = 0$. The latter, together with $\delta_{-i} < 1$, implies that $\frac{dEv_i}{d\lambda_i(0)} < 0$ and, therefore, that $\lambda_i(0) = 0$ and $\beta_i^{Acc}(1) = 1$.

If $i = 1$, $\beta_1^{Acc}(1) = 1$ and $\alpha > 1$ imply $\frac{dEU_1}{d\lambda_1(1)} = 1 - f_1 > 0$, which contradicts $\lambda_1(1) < 1$.

If $i = 2$, $\frac{dEv_2}{d\lambda_2(1)} = 0$ holds true only if $(1 - \delta_1) \leq f_2$. This inequality, together with $f_2 < 1 - \pi_1$, requires $\lambda_1(0) > 0$. In turn, $\lambda_1(0) > 0$ requires $\gamma_1 < 1$ and, therefore, $X_1(\rho) \cdot \alpha \leq X_2(\rho)$. Simple algebra shows that, taken together, $\beta_2^{Acc}(1) = 1$ and $\lambda_1(0) > 0$ imply $X_1(\rho) \cdot \alpha > X_2(\rho)$, a contradiction.

Seventh, and last, we show that $\lambda_i(0) = 0$ for each i. Assume by way of contradiction that $\lambda_i(0) > 0$ for some i. We already know from the fifth step that $\lambda_i(1) > \lambda_i(0)$, which implies $\lambda_i(0) \in (0,1)$. Moreover, given $\lambda_{-i}(1) = 1$, $\lambda_i(0) > 0$ requires $\lambda_{-i}(0) \in (0,1)$ as well. Finally, for $\lambda_j(0) \in (0,1)$ for each j, it must be that $\gamma_j \in (0,1)$, which requires $X_1(\rho) \cdot \alpha = X_2(\rho)$. Simple, but tedious, algebra shows that $X_1(\rho) > 0$ and $X_1(\rho) \geq X_2(\rho)$ which, together with $\alpha > 1$, contradicts $X_1(\rho) \cdot \alpha = X_2(\rho)$. ■

Proof of Proposition 1. The result follows directly from lemmata 1 and 2.

Consider first the case where $f_2 > 1 - \pi_1$. Simple algebra establishes that $f_2 > 1 - \pi_1$ implies $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} > 1$. From lemma 1 we know that equilibrium lobbying is truthful in the $N = 2$-game. Hence, $\beta_i^{N=2} \in \{0,1\}$ for each i. From lemma 2 we know that in the $N = 1$-game, IG_1 lobbies truthfully while IG_2 does not lobby. Hence, $\beta_1^{N=1} \in \{0,1\}$ and $\beta_2^{N=1} = \pi_2$.

Consider second the case where $f_2 \in \left[\pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right), 1 - \pi_1\right]$. In other words, $f_2 \leq 1 - \pi_1$ and $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$. For the $N = 2$-game, equilibrium lobbying and posterior beliefs are as described in the previous case. For the $N = 1$-game, we know from lemma 2 that equilibrium lobbying is truthful. It follows that $\beta_i^{N=1} \in \{0,1\}$ for each i.

Consider third the case where $f_2 < \pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right)$. In other words, $f_2 < 1 - \pi_1$ and $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. For the $N = 1$-game, equilibrium lobbying and posterior beliefs are as described in the previous case. For the $N = 2$-game, we know from lemma 1 that, in equilibrium, IGs overlobby. It follows that $\beta_i^{N=2}(1, 0; \theta_i) \in [1/2, 1)$ for each i. ■

Proof of Proposition 2. We start by establishing the sufficiency of the stated condition. Observe that this condition, together with $\alpha > 1$, implies

$\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$ and $f_2 < 1 - \pi_1$. Thus, case 2 of lemma 1 and case 2 of lemma 2 apply.

In the $N = 1$-game, equilibrium lobbying is truthful and the PM prioritizes issue 1. The PM chooses $p = (1, 0)$ when $\theta = (1, 1)$. He chooses $p = \theta$ otherwise. Players' expected payoffs are then given by

$$\begin{aligned} EU_1^{N=1} &= \pi_1 \cdot (1 - f_1) \\ EU_2^{N=1} &= \pi_2 \cdot (1 - \pi_1 - f_2) \\ EU_{PM}^{N=1} &= \alpha + (1 - \pi_1 \pi_2) . \end{aligned}$$

In the $N = 2$-game, IGs overlobby in equilibrium. Given the strategies and beliefs described in the statement and the proof of lemma 1, we get that players' expected payoffs are given by

$$\begin{aligned} EU_1^{N=2} &= \pi_1 \cdot (1 - f_1) \\ EU_2^{N=2} &= \pi_2 \cdot [1 - \delta_1 \cdot \gamma_1 (1, 1) \cdot (1 - \rho_2 (1, 0)) - f_2] \\ &= \pi_2 \cdot \left\{ 1 - \pi_1 \cdot \left[\frac{\alpha \cdot (2\pi_2 - f_1) - \frac{\pi_2}{\pi_1} \cdot (2\alpha - 1) \cdot f_2}{\pi_2 \cdot (2\alpha - 1)} \right] - f_2 \right\} \\ EU_{PM}^{N=2} &= (\alpha + 1) - \frac{2\pi_1 \pi_2 \alpha}{2\alpha - 1} . \end{aligned}$$

Thus, $EU_1^{N=1} = EU_1^{N=2}$ and $EU_{PM}^{N=1} > EU_{PM}^{N=2}$. Moreover, the condition in the statement of proposition 2 implies $EU_2^{N=1} \geq EU_2^{N=2}$.

We now establish the necessity of the stated condition. Suppose $EU_k^{N=1} \geq EU_k^{N=2}$ for every player $k \in \{1, 2, PM\}$, with at least one inequality strict.

We start by observing that we must have $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. To see this, assume the contrary. Case 1 of lemma 1 would then apply. In the $N = 2$-game, equilibrium lobbying would be truthful. IG_2's equilibrium expected payoff would thus be given by

$$EU_2^{N=2} = \pi_2 \cdot (1 - f_2) .$$

In the $N = 1$-game, IG_2 would either lobby truthfully (if $f_2 \leq 1 - \pi_1$) or would abstain from lobbying (if $f_2 > 1 - \pi_1$). IG_2's equilibrium expected payoff would thus be given by

$$EU_2^{N=1} = \begin{cases} \pi_2 \cdot (1 - \pi_1 - f_2) & \text{if } f_2 \leq 1 - \pi_1 \\ 0 & \text{if } f_2 > 1 - \pi_1 . \end{cases}$$

Simple algebra establishes $EU_2^{N=2} > EU_2^{N=1}$, a contradiction.

We continue by observing that $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$ implies case 2 of lemma 1 and case 2 of lemma 2 apply. As shown in the proof of sufficiency above, we have in this case that

$$sign \left\{ EU_2^{N=1} - EU_2^{N=2} \right\} = sign \left\{ 1 - \frac{\alpha \pi_1 f_1 + (2\alpha - 1) \pi_2 f_2}{\pi_1 \pi_2} \right\} .$$

Hence the necessity of this condition. Observe that this condition implies that $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$ is satisfied. ■

Supplementary Online Appendix (not for publication)

Expressions for $W_i(\rho)$ and $Z_i(\rho)$

The expressions for $W_i(\rho)$ and $Z_i(\rho)$ depend on whether or not there is an agenda constraint.

When there is no agenda constraint ($N = 2$) the policy choice for issue i depends only on the PM's belief for this issue, $\beta_i(\ell_i, a_i; \theta_i)$. If the PM grants access to IG$_i$, he anticipates to make the correct policy choice for issue i with probability one. Hence $W_i(\rho) = 1$. If the PM grants access to IG$_{-i}$, he anticipates to make the correct policy choice for issue i with probability

$$Z_i(\rho) = \beta_i^{Acc} \cdot \rho_i(1,0) + \left(1 - \beta_i^{Acc}\right) \cdot [1 - \rho_i(1,0)]$$

where $\rho_i(1,0)$ denotes the probability that the PM chooses $p_i = 1$ given $(\ell_i, a_i) = (1,0)$. The first term on the r.h.s is the PM's belief that $\theta_i = p_i = 1$. The second term on the r.h.s. is the PM's belief that $\theta_i = p_i = 0$.

We thus obtain the following expression for $X_i(\rho)$:

$$\begin{aligned} X_i(\rho) &= W_i(\rho) - Z_i(\rho) \\ &= \rho_i(1,0) \cdot \left(1 - \beta_i^{Acc}\right) + [1 - \rho_i(1,0)] \cdot \beta_i^{Acc}, \end{aligned}$$

which corresponds to the PM's belief that he will make the wrong policy choice for issue i if he does not grant access to IG$_i$.

When there is an agenda constraint ($N = 1$) the policy choice for issue i depends on the PM's beliefs for each of the two issues, $\beta_1(\ell_1, a_1; \theta_1)$ and $\beta_2(\ell_2, a_2; \theta_2)$. It is quite tedious to show that the expressions for $W_i(\rho)$ and $Z_i(\rho)$ are here given by

$$\begin{cases} W_i(\rho) = \beta_i^{Acc} \cdot \rho_i(\theta_i = 1) + \left(1 - \beta_i^{Acc}\right) \\ Z_i(\rho) = \left(1 - \beta_i^{Acc}\right) \\ \qquad\quad + \left(2\beta_i^{Acc} - 1\right) \cdot \left[\beta_{-i}^{Acc} \cdot \rho_i(\theta_{-i} = 1) + \left(1 - \beta_{-i}^{Acc}\right) \cdot \rho_i(\theta_{-i} = 0)\right], \end{cases}$$

where $\rho_i(\theta_i = 1)$ (resp. $\rho_i(\theta_{-i})$) is a shorthand for the probability that the PM chooses $p_i = 1$ given that he had granted access to IG$_i$ (resp. IG$_{-i}$) and observed $\theta_i = 1$ (resp. θ_{-i}) while, at the same time, IG$_{-i}$ (resp. IG$_i$) lobbied but was not granted access.

We obtain the following expression for $X_i(\rho)$:

$$X_i(\rho) = \beta_i^{Acc} \cdot \rho_i(\theta_i = 1) - \left(2\beta_i^{Acc} - 1\right) \cdot \left[\beta_{-i}^{Acc} \cdot \rho_i(\theta_{-i} = 1) + \left(1 - \beta_{-i}^{Acc}\right) \cdot \rho_i(\theta_{-i} = 0)\right],$$

which corresponds to

1. the PM's belief that $p_i = \theta_i = 1$ when he grants access to IG$_i$ (first term on the r.h.s) from which we subtract the PM's belief that $p_i = \theta_i = 1$ when he does not grant access to IG$_i$ (β_i^{Acc} times the term in square brackets), and to which we add

2. the PM's belief that $p_i = 1$ and $\theta_i = 0$ when he does not grant access to IG$_i$ ($\left(1 - \beta_i^{Acc}\right)$ times the term in square brackets).

The first part corresponds to the probability increase of making the correct policy choice for issue i when $\theta_i = 1$. The second part corresponds to the probability reduction of making the wrong policy choice for issue i when $\theta_i = 0$ (knowing that the PM will choose $p_i = 0$ when he grants access to IG$_i$ and observes $\theta_i = 0$).

An Illustrative Example

We present the main qualitative results of our model by means of an illustrative example. The example characterizes equilibrium for the game without agenda constraint ($N = 2$) and for the game with agenda constraint ($N = 1$). We show, for some parameters values, that an agenda constraint leads to truthful lobbying and a fully informed PM, whereas the absence of constraint on the agenda leads in equilibrium to overlobbying, which prevents the PM from becoming fully informed. Moreover, we show that the equilibrium outcome of the $N = 1$-game Pareto-dominates the equilibrium outcome of the $N = 2$-game.

Consider the following parameters values:

- $\alpha = 2$, i.e., the PM finds issue 1 twice as important as issue 2,
- $\pi_1 = \pi_2 = 2/5$, i.e., the PM is ex ante biased against reforms, and
- the lobbying cost for each IG is $f = 1/20$.

We start by characterizing equilibrium access and policy choice strategies in the subgame following truthful lobbying. Consistency requires that the beliefs of the PM at the access stage are given by $\beta_i^{Acc}(\ell_i) = \ell_i$ for each ℓ_i and each i. Under these beliefs, any feasible access strategy (γ_1, γ_2) is optimal since there is no further information to be gained.

Let's look at the optimal policy strategy under truthful lobbying. When IG$_i$ does not lobby, the optimal policy choice is to keep the status quo on issue i ($p_i = 0$). When only IG$_i$ lobbies, it is granted access with probability one and the optimal policy choice is $p_i = \theta_i$. When both IGs lobby, the PM's interim beliefs imply that, absent further information, he gets a positive payoff from implementing reform on either issue. If there is no agenda constraint ($N = 2$), he chooses policy $p = (1, 1)$, unless he grants access to IG$_i$ and finds out that $\theta_i = 0$, in which case he chooses $p_i = 0$ and $p_{-i} = 1$. If there is an agenda constraint ($N = 1$), the PM 'prioritizes' issue 1 given $\alpha > 1$, i.e., he reforms issue 1 ($p = (1, 0)$), unless he grants access to IG$_1$ and finds out that $\theta_1 = 0$, in which case he chooses policy $p = (0, 1)$.

Game with no agenda constraint ($N = 2$)

We first establish that no equilibrium of the $N = 2$-game leads to full information revelation. To see this, assume by way of contradiction that such an equilibrium were to exist. In this case lobbying must be truthful, as we show in section 4 of the paper.[24] Let $\widehat{\gamma}_i \in [0, 1]$ denote the equilibrium probability with which IG_i is granted access when both IGs lobby, with the restriction that $\sum_{i=1}^{2} \widehat{\gamma}_i = 1$. Given truthful lobbying, in equilibrium the PM believes $\theta_i = 1$ (resp. $\theta_i = 0$) if IG_i lobbies (resp. does not lobby). It follows that, if an IG lobbies but is not granted access, the PM chooses to reform its issue. IG_i's expected policy payoff from lobbying when $\theta_i = 0$ is then equal to $2/5 \cdot \widehat{\gamma}_{-i}$, which corresponds to the probability that IG_{-i} lobbies and is granted access. For IG_i to not deviate to lobby when $\theta_i = 0$, it must be that $2/5 \cdot \widehat{\gamma}_{-i} \leq 1/20$, i.e., the expected gain from lobbying must not exceed the lobbying cost. This inequality is satisfied only if $\widehat{\gamma}_{-i} \leq 1/8$, which cannot be satisfied simultaneously for both i since $\sum_{i=1}^{2} \widehat{\gamma}_i = 1$.

Next, we assert that there is a unique equilibrium of the $N = 2$-game (see lemma 1 in the paper for a formal statement and proof of this equilibrium and its unicity), which has the following strategies and beliefs:

1. The lobbying strategies are given by $\lambda_i(1) = 1$ for each i, $\lambda_1(0) = 2/9$ and $\lambda_2(0) = 2/3$, i.e., each IG lobbies when it has favorable information and randomizes between lobbying and not lobbying when it has unfavorable information.

2. The access strategy is such that when both IGs lobby, $\gamma_1(1, 1) = 15/16$ and $\gamma_2(1, 1) = 1/16$, i.e., the PM randomizes between granting access to the IGs; IG_1 is granted access with a much higher probability. When only one IG lobbies, it is granted access with probability one. When neither IG lobbies, the PM cannot grant access to any IG.

3. The policy strategy is such that the PM chooses $p_1 = 1$ when IG_1 lobbies and is not granted access. The PM chooses $p_2 = 1$ with probability 1/10 when IG_2 lobbies and is not granted access. Finally, $p_i = 0$ when IG_i does not lobby, and $p_i = \theta_i$ when IG_i lobbies and is granted access.

4. PM's beliefs at the access stage are obtained from the lobbying strategies using Bayes' rule: $\beta_i^{Acc}(0) = 0$ for each i, $\beta_1^{Acc}(1) = 3/4$ and $\beta_2^{Acc}(1) = 1/2$.

[24] Intuitively, both IGs must be lobbying with (sufficiently high) positive probability. Moreover, at least one of the two IGs must be lobbying truthfully since the PM can grant access to only one IG, thereby requiring lobbying decisions to be perfectly informative for at least one issue. If only one IG lobbies truthfully, the PM will necessarily choose to grant access to the 'untruthful' IG when this IG lobbies since the expected value of the information obtained by granting access to the 'untruthful' IG is greater than the value of the information obtained by granting access to the 'truthful' IG (where no information is to be gained). This implies that the 'truthful' IG has an incentive to deviate to lobby when it has unfavorable information, since there is a sufficiently high probability it will not have to reveal its information.

We now verify that these strategies and beliefs constitute an equilibrium.

First, it is clear from the description of the policy stage in section 3 of the paper that the policy strategy maximizes the PM's expected payoff. The exact randomization on p_2 when IG_2 lobbies and is not granted access justifies IG_2's randomization over its lobbying decision when $\theta_2 = 0$.

Second, consider the PM's access decision when both IGs lobby. The PM believes $\theta_1 = 1$ with probability 3/4 and $\theta_2 = 1$ with probability 1/2.

1. If the PM grants access to IG_1, he learns θ_1 and chooses $p_1 = \theta_1$, while randomizing on p_2 and choosing $p_2 = \theta_2$ with probability 1/2. The PM's expected payoff is equal to $2 + 1/2 = 5/2$.

2. If the PM grants access to IG_2, he learns θ_2 and chooses $p_2 = \theta_2$, while choosing $p_1 = 1$, which corresponds to θ_1 with probability 3/4. The PM's expected payoff is equal to $(3/4) \cdot 2 + 1 = 5/2$.

Thus, when the two IGs lobby, the PM is indifferent between granting access to IG_1 and granting access to IG_2. The exact randomization justifies IG_1's lobbying randomization when $\theta_1 = 0$.

Third, consider IGs' lobbying strategies. We start by observing that if IG_i does not lobby, the PM believes $\theta_i = 0$ and chooses $p_i = 0$. IG_i's payoff is then equal to zero.

We continue by checking that IG_1's lobbying strategy is an equilibrium strategy.

1. When $\theta_1 = 1$, IG_1 is strictly better off lobbying. If it lobbies, the PM chooses $p_1 = 1$, independently of whether or not he awards access to IG_1. IG_1's payoff is thus equal to $1 - 1/20 = 19/20 > 0$, which is strictly bigger than if it were not lobbying.

2. When $\theta_1 = 0$, IG_1 is indifferent between lobbying and not lobbying. If IG_1 lobbies, the PM chooses $p_1 = 1$ when he does not grant access to IG_1, which happens when IG_2 lobbies and is the one to be granted access, an event that occurs with probability $[2/5+(3/5)\cdot(2/3)]\cdot(1/16)=1/20$. IG_1's expected payoff is thus equal to $\frac{1}{20} - \frac{1}{20} = 0$, which corresponds to the probability $p_1 = 1$ minus the lobbying cost. Thus, IG_1 gets zero expected payoff whether it lobbies or not. The exact randomization justifies the PM's access randomization when both IGs lobby.

It remains to check that IG_2's lobbying strategy is an equilibrium strategy.

1. When $\theta_2 = 1$, IG_2 is strictly better off lobbying. If it lobbies, the PM chooses $p_2 = 1$ with probability 11/20 (viz. with probability 1 if he grants access to IG_2 and with probability 1/10 if IG_1 lobbies and is granted access). IG_2's expected payoff is thus equal to $\frac{11}{20} - \frac{1}{20} = 1/2 > 0$, which is strictly bigger than if IG_2 were not lobbying.

2. When $\theta_2 = 0$, IG_2 is indifferent between lobbying and not lobbying. If it lobbies, the PM chooses $p_2 = 1$ when he awards access to IG_1 and randomizes in favor of $p_2 = 1$, which happens with probability $[2/5+(3/5)\cdot(2/9)]\cdot(15/16)\cdot(1/10)=1/20$. IG_2's expected payoff from lobbying is thus equal to $\frac{1}{20} - \frac{1}{20} = 0$. IG_2's expected payoff is equal to zero whether it lobbies or not. The exact randomization justifies the PM's policy randomization over p_2 when IG_2 lobbies but is not granted access.

We calculate the equilibrium ex-ante expected payoffs of the two IGs and of the PM to be

$$
\begin{aligned}
Ev_1^{N=2} = &\quad \pi \cdot (1-f) + (1-\pi) \cdot 0 = \tfrac{19}{50} \\
Ev_2^{N=2} = &\quad \pi \cdot \left\{1 - \left[\pi + (1-\pi) \cdot \tfrac{2}{9}\right] \cdot \left(\tfrac{15}{16}\right) \cdot \left(\tfrac{9}{10}\right) - f\right\} + (1-\pi) \cdot 0 = \tfrac{1}{5} \\
EU^{N=2} = &\quad \alpha \cdot \left\{1 - (1-\pi) \cdot \tfrac{2}{9} \cdot \left[\pi + (1-\pi) \cdot \tfrac{2}{3}\right] \cdot \tfrac{1}{16}\right\} \\
&\quad + 1 - \left\{\left[\pi + (1-\pi) \cdot \tfrac{2}{9}\right] \cdot \tfrac{15}{16} \cdot \left[\pi \cdot \tfrac{9}{10} + (1-\pi) \cdot \tfrac{2}{3} \cdot \tfrac{1}{10}\right]\right\} = \tfrac{209}{75}.
\end{aligned}
$$

Game with agenda constraint ($N = 1$)

We now show that there exists an equilibrium for the $N = 1$-game in which the PM gets perfectly informed about θ. (Lemma 2 in the paper shows that, for the parameters values considered in this example, the PM gets perfectly informed in *any* equilibrium.) This illustrates our result that an agenda constraint can lead to better information transmission (proposition 1 in the paper).

Suppose lobbying strategies are truthful, i.e., $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. Suppose the PM chooses $\gamma_1(1,1) = 1$, i.e., he grants access to IG_1 when both IGs lobby; if $\theta_1 = 1$, the PM reforms issue 1, while he reforms issue 2 if $\theta_1 = 0$. Finally, let the access and policy strategies when none or exactly one IG lobbies be the same as in the equilibrium of the $N = 2$-game.

To show that these strategies constitute an equilibrium, it remains to establish that truthful lobbying is an optimal strategy for each IG. Observe that issue i does not get reformed when $\theta_i = 0$, implying that IG_i has no incentive to deviate to lobby in this state. When $\theta_1 = 1$, IG_1 gets payoff $1 - 1/20 = 19/20$ from lobbying (i.e., it gets its issue reformed and bears lobbying cost $f = 1/20$). When $\theta_2 = 1$, IG_2 gets expected payoff $3/5 - 1/20 = 11/20$ from lobbying (i.e., it gets its issue reformed when $\theta_1 = 0$, which happens with probability $3/5$, and bears lobbying cost $f = 1/20$). Since each IG gets zero payoff if it does not lobby ($p_i = 0$ since $\beta_i^{Acc}(0) = 0$), neither IG_i wants to deviate to not lobby when $\theta_i = 1$.

To sum up, the PM gets perfectly informed about θ through IGs' lobbying decisions. He always chooses $p_1 = \theta_1$. He chooses $p_2 = \theta_2$ unless $\theta = (1,1)$, in which case the agenda constraint is binding and the PM reforms issue 1, while keeping the status quo for issue 2.

We calculate the equilibrium ex-ante expected payoffs of the two IGs and the PM to be

$$
\begin{aligned}
Ev_1^{N=1} = &\quad \pi \cdot (1-f) = 19/50 \\
Ev_2^{N=1} = &\quad \pi \cdot (1-\pi-f) = 11/50 \\
EU^{N=1} = &\quad \alpha + 1 - \pi^2 = 71/25.
\end{aligned}
$$

Pareto improvement

Comparing equilibrium expected payoffs in the two games, we get

$$\begin{aligned} Ev_1^{N=2} &= \frac{19}{50} = Ev_1^{N=1} \\ Ev_2^{N=2} &= \frac{1}{5} < \frac{11}{50} = Ev_2^{N=1} \\ EU^{N=2} &= \frac{209}{75} < \frac{71}{25} = EU^{N=1}. \end{aligned}$$

Thus, IG_1 is ex ante as well off in the $N = 1$-game as in the $N = 2$-game, while IG_2 and the PM are each ex ante strictly better off in the $N = 1$-game than in the $N = 2$-game. This illustrates our second result that, from an ex ante point of view, the introduction of an agenda constraint can generate a Pareto improvement (proposition 2 in the paper).

Note that it is not *a priori* clear that an agenda constraint can be Pareto-improving, nor does it lead to such improvement for all parameters values. Intuitively, there are costs and benefits of imposing an agenda constraint for the PM as well as the IGs. The downside is that an agenda constraint contracts the choice set of the PM, preventing him from reforming all issues. On the positive side, an agenda constraint can provide the PM with a tool to discipline the IGs to truthfully reveal information through their lobbying decisions. This may benefit not only the PM but also the IGs by saving them the costs associated with overlobbying. Under a range of parameters values, the benefits are greater than the costs for *each* of the three players, in which case an agenda constraint generates a Pareto improvement. Proposition 2 in the paper provides the precise conditions under which this occurs.

Coming back to our example, observe that the introduction of an agenda constraint has a depressing effect on the PM's expected payoff by preventing him from reforming both issues. For the introduction of an agenda constraint to increase the PM's expected payoff, it must then be that the PM gets better informed about θ with than without agenda constraint. This is made possible by the fact that the agenda constraint allows the PM to use his access strategy to 'discipline' the lobbying behavior of IGs, something he cannot do without agenda constraint. More specifically,

1. in the $N = 1$-game, the PM can proceed 'lexicographically', prioritizing issue 1 by awarding access to IG_1 whenever it lobbies, and adopting $p = (1, 0)$ if and only if IG_1 reveals $\theta_1 = 1$. This strategy induces both IGs to lobby truthfully: IG_1 because it knows it will be granted access if it lobbies; IG_2 because it knows its lobbying decision will matter for the policy outcome if and only if $\theta_1 = 0$, in which case IG_1 will not lobby and IG_2 will necessarily be granted access if it lobbies.

2. in the $N = 2$-game, the PM can no longer 'discipline' IGs by prioritizing issue 1. Even if the PM were to prioritize issue 1, IG_2's lobbying decision would still matter since the PM can reform both issues. It follows that if

IGs were to lobby truthfully, when IG_2 lobbies and is not granted access, the PM would believe $\theta_2 = 1$ and would choose $p_2 = 1$. If lobbying is not too costly, as it is the case in this example, IG_2 would then want to deviate to lobby when $\theta_2 = 0$, hoping it will not be granted access. In other words, the fact that the PM can reform both issues while he can grant access to only one IG creates an incentive for IGs to overlobby. In equilibrium IGs overlobby up to the point where they are indifferent between lobbying and not lobbying when they have unfavorable information, i.e., up to the point where, in expectation, all the rent from overlobbying is exhausted and the expected payoff in state $\theta_i = 0$ is equal to zero whether IG_i lobbies or not.

IG_1 gets the same expected payoff in both games. This is because the PM prioritizes issue 1 in the $N = 1$-game and IG_1 overlobbies in the $N = 2$-game.

IG_2 gets a higher expected payoff in the $N = 1$-game than in the $N = 2$-game. To see this, observe that when $\theta_2 = 0$, IG_2 gets zero expected payoff in both games. This is because IG_2 lobbies truthfully in the $N = 1$-game and exhausts, in expectation, the rent from overlobbying in the $N = 2$-game. When $\theta_2 = 1$, IG_2 benefits from the relaxation of the agenda constraint: in the $N = 2$-game, IG_2 can get its reform adopted even when $\theta_1 = 1$, which is not possible in the $N = 1$-game since the PM prioritizes issue 1. At the same time, IG_2's overlobbying in state $\theta_2 = 0$ generates a negative externality on IG_2's $\theta_2 = 1$-self, by undermining the PM's belief that $\theta_2 = 1$ when IG_2 lobbies but is not granted access. The latter induces the PM to adopt $p_2 = 1$ with probability less than one. Given the parameter values in this example, the overlobbying externality cost exceeds the benefit from the relaxation of the agenda constraint, implying that IG_2 is ex ante strictly better off in the $N = 1$-game than in the $N = 2$-game.

Finally, the PM gets a higher expected payoff in the $N = 1$-game than in the $N = 2$-game. On the one hand, the PM benefits from the relaxation of the agenda constraint by being able to reform both issues. On the other hand, overlobbying implies that the PM is less well informed in the $N = 2$-game than in the $N = 1$-game. For the parameters values in this example, the informational benefit from the introduction of the agenda constraint exceeds its cost.

Extensions

We extend our baseline model in different ways. First, we extend our analysis to an arbitrary finite number of issues. Second, we endogenize the set of IGs. Third, we add a positive exogenous cost of granting access to an IG. Fourth, we allow for ex ante beliefs to be favorable to reform at least one issue.

More than two issues

We examine whether our main findings can be extended to more than two issues. We consider a setting where there is an arbitrary finite number of issues, I, each issue being advocated by a different IG. The PM can reform at most N issues, and can grant access to at most K IGs, where $1 \leq K \leq N \leq I$.[25] To keep our analysis tractable we consider a symmetric setting, i.e., we assume that for each IG$_i$, $\pi_i \equiv \pi < 1/2$, $f_i \equiv f \in (0,1)$ and $\alpha_i \equiv 1$. We will focus on the class of symmetric equilibria, i.e., equilibria in which 1) each IG uses identical lobbying strategies, $\{\lambda^*(\theta_i)\}_{\theta_i \in \{0,1\}}$, and 2) the PM's access and policy choices are also symmetric with respect to all IGs, i.e., for all i, j such that $\ell_i = \ell_j$, we have $\gamma_i^* = \gamma_j^*$, and for all i, j such that $\ell_i = \ell_j$ and $a_i = a_j$ (and, when $a_i = a_j = 1$, $\theta_i = \theta_j$), we have $\rho_i^* = \rho_j^*$. In a symmetric equilibrium with lobbying strategy λ^* the probability that an IG lobbies is $\delta^* \equiv \pi \cdot \lambda^*(1) + (1-\pi) \cdot \lambda^*(0)$. In addition to this, we impose a reasonable restriction that if the PM grants access to IG$_i$ and learns $\theta_i = 1$, then he reforms issue i ahead of any other issue j to which access was not granted.[26] The following lemma is useful in characterizing the set of symmetric equilibria.

Lemma 5 *In any symmetric equilibrium the lobbying strategy must be one of three types:*

1. *Truthful lobbying, i.e.,* $\lambda^*(1) = 1, \lambda^*(0) = 0$ *and hence* $\delta^* = \pi$;
2. *Overlobbying, i.e.,* $\lambda^*(1) = 1, \lambda^*(0) \in (0,1)$ *and hence* $\delta^* \in (\pi, 1)$; *or*
3. *Underlobbying, i.e.,* $\lambda^*(1) \in (0,1), \lambda^*(0) = 0$ *and hence* $\delta^* \in (0, \pi)$.

Proof. Note that if we had $\delta^* = 0$ then it must be that $\lambda(1) = \lambda(0) = 0$. In that case an IG$_i$ has a profitable deviation $\lambda_i(1) = 1$. This gives us a contradiction.

Similarly, if we had $\delta^* = 1$ then it must be that $\lambda(1) = \lambda(0) = 1$. However, if we had an equilibrium with $\lambda^*(0) = \lambda^*(1) = 1$ then it must be that $\beta^*(1, 0; \theta) = \pi(< 1/2)$, which means we must have $\rho^*(1, 0) = 0$. However, in that case IG$_i$ is better off deviating to $\lambda_i(0) = 0$ and thereby saving on the lobbying cost. This gives us a contradiction. Hence, in any symmetric equilibrium we must have $\delta^* \in (0, 1)$.

Since $\delta^* > 0$, we have

$$\frac{\partial E\Pi_i}{\partial \lambda_i(1)} = (1-\Gamma) \cdot \rho^*(1,0) + \Gamma - f > (1-\Gamma) \cdot \rho^*(1,0) - f = \frac{\partial E\Pi_i}{\partial \lambda_i(0)}.$$

Since $\delta^* > 0 \Longrightarrow \Gamma^* > 0$, we have that $\lambda^*(1) \geq \lambda^*(0)$. But we already ruled out the case, $\lambda^*(1) = \lambda^*(0) = 1$. Hence, we must have $\lambda^*(1) > \lambda^*(0)$.

This gives us three possible types of symmetric equilibria: (1) truthful lobbying equilibrium: $\lambda^*(1) = 1, \lambda^*(0) = 0$; (2) overlobbying equilibrium: $\lambda^*(1) = 1, \lambda^*(0) \in (0,1)$; (3) underlobbying equilibrium: $\lambda^*(1) \in (0,1), \lambda^*(0) = 0$. ■

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[25] Restricting attention to the case where $K \leq N$ is without loss of generality. This is because we get the same result with $K > N$ as with $K = N$, viz. an equilibrium exists in which the PM makes the same policy choice as the one he would make if he were fully informed about θ.

[26] Note that this requirement imposes no additional restriction if $\beta_j < 1$. It has bite only when $\beta_j = 1$. In that case the requirement is reasonable in the sense that if there is an arbitrarily small chance that the unaudited issue (issue j) has state 0, then the PM would give priority to implementing reform on the audited issue (issue i) for which he *knows* the state to be 1.

The intuition for the above lemma is as follows. First, observe that IGs never lobbying ($\delta^* = 0$), or always lobbying ($\delta^* = 1$), cannot constitute an equilibrium. In the former case, an IG would prefer to lobby in state 1 since such a deviation will get his reform implemented for sure. In the latter case, the PM's interim belief about a lobbying IG having state 1 must be $\pi < 1/2$, which means a lobbying IG in state 0 will not get reform implemented; hence, it is better off not lobbying since such a deviation will save on the cost of lobbying. Second, in any symmetric equilibrium the marginal return to lobbying is strictly greater in state 1 than in state 0. For an IG to be playing a strictly mixed strategy in state 0 (i.e., $\lambda^*(0) \in (0, 1)$) it must be indifferent between lobbying and not lobbying. In that case, it must be strictly better off lobbying in state 1, and hence we have $\lambda^*(1) = 1$. Similarly, whenever $\lambda^*(1) \in (0, 1)$ it must be that $\lambda^*(0) = 0$. This means, we cannot have a completely mixed symmetric equilibrium such that both $\lambda^*(1)$ and $\lambda^*(0)$ are in $(0, 1)$.

An important implication of the above lemma is that in any symmetric equilibrium, the interim beliefs of the PM must be such that $\beta^{Acc*}(0) < 1/2$ and $\beta^{Acc*}(1) \geq 1/2$. Hence, since $\beta^{Acc*}(1) = \pi/\delta^*$, we must have $\delta^* \in (0, 2\pi]$.

In order to characterize the symmetric equilibria, it is useful to define the following functions $z_n(\delta)$ and $\Gamma(\delta)$ over $\delta \in (0, 2\pi]$,

$$z_n(\delta) \equiv \binom{I-1}{n} \cdot \delta^n \cdot (1-\delta)^{I-1-n},$$

$$\Gamma(\delta) \equiv \sum_{n=0}^{K-1} z_n(\delta) + \sum_{n=K}^{I-1} \frac{K}{n+1} \cdot z_n(\delta)$$

and a function $\widetilde{\rho}(N, \delta)$ over $\delta \in (0, 2\pi]$ and $N \in \{K, \cdots, I\}$,

$$\widetilde{\rho}(N,\delta) \equiv \frac{1}{1-\Gamma(\delta)} \cdot \left\{ \sum_{n=K}^{N-1} \frac{n+1-K}{n+1} \cdot z_n(\delta) + \sum_{n=N}^{I-1} \frac{N - \min\{1, \pi/\delta\} \cdot K}{n+1} \cdot z_n(\delta) \right\}.$$

Assuming each IG lobbies with probability δ, $z_n(\delta)$ denotes the probability that n out of $I - 1$ groups lobby, and $\Gamma(\delta)$ denotes the probability that a group that lobbies is granted access by the PM. To better understand this expression, note that it is comprised of two terms. The first term is the probability that there are less than K other lobbying IGs, in which case a lobbying IG is granted access for sure. The second term adds up the probabilities associated with there being $n + 1 (> K)$ lobbying IGs, in which case each lobbying IG has $K/(n + 1)$ probability of being granted access. Consider a candidate symmetric equilibrium of a lobbying game with agenda constraint N in which each IG lobbies with probability δ.[27] The term $\widetilde{\rho}(N, \delta)$ denotes the maximal probability that an IG that lobbies gets its issue reformed conditional on it not being granted access

[27] Note that given lemma 3, there is a unique δ associated with each symmetric equilibrium allowing us to use δ as a sufficient statistic for the lobbying strategies in a symmetric equilibrium.

by the PM. To understand this expression, note that when there are fewer than N lobbying IGs, the maximal probability of getting reform (conditional on not being granted access) is 1, since $\beta^{Acc*}(1) \geq 1/2$. When there are $n+1(>N)$ lobbying IGs, the probability of an IG getting its issue reformed (conditional on not being granted access) depends on how many issues the PM granted access to but chose not to reform, i.e., on the expected number of 'vacant' positions which is $N - \min\{1, \pi/\delta\} \cdot K$. Hence, each such IG has the maximal probability $N - \min\{1, \pi/\delta\} \cdot K/(n+1)$ of getting its issue reformed.

The following lemma provides necessary and sufficient conditions for the existence of the different types of symmetric lobbying equilibria.

Lemma 6 *Consider a lobbying game with agenda constraint* $N \in \{K, \cdots, I\}$. *Define* $\underline{f}(N)$ *and* $\overline{f}(N)$ *as*

$$\begin{aligned} \underline{f}(N) &\equiv [1-\Gamma(\pi)] \cdot \widetilde{\rho}(N,\pi), \\ \overline{f}(N) &\equiv [1-\Gamma(\pi)] \cdot \widetilde{\rho}(N,\pi) + \Gamma(\pi). \end{aligned}$$

1. *A symmetric truthful lobbying equilibrium exists if and only if* $f \in [\underline{f}(N)$ $, \overline{f}(N)]$.
2. *A symmetric overlobbying equilibrium exists if* $f \leq \underline{f}(N)$; *a symmetric underlobbying equilibrium exists if* $f \geq \overline{f}(N)$.
3. *Moreover, if* $[1-\Gamma(\delta)] \cdot \widetilde{\rho}(N,\delta) + \Gamma(\delta)$ *is decreasing on* $(0, 2\pi]$, *then a symmetric overlobbying equilibrium exists only if* $f < \overline{f}(N)$ *and a symmetric underlobbying equilibrium exists only if* $f > \overline{f}(N)$.

PROOF.

4.1 (Sufficiency). Suppose $f \in [(1-\Gamma(\pi)) \cdot \widetilde{\rho}(N,\pi), (1-\Gamma(\pi)) \cdot \widetilde{\rho}(N,\pi) + \Gamma(\pi)]$. Consider the truthful lobbying strategies played by the IGs (i.e., $\lambda(0) = 0, \lambda(1) = 1$); let access strategy of the PM be $\gamma(0) = 0, \gamma(1) = \min\{K/M, 1\}$ where $M = \#\{i : \ell_i = 1\}$; and let $\rho(0, \cdot) = 0, \rho(1,1) = \theta$ and $\rho(1,0) = \max\{\frac{N-\widehat{K}}{M-K}, 1\}$ where $\widehat{K} = \#\{i : a_i = \theta_i = 1\}$; PM's beliefs are $\beta^{Acc}(0) = 0, \beta^{Acc}(1) = 1; \beta(0,0;\theta) = \beta(1,1;0) = 0$, and $\beta(1,0;\theta) = \beta(1,1;1) = 1$. It is easy to see that the interim beliefs are consistent with the lobbying strategies; the access strategy is optimal given the beliefs and the policy function; the final beliefs are consistent with the access strategy and the policy function; and the policy function is optimal given the beliefs. We therefore need to check whether each IG_i's lobbying strategy is optimal given the PM's and other IGs' strategies. Note that when $\theta_i = 0$, IG_i's expected payoff from lobbying is $(1-\Gamma(\pi)) \cdot \widetilde{\rho}(N,\pi) - f$ which is weakly less 0, the expected payoff from not lobbying. On the other hand, when $\theta_i = 1$, IG_i's expected payoff from lobbying is $(1-\Gamma(\pi)) \cdot \widetilde{\rho}(N,\pi) + \Gamma(\pi) - f$ which is weakly greater than 0, the expected payoff from not lobbying. This establishes that the strategies described above constitute a symmetric Nash equilibrium.

4.1 (Necessity). Given the definition of equilibrium, a truthful lobbying equilibrium is unique. In equilibrium an IG_i lobbies with probability 1 when

$\theta_i = 1$ which implies $f \leq (1 - \Gamma(\pi)) \cdot \widetilde{\rho}(N, \pi) + \Gamma(\pi)$; also, the IG$_i$ does not lobby when $\theta_i = 0$, which implies $f \geq (1 - \Gamma(\pi)) \cdot \widetilde{\rho}(N, \pi)$.

4.2 *Overlobbying equilibrium:* There are two possibilities to consider: 4.2.1 There exists $\widehat{\delta} \in [\pi, 2\pi]$ such that $f = [1 - \Gamma(\widehat{\delta})] \cdot \widetilde{\rho}(N, \widehat{\delta})$; 4.2.2 For any $\delta \in [\pi, 2\pi]$, $f > [1 - \Gamma(\delta)] \cdot \widetilde{\rho}(N, \delta)$.

4.2.1 Pick such a $\widehat{\delta}$. Consider the following strategies for each IG: $\lambda(1) = 1$, $\lambda(0) = \widehat{\delta} - \pi/1 - \pi$; PM's strategies are $\gamma(0) = 0, \gamma(1) = \min\{K/M, 1\}$; and $\rho(0, \cdot) = 0 = \rho(1, 0), \rho(1, 1) = 1$ and $\rho(1, 0) = \max\{\frac{N - \widehat{K}}{M - K}, 1\}$. PM's interim and final beliefs are $\beta^{Acc}(0) = 0$, $\beta^{Acc}(1) = \pi/\widehat{\delta}$; $\beta(0, 0; \theta) = \beta(1, 1; 0) = 0$, $\beta(1, 1; 1) = 1$ and $\beta(1, 0; \theta) = \pi/\widehat{\delta}$. Since $\pi/\widehat{\delta} \geq 1/2$, PM's policy choice is optimal given his beliefs. Also, his access strategy is optimal given the IGs' lobbying strategies and his interim beliefs; moreover, PM's interim beliefs are derived from the IGs' strategies using Bayes rule. Also, $f = [1 - \Gamma(\widehat{\delta})] \cdot \widetilde{\rho}(N, \widehat{\delta}) \Longrightarrow \lambda(0) = \widehat{\delta} - \pi/1 - \pi$ is optimal and also, $f < [1 - \Gamma(\widehat{\delta})] \cdot \widetilde{\rho}(N, \widehat{\delta}) + \Gamma(\widehat{\delta}) \Longrightarrow \lambda(1) = 1$ is optimal. This establishes that the strategies and beliefs described above constitute a symmetric Nash equilibrium.

4.2.2 Consider the following strategies for the IGs: $\lambda(1) = 1, \lambda(0) = \pi/1 - \pi$; PM's strategies are $\gamma(0) = 0, \gamma(1) = \min\{K/M, 1\}$; and $\rho(0, \cdot) = 0 = \rho(1, 0), \rho(1, 1) = 1$ and $\rho(1, 0) = \omega \cdot \max\{\frac{N - \widehat{K}}{M - K}, 1\}$ where ω is chosen such that $f = [1 - \Gamma(2\pi)] \cdot \omega \cdot \widetilde{\rho}(N, 2\pi)$. PM's interim and final beliefs are $\beta^{Acc}(0) = 0$, $\beta^{Acc}(1) = 1/2$; $\beta(0, 0; \theta) = \beta(1, 1; 0) = 0$, $\beta(1, 1; 1) = 1$ and $\beta(1, 0; \theta) = 1/2$. Note that given the PM's belief $\beta(1, 0; \theta) = 1/2$, he is indifferent between implementing and not implementing reform on an issue to which he did not grant access in spite of lobbying. Hence, his strategy to implement reforms on a fraction ω of such issues is optimal. Likewise, an IG is indifferent between lobbying and not lobbying in state 0 since $f = [1 - \Gamma(2\pi)] \cdot \omega \cdot \widetilde{\rho}(N, 2\pi)$. This establishes that the strategies and beliefs described above constitute a symmetric Nash equilibrium.

4.2 *Underlobbying equilibrium:* Suppose $f > [1 - \Gamma(\pi)] \cdot \widetilde{\rho}(N, \pi) + \Gamma(\pi)$. Observe that $[1 - \Gamma(\delta)] \cdot \widetilde{\rho}(N, \delta) + \Gamma(\delta)$ is a continuous function of δ and as $\delta \to 0, [1 - \Gamma(\delta)] \cdot \widetilde{\rho}(N, \delta) + \Gamma(\delta) \to 1$. Hence, there exists $\widehat{\delta} \in (0, \pi)$ such that $[1 - \Gamma(\widehat{\delta})] \cdot \widetilde{\rho}(N, \widehat{\delta}) + \Gamma(\widehat{\delta}) = f$. Consider the following strategies for the IGs: $\lambda(1) = \widehat{\delta}/\pi, \lambda(0) = 0$; PM's strategies are $\gamma(0) = 0, \gamma(1) = \min\{K/M, 1\}$; and $\rho(0, \cdot) = 0, \rho(1, 1) = \theta$ and $\rho(1, 0) = \max\{\frac{N - \widehat{K}}{M - K}, 1\}$. PM's interim and final beliefs are $\beta^{Acc}(0) = \frac{\pi \cdot (1 - \widehat{\delta})}{\pi \cdot (1 - \widehat{\delta}) + (1 - \pi)}$, $\beta^{Acc}(1) = 1$; $\beta(0, 0; \theta) = \beta(1, 1; 0) = 0$, $\beta(1, 1; 1) = 1$ and $\beta(1, 0; \theta) = 1$. As in the case of truthful lobbying equilibrium, PM's policy choice is optimal given his beliefs. Also, his access strategy is optimal given the IGs' lobbying strategies and his interim beliefs; moreover, PM's interim beliefs are derived from the IGs' strategies using Bayes rule. This establishes that the strategies and beliefs described above constitute a symmetric Nash equilibrium.

4.3 Suppose there existed a symmetric overlobbying equilibrium for $f \geq \overline{f}(N)$. Let $\delta^* \in (\pi, 2\pi]$ denote the ex-ante lobbying probability in such equilibrium. It must then be the case that $[1-\Gamma(\delta^*)]\cdot\omega\cdot\widetilde{\rho}(N,\delta^*)+\Gamma(\delta^*)>f$ for some $\omega\in(0,1]$, which in turn implies that $[1-\Gamma(\delta^*)]\cdot\widetilde{\rho}(N,\delta^*)+\Gamma(\delta^*)>f$. However, since $[1-\Gamma(\delta)]\cdot\widetilde{\rho}(N,\delta)+\Gamma(\delta)$ is decreasing on $(0,2\pi]$, we have $\overline{f}(N)\equiv[1-\Gamma(\pi)]\cdot\widetilde{\rho}(N,\pi)+\Gamma(\pi)>[1-\Gamma(\delta^*)]\cdot\widetilde{\rho}(N,\delta^*)+\Gamma(\delta^*)>f$. This gives us a contradiction.

Similarly, suppose there existed a symmetric underlobbying equilibrium for $f\leq\overline{f}(N)$. Let $\delta^*\in(0,\pi)$ denote the ex-ante lobbying probability in such equilibrium. Such equilibrium requires that $[1-\Gamma(\delta^*)]\cdot\widetilde{\rho}(N,\delta^*)+\Gamma(\delta^*)=f$. But given that $[1-\Gamma(\delta)]\cdot\widetilde{\rho}(N,\delta)+\Gamma(\delta)$ is decreasing, we have $[1-\Gamma(\pi)]\cdot\widetilde{\rho}(N,\pi)+\Gamma(\pi)\equiv\overline{f}(N)<f$. This gives us a contradiction. ■

To understand the term $\underline{f}(N)$, suppose we are in a symmetric truthful lobbying equilibrium. Suppose an IG were to deviate in state 0 and choose to lobby. Since the PM believes each lobbying IG has state 1, it will get its issue reformed with probability $[1-\Gamma(\pi)]\cdot\widetilde{\rho}(N,\pi)$, which is the probability that it is not granted access times the maximal probability of getting reform conditional on being not granted access. An IG in state 0 will not find it profitable to deviate if the lobbying cost, f, exceeds $\underline{f}(N)$. Similarly, $\overline{f}(N)$ is the payoff of an IG from lobbying in state 1 in a symmetric truthful lobbying equilibrium. An IG will not find it profitable to deviate to not lobbying in state 1 if the lobbying cost, f, is below $\overline{f}(N)$.

Furthermore, it can be shown that both $\underline{f}(N)$ and $\overline{f}(N)$ are strictly increasing in N with $\underline{f}(K)=0$ and $\overline{f}(I)=1$. Also, for any $N\in\{K,\cdots,I-1\}$, $[\underline{f}(N)\,,\,\overline{f}(N)]\cap[\underline{f}(N+1)\,,\,\overline{f}(N+1)]$ is non-empty. We can then state the following.

Proposition 7 *For any lobbying cost $f\in(0,1)$, denote by $\mathcal{N}(f)\subseteq\{K,\cdots,I\}$ the set of agenda constraints for which a symmetric truthful lobbying equilibrium exists and let $\overline{N}(f)$ denote $\max\mathcal{N}(f)$. Then,*

1. *for any $f\in(0,1)$, $\mathcal{N}(f)$ is non-empty; and*
2. *$\overline{N}(f)$ is increasing in f with $\lim_{f\downarrow 0}\overline{N}(f)=K$ and $\lim_{f\uparrow 1}\overline{N}(f)=I$.*

Proof. To prove this proposition we establish a series of two claims.

Claim 1. For any $N\in\{K,\cdots,I\}$, $\overline{f}(N)-\underline{f}(N)$ is positive and independent of N.

Proof of Claim 1. To see this, note that $\overline{f}(N)-\underline{f}(N)$ can be broken down as

$$\begin{aligned}&\sum_{n=0}^{K-1}z_n(\pi)+\sum_{n=K}^{N-1}[1-\frac{n+1-K}{n+1}]\cdot z_n(\pi)+\sum_{n=N}^{I-1}[\frac{N}{n+1}-\frac{N-K}{n+1}]\cdot z_n(\pi)\\ =\;&\sum_{n=0}^{K-1}z_n(\pi)+\sum_{n=K}^{I-1}\frac{K}{n+1}\cdot z_n(\pi)>0\end{aligned}$$

since each term is non-negative and at least one term is strictly positive. In fact the expression above is $\Gamma^*(\pi)$ which is independent of N.

Claim 2. $\underline{f}(N)$ is an increasing function of N.

Proof of Claim 2. To see this, note that $\underline{f}(N) - \underline{f}(N+1)$ can be broken down as

$$-\frac{N+1-K}{N+1} \cdot z_N(\pi) + \frac{N-K}{N+1} \cdot z_N(\pi) + \sum_{n=N+1}^{I-1} \frac{-(N+1-K)+(N-K)}{n+1} \cdot z_n(\pi)$$

$$= \quad -\sum_{n=N}^{I-1} \frac{1}{n+1} \cdot z_n(\pi) < 0.$$

We can also see that when $N = I$ we have $\overline{f}(N) = 1$ and $\underline{f}(N) = 1 - \Gamma^*(\pi)$. Similarly, when $N = K$ we have $\overline{f}(N) = \Gamma^*(\pi)$ and $\underline{f}(N) = 0$. This establishes Proposition 3. ■

As with the two-issue model, the introduction of an agenda constraint yields benefits and costs. On the benefit side, as shown in the proposition above, there always exists an agenda constraint that induces full information revelation. On the cost side, agenda constraint reduces the PM's ability to implement welfare improving reform. Can there exist a Pareto improving agenda constraint? Our next example shows that it is indeed possible to introduce an optimal degree of agenda control that leads to Pareto improvement over no agenda constraint.

Example Suppose there are three issues ($I = 3$) and the PM can grant access to at most one IG ($K = 1$); let $\pi = 0.4$. We consider three possible levels of agenda constraint, with $N = 1, 2$ or 3; $N = 3$ corresponding to the absence of agenda constraint, $N = 2$ corresponding to an agenda constraint that is less tight than the constraint on access and, finally, $N = 1$ corresponding to an agenda constraint as tight as the access constraint. It can be shown that

1. for $f \in (0, 0.2928]$, $\mathcal{N}(f) = \{1\}$;
2. for $f \in [0.2928, 0.3472]$, $\mathcal{N}(f) = \{1, 2\}$;
3. for $f \in [0.3472, 0.6528]$, $\mathcal{N}(f) = \{1, 2, 3\}$;
4. for $f \in [0.6528, 9472]$, $\mathcal{N}(f) = \{2, 3\}$;
5. for $f \in [0.9472, 1]$, $\mathcal{N}(f) = \{3\}$.

Consider further, the case where $f = 0.33$. For this cost, $N = 1$ and 2 induce truthful lobbying in a symmetric equilibrium. Of these, $N = 2$ yields higher payoffs to both the PM and the IGs. It can be shown that the payoffs of the PM and the IGs in the truthful lobbying equilibrium are as follows: $EU^{N=2} = 2.936$ and $Ev^{N=2} = 0.10267$. However, what about $N = 3$? When there is no agenda constraint, i.e., $N = 3$, there exists a unique symmetric equilibrium which is an overlobbying equilibrium with $\delta^* = 0.8$ and $\rho^*(1, 0) = 25/28 \simeq 0.893$. The equilibrium payoffs are $EU^{N=3} = 2.104$ and $Ev^{N=3} = 0.0783$. Hence, we see that an optimal degree of agenda constraint ($N = 2$) leads to a strict Pareto improvement as compared to the absence of agenda constraint.

Endogenous interest groups

We go back to our baseline, two-issue model and relax the assumption that the set of IGs is exogenously given. Specifically, we endogenize the set of IGs by adding to the game a preliminary stage at which IGs decide simultaneously whether to organize. An IG's decision to organize can be interpreted in two ways. First, it can be interpreted as the IG's decision to open an office in D.C., Brussels or Canberra before knowing who is going to be the PM or whether the PM will benefit from reforming the IG's issue. Alternatively, an organization decision can be interpreted as the IG's decision to acquire information about the realized state for its issue. Our preference goes for the first interpretation since it then makes more sense that each IG's organization decision is observed by the other players.

For expositional purposes, we assume that an IG chooses to organize whenever it is indifferent between organizing and not organizing. Once made, IGs' organization decisions are observed by all. If IG$_i$ decides to organize, it bears a cost $c_i \geq 0$ and gets privately informed about θ_i. Organization costs, c_is, are common knowledge. We are interested in determining the robustness of our results to endogenizing the set of IGs (or, alternatively, the information owned by IGs).

The next lemma describes IGs' organization strategies. Let η_i denote IG$_i$'s organization strategy, where $\eta_i \in [0, 1]$ is the probability that IG$_i$ organizes.

Lemma 8 *IG$_1$'s organization strategy is given by*

$$\eta_1 \begin{cases} = 1 & \text{if } \pi_1 \cdot (1 - f_1) > c_1 \\ \in [0,1] & \text{if } \pi_1 \cdot (1 - f_1) = c_1 \\ = 0 & \text{if } \pi_1 \cdot (1 - f_1) < c_1. \end{cases}$$

IG$_2$'s organization strategy is as follows:

1. *When $N = 2$,*

$$\eta_2 \begin{cases} = 1 & \text{if } \pi_2 \cdot (1 - f_2) > c_2 \\ \in [0,1] & \text{if } \pi_2 \cdot (1 - f_2) = c_2 \\ = 0 & \text{if } \pi_2 \cdot (1 - f_2) < c_2 \end{cases}$$

if $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$, *and*

$$\eta_2 \begin{cases} = 1 & \text{if } \pi_2 \cdot \left\{ 1 - \eta_1 \pi_1 \cdot \left[\frac{2\alpha + (\alpha - 1)\frac{f_1}{\pi_2}}{2\alpha - 1} - \frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \right] - f_2 \right\} > c_2 \\ \in [0,1] & \text{if } \pi_2 \cdot \left\{ 1 - \eta_1 \pi_1 \cdot \left[\frac{2\alpha + (\alpha - 1)\frac{f_1}{\pi_2}}{2\alpha - 1} - \frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \right] - f_2 \right\} = c_2 \\ = 0 & \text{if } \pi_2 \cdot \left\{ 1 - \eta_1 \pi_1 \cdot \left[\frac{2\alpha + (\alpha - 1)\frac{f_1}{\pi_2}}{2\alpha - 1} - \frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \right] - f_2 \right\} < c_2 \end{cases}$$

if $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$.

2. *When* $N = 1$,

$$\eta_2 \begin{cases} = 1 & \text{if } \pi_2 \cdot [1 - \eta_1 \cdot (1 - f_2) - f_2] > c_2 \\ \in [0,1] & \text{if } \pi_2 \cdot [1 - \eta_1 \cdot (1 - f_2) - f_2] = c_2 \\ = 0 & \text{if } \pi_2 \cdot [1 - \eta_1 \cdot (1 - f_2) - f_2] < c_2 \end{cases}$$

if $f_2 > 1 - \pi_1$, *and*

$$\eta_2 \begin{cases} = 1 & \text{if } \pi_2 \cdot [1 - \eta_1 \pi_1 - f_2] > c_2 \\ \in [0,1] & \text{if } \pi_2 \cdot [1 - \eta_1 \pi_1 - f_2] = c_2 \\ = 0 & \text{if } \pi_2 \cdot [1 - \eta_1 \pi_1 - f_2] < c_2 \end{cases}$$

if $f_2 \leq 1 - \pi_1$.

Proof. Observe that if IG_i does not organize, the PM's belief about θ_i is given by $\pi_i < 1/2$. In this case, the PM chooses $p_i = 0$, and IG_i's expected payoff is $Ev_i(n_i = 0) = 0$, where $Ev_i(n_i)$ denotes IG_i's equilibrium expected payoff given its organization decision $n_i \in \{0, 1\}$.

We know from the proof of proposition 2 that IG_1's expected payoff if it organizes is given by

$$Ev_1(n_1 = 1) = \pi_1 \cdot (1 - f_1) - c_1.$$

Consider now IG_2's expected payoff when it organizes. There are three cases to consider:

1. $N = 1$ and $f_2 > 1 - \pi_1$. If IG_1 is organized (which occurs with probability η_1), IG_2 will abstain from lobbying. The PM will then believe $\theta_2 = 1$ with probability $\beta_2^{Acc}(0) = \pi_2 < 1/2$ and will choose $p_2 = 0$. In this case, IG_2's expected payoff is equal to zero. If IG_1 is not organized, IG_2 will lobby truthfully and the PM will choose $p_2 = \theta_2$. In this case, IG_2's expected payoff is equal to $\pi_2 \cdot (1 - f_2)$. To sum up, IG_2's expected payoff if it organizes is here given by

$$Ev_2(n_2 = 1) = (1 - \eta_1) \cdot \pi_2 \cdot (1 - f_2) - c_2.$$

2. Either $N = 1$ and $f_2 \leq 1 - \pi_1$, or $N = 2$ and $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} \geq 1$. In either of these two cases, any organized IG lobbies truthfully (by lemmata 1 and 2) and the PM chooses $p_2 = \theta_2$, unless $N = 1$, the two IGs are organized and $\theta = (1, 1)$, in which case the PM chooses $p = (1, 0)$. IG_2's expected payoff if it organizes is here given by

$$Ev_2(n_2 = 1) = \begin{cases} \pi_2 \cdot (1 - f_2) - c_2 & \text{if } N = 2 \\ \pi_2 \cdot [\eta_1 \cdot (1 - \pi_1) + (1 - \eta_1) - f_2] - c_2 & \text{if } N = 1. \end{cases}$$

3. $N = 2$ and $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. If IG_1 is not organized, IG_2 will lobby truthfully; IG_2's expected payoff is then equal to $\pi_2 \cdot (1 - f_2)$. If IG_1 is organized, both IGs will overlobby (by lemma 1). We know from the proof of proposition 2 that, in this case, IG_2's expected payoff is equal to

$$\pi_2 \cdot \left\{ 1 - \pi_1 \cdot \left[\frac{\alpha \cdot (2\pi_2 - f_1) - \frac{\pi_2}{\pi_1} \cdot (2\alpha - 1) \cdot f_2}{\pi_2 \cdot (2\alpha - 1)} \right] - f_2 \right\}.$$

To sum up, IG_2's expected payoff if it organizes is here given by

$$Ev_2 (n_2 = 1) = \pi_2 \cdot \left\{ 1 - \eta_1 \cdot \pi_1 \cdot \left[\frac{\alpha \cdot (2\pi_2 - f_1) - \frac{\pi_2}{\pi_1} \cdot (2\alpha - 1) \cdot f_2}{\pi_2 \cdot (2\alpha - 1)} \right] - f_2 \right\} - c_2.$$

Thus, IG_i organizes if $Ev_i (n_i = 1) > Ev_i (n_i = 0) = 0$, and only if $Ev_i (n_i = 1) \geq Ev_i (n_i = 0) = 0$. ■

We can make three observations relative to lemma 5.

First, $\pi_i < 1/2$ implies that if it does not organize, IG_i gets $p_i = 0$. Moreover, an IG lobbies truthfully in the equilibrium of the subgame where it is the only organized IG. This means that the difference in organization incentives between the $N = 1$-game and the $N = 2$-game is associated with the subgame where the two IGs are organized.

Second, IG_1's organization strategy does not depend on N. This is because the PM prioritizes issue 1 when IG_1 is organized and lobbies. When $\theta_1 = 1$, IG_1 lobbies and gets $p_1 = 1$ with probability one. When $\theta_1 = 0$, IG_1 does not lobby or it randomizes between lobbying and not lobbying; in either case IG_1 gets zero expected payoff. Thus, whether $\theta_1 = 1$ or $\theta_1 = 0$, IG_1's expected payoff, and therefore its organization strategy, is independent of N.

Third, IG_2's organization strategy depends on N (if and only if IG_1 organizes with positive probability). To understand why, we partition the parameters space into the same three regions as in proposition 1 and consider subgames where IG_1 is organized (since, as argued in the first observation, the differences between $N = 1$ and $N = 2$ occur only in the subgame where the two IGs are organized).

1. $f_2 > 1 - \pi_1$: When $N = 1$, IG_2 does not organize. This is because it anticipates that IG_1 will lobby truthfully and, then, that it, IG_2, will not lobby at all. IG_2's expected payoff will then be equal to zero. When $N = 2$, IG_2 anticipates truthful lobbying and positive expected payoff. Thus, IG_2 is (weakly) more likely to organize when $N = 2$ than when $N = 1$.

2. $f_2 \in \left[\pi_1 \cdot \left(1 - \frac{f_1}{\pi_2} \right), 1 - \pi_1 \right]$: IG_2 anticipates truthful lobbying whether $N = 1$ or $N = 2$. In this case, IG_2's expected payoff is bigger when $N = 2$ than when $N = 1$ since IG_2 does not have to bear the agenda constraint cost when $N = 2$, in contrast to when $N = 1$. It follows that, as in the first region, IG_2 is more likely to organize when $N = 2$ than when $N = 1$.

3. $f_2 < \pi_1 \cdot \left(1 - \frac{f_1}{\pi_2}\right)$: In contrast to what happens in the other two regions of the parameters space, here IG_2 can be more likely to organize when $N = 1$ than when $N = 2$. This happens when, as discussed in section 4.3 of the paper, the overlobbying externality cost exceeds the agenda constraint cost. In that case, IG_2's expected payoff is bigger when $N = 1$ than when $N = 2$.

The next proposition identifies the region of the parameters space where an agenda constraint is Pareto-improving when the set of IGs is endogenous.

Proposition 9 *Suppose that the set of IGs is endogenous. We have $EU_k^{N=1} \geq EU_k^{N=2}$ for every player $k \in \{1, 2, PM\}$, with at least one inequality strict, if and only if each of the following three conditions holds:*

1. $c_1 \leq \pi_1 \cdot (1 - f_1)$*;*
2. $c_2 \leq \pi_2 \cdot (1 - \pi_1 - f_2)$*; and*
3. $\frac{\alpha \pi_1 f_1 + (2\alpha - 1) \cdot \pi_2 f_2}{\pi_1 \pi_2} \leq 1$.

Proof. We start by establishing the sufficiency of the three conditions in the statement.

Condition (1) implies that $\eta_1^{N=1} = \eta_1^{N=2} = 1$ (lemma 5), and IG_1's expected payoff is given by $EU_1^{N=1} = EU_1^{N=2} = \pi_1 \cdot (1 - f_1) - c_1$.

Together, condition (3) and $\alpha > 1$ imply $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$, and case (3) in lemma 5 applies. When $N = 1$, condition (2) implies $\eta_2^{N=1} = 1$ and $EU_2^{N=1} = \pi_2 \cdot (1 - \pi_1 - f_2) - c_2 > 0$. Moreover, $\eta_1^{N=1} = \eta_1^{N=2} = 1$ implies $EU_{PM}^{N=1} = \alpha + (1 - \pi_1 \pi_2)$. When $N = 2$, two cases are possible:

1. IG_2 organizes. In this case, condition (3) implies $EU_2^{N=1} \geq EU_2^{N=2}$. Moreover, given the equilibrium strategies (case (2) in lemma 1), we get $EU_{PM}^{N=2} = (\alpha + 1) - \frac{2\pi_1 \pi_2 \alpha}{2\alpha - 1} < EU_{PM}^{N=1}$.

2. IG_2 does not organize. In this case, $EU_2^{N=2} = 0 < EU_2^{N=1}$. Moreover, the PM gets informed on issue 1 and, given $\pi_2 < 1/2$, chooses $p = (\theta_1, 0)$. The PM's expected payoff is then given by $EU_{PM}^{N=2} = \alpha + (1 - \pi_2) < EU_{PM}^{N=1}$.

To sum up, we have $EU_1^{N=1} = EU_1^{N=2}$, $EU_2^{N=1} \geq EU_2^{N=2}$ and $EU_{PM}^{N=1} > EU_{PM}^{N=2}$.

We now establish the necessity of each of the three conditions in the statement. Suppose $EU_k^{N=1} \geq EU_k^{N=2}$ for each player $k \in \{1, 2, PM\}$, with at least one inequality strict.

First, it must be that $c_1 \leq \pi_1 \cdot (1 - f_1)$, so that $\eta_1^N > 0$ (by lemma 5). To see this, assume by way of contradiction that $c_1 > \pi_1 \cdot (1 - f_1)$. We then have $\eta_1^N = 0$ for each $N \in \{1, 2\}$. It follows that $EU_1^{N=1} = EU_1^{N=2} = 0$.

Moreover, we know from lemma 5 that $EU_2^{N=1} = EU_2^{N=2}$. Finally, the PM chooses $p_1 = 0$, implying that an agenda constraint will not be binding and, therefore, that $EU_{PM}^{N=1} = EU_{PM}^{N=2}$. Hence $EU_k^{N=1} = EU_k^{N=2}$ for every player $k \in \{1, 2, PM\}$, a contradiction.

Second, it must be that $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$. This is because otherwise case (1) or case (2) of lemma 5 would apply, and IG_2 would have the strongest incentives to organize when $N = 2$. If IG_2 were to organize when $N = 2$, we would then have $EU_2^{N=2} > EU_2^{N=1}$, a contradiction. If IG_2 were to not organize when $N = 2$, it would not organize either when $N = 1$, and we would have $EU_k^{N=2} = EU_k^{N=1}$ for each player $k \in \{1, 2, PM\}$, a contradiction.

Third, it must be that $\frac{\alpha \pi_1 f_1 + (2\alpha - 1) \cdot \pi_2 f_2}{\pi_1 \pi_2} \leq 1$. The argument is the same as in the proof of proposition 2. (Observe that this restriction implies $\frac{\pi_1 f_1 + \pi_2 f_2}{\pi_1 \pi_2} < 1$.)

Finally, it must be that $c_2 \leq \pi_2 \cdot (1 - \pi_1 - f_2)$, so that $\eta_2^{N=1} > 0$ (by lemma 5). To see this, assume by way of contradiction that $c_2 > \pi_2 \cdot (1 - \pi_1 - f_2)$. We would then have $\eta_2^{N=1} = 0$ and, as mentioned above, $\eta_2^{N=2} = 0$. We would have again that $EU_k^{N=2} = EU_k^{N=1}$ for every player $k \in \{1, 2, PM\}$, a contradiction. ■

Compared to the case where the set of IGs is exogenous (proposition 2 in the paper), two conditions are added, conditions 1 and 2 in proposition 4, that impose upper-bounds on the organization costs of the IGs.

The intuition runs as follows. For an agenda constraint to be Pareto-improving, it must be that the PM gets better informed about θ when $N = 1$ than when $N = 2$. Hence, it requires that:

1. IG_1 organizes (condition 1). This condition follows because, as we noted above, IG_1's equilibrium organization strategy is independent of N and IG_2's equilibrium organization strategy depends on N only if IG_1 organizes. Thus, if IG_1 were to not organize, each player's expected payoff would be independent of N, closing the door to the possibility of a Pareto improvement.

2. Either the IGs overlobby in the equilibrium of the $N = 2$-game or IG_2 is more likely to organize in the $N = 1$-game than in the $N = 2$-game (condition 3). This condition follows because, otherwise, the agenda constraint could not generate an informational gain for the PM.

3. IG_2 organizes in the $N = 1$-game (condition 2). This condition follows because, given conditions 1 and 3, IG_2's incentives to organize are stronger when $N = 1$ than when $N = 2$. In consequence, if IG_2 were to not organize when $N = 1$, it would not organize either when $N = 2$. IG_1 would then be the only organized IG, and the expected payoff of every player would be independent of N, again closing the door to the possibility of a Pareto improvement.

To sum up, our result on Pareto-improving agenda constraint is robust to endogenizing the set of IGs, provided it is not too costly for IGs to organize.

Costly access

In this extension to our baseline model, we investigate the robustness of our main result (Proposition 2) to the introduction of an exogenous cost c that the PM must bear when he grants access to an IG. This exogenous cost comes in addition to the endogenous opportunity cost of our baseline model.

We set $c \in (0, 1/2)$ since the PM would never grant access to IG$_2$ if the cost c was larger than 1/2. Furthermore, for expositional purposes, we shall fix $f_1 = f_2 \equiv f$ and $\pi_1 = \pi_2 \equiv \pi$, and focus on the case where $f < \pi/2$, i.e., the case where, in our baseline model, the introduction of an agenda constraint leads to better-informed policy choices and, therefore, can generate a Pareto-improvement.

$N = 2$**-game** The following lemma parallels Lemma 1.2 in the paper.

Lemma 10 *Consider the $N = 2$-game with access cost $c \in (0, 1/2)$ and lobbying cost $f < \frac{\pi}{2}$. There is a unique equilibrium with lobbying IGs. In this equilibrium, we have*

$$\begin{cases} \lambda_i(1) = 1 \text{ \& } \lambda_i(0) = \frac{\pi}{1-\pi}\frac{1}{2\alpha_i - 1} \text{ for } i = 1, 2 \\ \gamma_1(1,0) = \gamma_2(0,1) = 1 \text{ \& } \gamma_2(1,1) = 1 - \gamma_1(1,1) = \frac{f}{2\pi} \\ \rho_1(1,0) = 1,\ \rho_2(1,0) = \frac{(2\alpha-1)\cdot f}{\alpha\cdot(2\pi - f)} \text{ \& } \rho_i(0,0) = 0 \text{ for } i = 1, 2 \\ \beta_i^{Acc}(1) = 1 - \frac{1}{2\alpha_i} \text{ \& } \beta_i^{Acc}(0) = 0 \text{ for } i = 1, 2 \end{cases}$$

where $\alpha_1 = \alpha$ and $\alpha_2 = 1$.

We prove this lemma via a sequence of claims.

We start by noting that IG$_i$'s equilibrium lobbying strategy takes one of the following forms:

1. $\lambda_i(\theta_i) = 1$ for each θ_i.
2. $\lambda_i(\theta_i) = \theta_i$ for each θ_i – Truthful lobbying.
3. $\lambda_i(1) = 1$ and $\lambda_i(0) \in (0, 1)$ – Overlobbying.
4. $\lambda_i(1) \in (0, 1)$ and $\lambda_i(0) = 0$ – Underlobbying.

Our first claim establishes that in equilibrium, each IG overlobbies.

Claim 11 *In equilibrium, $\lambda_i(1) = 1$ and $\lambda_i(0) \in (0, 1)$ for each i.*

Proof of Claim 1. Consider λ_i an equilibrium lobbying strategy for IG$_i$.

Assume by way of contradiction that $\lambda_i(1) = \lambda_i(0) = 1$. It follows that $\beta_i^{Acc}(1) = \pi < 1/2$, implying $\rho_i(1,0) = 0$ and

$$\frac{dEv_i}{d\lambda_i(0)} \leq -f,$$

which contradicts $\lambda_i(0) > 0$. This rules out case (1) above.

Assume by way of contradiction that either $\lambda_i(\theta_i) = \theta_i$ for each θ_i, or $\lambda_i(1) \in (0,1)$ and $\lambda_i(0) = 0$. In either case $\beta_i^{Acc}(1) = 1$ and $\beta_i^{Acc}(0) \in [0, 1/2)$. Given $c > 0$, $\beta_i^{Acc}(1) = 1$ implies $\Gamma_i = 0$, i.e., IG$_i$ is never granted access. Moreover, $\beta_i^{Acc}(1) = 1$ implies $\rho_i(1,0) = 1$, while $\beta_i^{Acc}(0) < 1/2$ implies $\rho_i(0,0) = 0$. IG$_i$'s expected utility in state $\theta_i = 0$ is then given by

$$Ev_i(\lambda_i(0)) = \lambda_i(0) \cdot (1 - f),$$

which contradicts $\lambda_i(0) = 0$. This rules out cases (2) and (4) above. ■

Claim 12 *In equilibrium,* $\beta_i^{Acc}(1) = 1 - \frac{1}{2\alpha_i}$ *and* $\beta_i^{Acc}(0) = 0$ *for each* i.

Proof of Claim 2. We know from the previous claim that in equilibrium, $\lambda_i(1) = 1$ and $\lambda_i(0) \in (0,1)$ for each i. Hence, $\ell_i = 0$ occurs only in state $\theta_i = 0$, implying $\beta_i^{Acc}(0) = 0$. Observe that $\beta_i^{Acc}(0) = 0$ implies $\rho_i(0,0) = 0$.

We now establish that $\beta_i^{Acc}(1) \geq 1/2$ for each i. Assume by way of contradiction that $\beta_i^{Acc}(1) < 1/2$ for some i. It follows that $\rho_i(1,0) = 0$. This, together with $\rho_i(0,0) = 0$, implies that IG$_i$'s expected utility in state $\theta_i = 0$ is given by

$$Ev_i(\lambda_i(0)) = \lambda_i(0) \cdot (-f),$$

which contradicts $\lambda_i(0) > 0$.

We continue by establishing that $\beta_1^{Acc}(1) > 1/2$. Assume by way of contradiction that $\beta_1^{Acc}(1) = 1/2$. Given $c < 1/2$ and $\alpha > 1$, we then get $\Gamma_1 = 1$. IG$_1$'s expected utility in state $\theta_1 = 0$ is then given by $Ev_1(\lambda_1(0)) = \lambda_1(0) \cdot (-f)$, which contradicts $\lambda_1(0) > 0$. Hence $\beta_1^{Acc}(1) > 1/2$. Observe that $\beta_1^{Acc}(1) > 1/2$ implies $\rho_1(1,0) = 1$.

We continue with two observations. First, since $\beta_1^{Acc}(1) > 1/2$, IG$_1$'s expected utility in state $\theta_1 = 0$ is given by

$$Ev_1(\lambda_1(0)) = \lambda_1(0) \cdot (1 - \Gamma_1 - f),$$

where $\Gamma_1 \equiv \delta_2 \cdot \gamma_1(1,1) + (1 - \delta_2) \cdot \gamma_1(1,0)$ and $\delta_2 \equiv \pi + (1 - \pi) \cdot \lambda_2(0)$. For $\lambda_1(0) \in (0,1)$, it must then be that

$$1 - \Gamma_1 = f. \tag{I}$$

Second, since $\beta_2^{Acc}(1) \geq \frac{1}{2}$, IG$_2$'s expected utility in state $\theta_2 = 0$ is given by

$$Ev_2(\lambda_2(0)) = \lambda_2(0) \cdot [(1 - \Gamma_2) \cdot \rho_2(1,0) - f].$$

For $\lambda_2(0) \in (0,1)$, it must then be that

$$(1 - \Gamma_2) \cdot \rho_2(1,0) = f. \tag{II}$$

We can now establish that $\beta_2^{Acc}(1) = 1/2$. Assume by way of contradiction that $\beta_2^{Acc}(1) > 1/2$. We then have $\rho_2(1,0) = 1$. Since $f < \pi/2$, conditions (I) and (II) then imply

$$1 - \frac{\pi}{2} < \delta_{-i} \cdot \gamma_i(1,1) + (1 - \delta_{-i}) \cdot \gamma_i(1;0) \text{ for } i = 1,2. \tag{III}$$

Observe that the r.h.s. is strictly increasing in $\gamma_i(1,1)$ and $\gamma_i(1;0)$. So consider the case where

$$\begin{cases} \gamma_1(1,0) = \gamma_2(0,1) = 1 \\ \gamma_1(1,1) + \gamma_2(1,1) = 1. \end{cases}$$

We then get from (III) that

$$\gamma_1(1,1) \in \left(1 - \frac{\pi}{2\delta_2}, \frac{\pi}{2\delta_1}\right).$$

However, since $\delta_i > \pi$ for each i, we get $\frac{\pi}{2\delta_1} < 1 - \frac{\pi}{2\delta_2}$. Hence the contradiction.

It remains to establish that $\beta_1^{Acc}(1) = 1 - \frac{1}{2\alpha}$. Observe that conditions (I) and (II) require $\Gamma_i < 1$ for each i. Given $\beta_2^{Acc}(1) = 1/2$ and $c < 1/2$, we have $\gamma_2(0,1) = 1$. For $\Gamma_2 < 1$, it must then be that $\gamma_2(1,1) < 1$ which, given $\beta_2^{Acc}(1) = 1/2$, requires $\beta_1^{Acc}(1) \leq 1 - \frac{1}{2\alpha}$ (i.e., the PM weakly prefers granting access to IG_1 when both IGs lobby). Together $\beta_1^{Acc}(1) \leq 1 - \frac{1}{2\alpha}$ and $c < 1/2$ imply $\gamma_1(1,0) = 1$. For $\Gamma_1 < 1$, it must then be that $\gamma_1(1,1) < 1$, which requires $\beta_1^{Acc}(1) \geq 1 - \frac{1}{2\alpha}$. Hence $\beta_1^{Acc}(1) = 1 - \frac{1}{2\alpha}$. ■

Claim 13 *In equilibrium,* $\gamma_2(1,1) = 1 - \gamma_1(1,1) = \frac{f}{2\pi}$ *and* $\rho_2(1,0) = \frac{(2\alpha-1)\cdot f}{\alpha\cdot(2\pi-f)}$.

Proof of Claim 3. We know from the previous claim that $\beta_i^{Acc}(1) = 1 - \frac{1}{2\alpha_i}$ for each i. Given $c < 1/2$, we then get

$$\begin{cases} \gamma_1(1,0) = \gamma_2(0,1) = 1 \\ \gamma_1(1,1) + \gamma_2(1,1) = 1. \end{cases}$$

It follows from condition (I) that $\gamma_2(1,1) = \frac{f}{2\pi} \in (0,1)$. It follows from condition (II) that $\rho_2(1,0) = \frac{(2\alpha-1)\cdot f}{\alpha\cdot(2\pi-f)} \in (0,1)$.

$N = 1$**-game** Lemma 2.2 in the paper establishes that in the absence of an access cost (i.e., $c = 0$), an equilibrium of the $N = 1$-game exists in which IGs lobby truthfully. IGs lobbying truthfully can no longer be part of an equilibrium when there is an exogenous access cost (i.e., $c > 0$). This is because IG_1 would then want to deviate to lobbying in state $\theta_1 = 0$ since the PM would reform its issue without granting it access and verifying its evidence. It can easily be shown (a proof is available from the authors) that any equilibrium with lobbying IGs involves IG_1 overlobbying.

Lemma 14 *Consider the* $N = 1$*-game with access cost* $c \in (0, 1/2)$ *and lobbying cost* $f < \frac{\pi}{2}$*. If* $c \leq \min\left\{1 - \frac{\pi}{1-f}, \frac{f\alpha}{f+\pi}\right\}$*, an equilibrium exists in which*

$$\begin{cases} \lambda_i(1) = 1 \text{ \& } \lambda_i(0) = \frac{\pi}{1-\pi}\frac{c}{\alpha_i - c} \text{ for } i = 1, 2 \\ \gamma_1(1,1) = 1,\ \gamma_1(1,0) = 1 - \frac{f\cdot(1-c)}{1-c-\pi} \text{ \& } \gamma_2(0,1) = \frac{(\alpha-c)(1-\pi-f)}{(1-\pi)\cdot\alpha - c} \\ \beta_i^{Acc}(1) = 1 - \frac{c}{\alpha_i} \text{ \& } \beta_i^{Acc}(0) = 0 \text{ for } i = 1, 2. \end{cases}$$

Observe that as c tends to zero, equilibrium lobbying strategies and access beliefs converge to the ones stated in Lemma 2.2 in the paper. Observe furthermore that the interval of values of the access cost that satisfy the condition in the statement can be quite large. For instance, taking the same parameters values as in our illustrative example above–$\alpha = 2$, $\pi = 2/5$ and $f = 1/20$–we get $c \leq 2/9$.

Proof. Let $\lambda_i(1) = 1$ & $\lambda_i(0) = \frac{\pi}{1-\pi}\frac{c}{\alpha_i - c}$ for each i. Using Bayes' rule, we get $\beta_i^{Acc}(1) = 1 - \frac{c}{\alpha_i}$ and $\beta_i^{Acc}(0) = 0$ for each i.

We now characterize the equilibrium policy strategy. Observe that $\alpha > 1$ and $c < 1/2$ imply $\beta_i^{Acc}(1) > 1/2$ for each i. This, together with $\beta_i^{Acc}(0) = 0$ for each i, implies

$$\begin{cases} \rho_1(1,1;\emptyset,0) = \rho_2(1,1;0,\emptyset) = 1 \\ \rho_1(1,0;\emptyset,\emptyset) = \rho_2(0,1;\emptyset,\emptyset) = 1. \end{cases}$$

Moreover, $\beta_i^{Acc}(0) = 0$ for each i implies

$$\begin{cases} \rho_1(0,\cdot;\emptyset,\cdot) = \rho_2(\cdot,0;\cdot,\emptyset) = 0 \\ \rho_1(1,0;1,\emptyset) = \rho_2(0,1;\emptyset,1) = 1. \end{cases}$$

Furthermore, it is straightforward to show that

$$\begin{cases} \rho_1(1,1;1,\emptyset) = \rho_1(1,1;\emptyset,\emptyset) = 1 \\ \rho_1(1,0;0,\emptyset) = \rho_2(0,1;\emptyset,0) = 0. \end{cases}$$

Finally, let $\rho_1(1,1;\emptyset,1) = 1$ if $\alpha \geq 1 + 2c$, and $\rho_2(1,1;\emptyset,1) = 1$ if $\alpha < 1 + 2c$.

It remains to characterize the equilibrium access strategy. Given $\beta_i^{Acc}(1) = 1 - \frac{c}{\alpha_i}$ for each i, we get $\gamma_1(1,1) = 1$, i.e., when both IGs lobby, the PM strictly prefers to grant IG_1 access than to grant IG_2 access or to grant no access.

IG_1's expected utility in state $\theta_1 = 0$ is given by

$$Ev_1(\lambda_1(0)) = \lambda_1(0)\cdot[(1-\delta_2)(1-\gamma_1(1,0)) - f].$$

Given $\delta_2 = \frac{\pi}{1-c}$, $\lambda_1(0) \in (0,1)$ thus requires

$$\gamma_1(1,0) = 1 - \frac{f\cdot(1-c)}{1-c-\pi}.$$

Observe that $\gamma_1(1,0) \in [0,1)$ if $c \leq 1 - \frac{\pi}{1-f}$.

IG$_2$'s expected utility in state $\theta_2 = 0$ is given by

$$Ev_2(\lambda_2(0)) = \lambda_2(0) \cdot \{1 - [\pi + (1-\delta_1) \cdot \gamma_2(0,1)] - f\}.$$

Given $\delta_1 = \frac{\pi\alpha}{\alpha - c}$, $\lambda_2(0) \in (0,1)$ thus requires

$$\gamma_2(0,1) = \frac{(\alpha - c) \cdot (1 - \pi - f)}{(1-\pi) \cdot \alpha - c}.$$

Observe that $\gamma_2(0,1) \in (0,1]$ if $c \leq \frac{f\alpha}{f+\pi}$.

It is easy to check that $\frac{dEv_i}{d\lambda_i(1)} > 0 = \frac{dEv_i}{d\lambda_i(0)}$ for each i, which satisfies $\lambda_i(1) = 1$ and $\lambda_i(0) \in (0,1)$. ■

Pareto-improving agenda constraint The following proposition parallels proposition 2 in the paper.

Proposition 15 *Consider the game with access cost* $c \leq \min\left\{1 - \frac{\pi}{1-f}, \frac{f\alpha}{f+\pi}\right\}$. *Let* EU_k^N *denote the equilibrium ex ante expected payoff of player* $k \in \{1, 2, PM\}$ *in the* N*-game. We have* $EU_k^{N=1} \geq EU_k^{N=2}$ *for each player* $k \in \{1, 2, PM\}$, *with at least one strict inequality, if*

$$\frac{(3\alpha - 1) \cdot f}{\pi} \leq 1.$$

Proof. We start by computing players' equilibrium ex ante expected payoffs in the $N = 2$-game. Given the strategies and beliefs described in lemma 6, we get (after simple, but tedious, algebra)

- For IG$_1$,
$$EU_1^{N=2} = \pi \cdot (1 - f).$$
- For IG$_2$,
$$EU_2^{N=2} = \pi \cdot \left[1 - \frac{(2\pi - f) \cdot \alpha}{2\alpha - 1}\right].$$
- For the PM,
$$EU_{PM}^{N=2} = \left(1 - \frac{\pi f}{2\alpha - 1}\right) \cdot \alpha + 1 - \pi \cdot \left(1 - \frac{f}{2\pi}\right) - (Ec)^{N=2},$$
where $(Ec)^{N=2} = \left[1 - (1 - 2\pi)\left(1 - \pi - \frac{\pi}{2\alpha - 1}\right)\right] \cdot c$ is the expected access cost.

We continue by computing players' equilibrium ex ante expected payoffs in the $N = 1$-game. Given the strategies and beliefs described in lemma 7, we get (after tedious algebra)

- For IG$_1$,
$$EU_1^{N=1} = \pi \cdot (1 - f) .$$
- For IG$_2$,
$$EU_2^{N=1} = \pi \cdot (1 - \pi - f) .$$
- For the PM,
$$EU_{PM}^{N=1} = \left[1 - \frac{\pi f c}{\alpha - c}\right] \cdot \alpha + 1 - \pi \cdot \left(\pi + \frac{fc}{1-c}\right) - (Ec)^{N=1} ,$$
where $(Ec)^{N=1}$ is the expected access cost.

We are now ready to compare equilibrium ex ante expected payoffs in the two games. Observe that $(Ec)^{N=1} < (Ec)^{N=2}$ (computations are tedious and are therefore omitted here); this is because $\lambda_i (0)^{N=1} < \lambda_i (0)^{N=2}$ for each i (i.e., IGs 'overlobby less' in the $N = 1$-game than in the $N = 2$-game) together with $\gamma_1 (1,0)^{N=1} < \gamma_1 (1,0)^{N=2}$ and $\gamma_2 (0,1)^{N=1} \leq \gamma_2 (0,1)^{N=2}$ (i.e., conditional on lobbying, IGs are granted access with lower probability in the $N = 1$-game than in the $N = 2$-game).

We have $EU_{PM}^{N=1} > EU_{PM}^{N=2}$ and $EU_1^{N=1} = EU_1^{N=2}$. Moreover, the condition in the statement implies $EU_2^{N=1} \geq EU_2^{N=2}$, with a strict equality whenever the condition in the statement holds with a strict equality. ■

Favorable prior beliefs

In this extension to our baseline model, we investigate the case where the priors on one or both issues are favorable, i.e., $\pi_i > 1/2$ for at least one i. To focus on priors and keep our analysis as simple as possible, we consider the case where only priors can be different across issues, i.e., we let $\alpha = 1$ and $f_1 = f_2 \equiv f$.

The following proposition establishes that when $\pi_i > 1/2$ for at least one i, a constraint on the agenda cannot be Pareto-improving. This happens because we now have in the $N = 2$-game that $\beta_i^{Acc} (1) > 1/2$ in any equilibrium where IG$_i$ lobbies with positive probability, meaning there is no longer a negative externality from overlobbying. As a result, an agenda constraint imposes costs (due to the restriction of the choice set of the PM) without bringing any benefit (related to the elimination of the negative externality that an IG$_i$ lobbying in state $\theta_i = 0$ creates for its $\theta_i = 1$-self).

Proposition 16 *Let $\alpha = 1$ and $f_1 = f_2 \equiv f$. We denote by EU_k^N player k's ex ante expected equilibrium payoff in the N-game, where $k \in \{1, 2, PM\}$. If $\pi_i > 1/2$ for some issue i, then*
$$EU_k^{N=2} > EU_k^{N=1}$$
for at least one player k.

PROOF. We proceed via a sequence of claims.

Our first claim identifies the region of the parameters space in which an equilibrium with truthful lobbying exists in the $N = 2$-game.

CLAIM 1. *Consider the* $N = 2$*-game where* $\alpha = 1$ *and* $f_1 = f_2 \equiv f$*. An equilibrium exists in which* $\lambda_i(\theta_i) = \theta_i$ *for each* θ_i *and each* i *if and only if* $f \geq \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$.

PROOF OF CLAIM 1. We start by establishing the necessity. Let $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. Using Bayes' rule, we get $\beta_i^{Acc}(\ell_i) = \ell_i$ and $\rho_i(\ell_i, 0) = \ell_i$ for each ℓ_i and each i.

IG$_i$'s expected payoff in state $\theta_i = 0$ is given by

$$Ev_i(0) = \lambda_i(0) \cdot (1 - \Gamma_i - f),$$

where $\Gamma_i = 1 - \pi_{-i} \cdot \gamma_{-i}(1,1)$ is the probability IG$_i$ is granted access when lobbying. For $\lambda_i(0) = 0$, it must be that

$$\begin{aligned} \tfrac{dEv_i(0)}{d\lambda_i(0)} \leq 0 \quad &\Leftrightarrow \Gamma_i \geq 1 - f \\ &\Leftrightarrow f \geq \pi_{-i} \cdot \gamma_{-i}(1,1). \end{aligned}$$

The latter inequality holds for both issues when

$$\gamma_1(1,1) \in \left[1 - \frac{f}{\pi_2}, \frac{f}{\pi_1}\right].$$

This interval is non-empty only if $f \geq \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$. Hence the necessity.

The sufficiency is easily obtained by constructing an equilibrium with truthful lobbying. ■

It follows from claim 1 that $EU_{PM}^{N=2} > EU_{PM}^{N=1}$ when $f \geq \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$. From now on, we shall therefore restrict attention to the region of the parameters space where $f < \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$.

Our next claim establishes that in this region of the parameters space, an equilibrium with truthful lobbying exists in the $N = 1$-game.

CLAIM 2. *Consider the* $N = 1$*-game where* $\alpha = 1$ *and* $f_1 = f_2 \equiv f$*. If* $f < \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$*, then an equilibrium exists in which* $\lambda_i(\theta_i) = \theta_i$ *for each* θ_i *and each* i*.*

PROOF OF CLAIM 2. We proceed by construction. Let $\lambda_i(\theta_i) = \theta_i$ for each θ_i and each i. Using Bayes' rule, we get $\beta_i^{Acc}(\ell_i) = \ell_i$ for each ℓ_i and each i, and therefore $\rho_i(0, \ell_{-i}; 0, a_{-i}) = 0$.

Let $\gamma_i(1,1) = \frac{\pi_{-i}}{\pi_1 + \pi_2}$ for each i, together with

$$\begin{cases} \rho_1(1,1;1,0) = \theta_1 \text{ and } \rho_2(1,1;1,0) = 1 - \theta_1 \\ \rho_1(1,1;0,1) = 1 - \theta_2 \text{ and } \rho_2(1,1;0,1) = \theta_2. \end{cases}$$

Furthermore, let $\gamma_1(1,0) = \gamma_2(0,1) = 1$ and $\gamma_i(0,0) = 0$ for each i. It is easy to check that these strategies, γ and ρ, are optimal given the beliefs.

IG$_i$'s expected payoff in state $\theta_i = 0$ is given by

$$Ev_i(0) = \lambda_i(0) \cdot (-f),$$

meaning $\lambda_i(0) = 0$ is indeed optimal.

IG$_i$'s expected payoff in state $\theta_i = 1$ is given by

$$Ev_i(1) = \lambda_i(1) \cdot (\Gamma_i - f),$$

where $\Gamma_i = \pi_{-i} \cdot \gamma_i(1,1) + (1 - \pi_{-i})$. For $\lambda_i(1) = 1$, it must be that

$$\begin{aligned} \tfrac{dEv_i(1)}{d\lambda_i(1)} \geq 0 \quad &\Leftrightarrow f \leq \Gamma_i \\ &\Leftrightarrow f \leq 1 - \tfrac{\pi_1 \pi_2}{\pi_1 + \pi_2}. \end{aligned} \tag{*}$$

Simple algebra establishes that $\frac{\pi_1 \pi_2}{\pi_1 + \pi_2} < 1 - \frac{\pi_1 \pi_2}{\pi_1 + \pi_2}$, meaning that $(*)$ holds with a strict inequality.

Hence, we have constructed an equilibrium with truthful lobbying. ■

From claim 2 and the fact that $p \neq (1,1)$ in the $N = 1$-game, we get that for at least one IG, its ex ante expected equilibrium payoff is such that $EU_i^{N=1} < \pi_i \cdot (1 - f)$.

Our next claim establishes that in the $N = 2$-game, $\pi_i > 1/2$ implies that IG$_i$'s expected equilibrium payoff in state $\theta_i = 1$ is such that $Ev_i(1) \geq 1 - f$.

Claim 3. *Consider the $N = 2$-game where $\alpha = 1$ and $f_1 = f_2 \equiv f$. If $\pi_i > 1/2$, then IG$_i$'s expected equilibrium payoff in state $\theta_i = 1$ is $Ev_i(1) \geq 1 - f$.*

Proof of Claim 3. If $\lambda_i(\theta_i) = 0$ for each θ_i (i.e., IG$_i$ abstains from lobbying), then we get from Bayes' rule that $\beta_i^{Acc}(0) = \pi_i > 1/2$, implying $\rho_i(0,0) = 1$ and $Ev_i(1) = 1$.

If $\lambda_i(\theta_i) > 0$ for some θ_i (i.e., IG$_i$ lobbies with positive probability), then we get from Bayes' rule that

$$\beta_i^{Acc}(1) = \frac{\pi_i \lambda_i(1)}{\pi_i \lambda_i(1) + (1 - \pi_i)\lambda_i(0)}.$$

First, we establish that $\beta_i^{Acc}(1) > 1/2$. Assume the contrary. Given $\pi_i > 1/2$, it must then be that $\lambda_i(0) > \lambda_i(1)$ (and, therefore, $\lambda_i(0) > 0$). The latter implies

$$\beta_i^{Acc}(0) = \frac{\pi_i \cdot (1 - \lambda_i(1))}{1 - [\pi_i \lambda_i(1) + (1 - \pi_i)\lambda_i(0)]} > 1/2$$

and, therefore, $\rho_i(0,0) = 1$. IG$_i$'s expected payoff in state $\theta_i = 0$ is then given by

$$Ev_i(0) = \lambda_i(0) \cdot [(1 - \Gamma_i) \cdot \rho_i(1,0) - f] + (1 - \lambda_i(0)).$$

Given $\lambda_i(0) > 0$, we must have

$$\frac{dEv_i(0)}{d\lambda_i(0)} \geq 0 \Leftrightarrow (1 - \Gamma_i) \cdot \rho_i(1,0) - f - 1 \geq 0,$$

a contradiction since $(1-\Gamma_i)\cdot\rho_i(1,0)\leq 1$ and $f>0$. Hence we have $\beta_i^{Acc}(1)>1/2$.

Second, we establish that $Ev_i(1)=1-f$. Given $\beta_i^{Acc}(1)>1/2$, we must have $\lambda_i(1)>0$ (otherwise we would have $\lambda_i(0)>0=\lambda_i(1)$ and, therefore, $\beta_i^{Acc}(1)=0$) and $\rho_i(1,0)=1$. Hence, in state $\theta_i=1$, $\ell_i=1$ implies $p_i=1$ with probability one, implying that whether $\lambda_i(1)=1$ or $\lambda_i(1)\in(0,1)$, IG$_i$'s expected equilibrium payoff in state $\theta_i=1$ is given by $Ev_i(1)=1-f$. ■

It follows from claim 3 that if $\pi_i>1/2$ for each i, then $EU_i^{N=2}\geq\pi_i\cdot(1-f)$ for each i and, therefore, that $EU_i^{N=2}>EU_i^{N=1}$ for at least one IG.

It remains to consider the case where $\pi_i>1/2>\pi_{-i}$. W.l.o.g. suppose $\pi_1>1/2>\pi_2$. Consider the $N=2$-game. We start by observing that an equilibrium in which $\lambda_2(\theta_2)=0$ for each θ_2 is not the most-informative equilibrium (in the sense that another equilibrium exists in which $\sum_i prob(p_i=\theta_i)$ is strictly higher).[28] In consequence, we restrict attention to equilibria in which $\lambda_2(\theta_2)>0$ for some θ_2.

We continue by establishing that $\beta_2^{Acc}(1)>1/2$ and, therefore, $\rho_2(1,0)=1$. There are two cases to consider:

- Either $\lambda_1(\theta_1)=0$ for each θ_1, in which case $\Gamma_2=1$ and $\pi_2<1/2$ imply $\lambda_2(\theta_2)=\theta_2$ for each θ_2. Hence $\beta_2^{Acc}(1)=1$.

- Or $\lambda_1(\theta_1)>0$ for some θ_1. Assume by way of contradiction that $\beta_2^{Acc}(1)\leq 1/2$. If $\beta_2^{Acc}(1)<1/2$, then $\rho_2(1,0)=0$. If $\beta_2^{Acc}(1)=1/2$, then $\beta_1^{Acc}(1)>1/2$ implies $\Gamma_2=1$. In both cases, IG$_2$'s expected payoff in state $\theta_2=0$ is given by $Ev_2(0)=\lambda_2(0)\cdot(-f)+(1-\lambda_2(0))\cdot\rho_2(0,0)$, implying $\lambda_2(0)=0$. Hence $\lambda_2(1)>0$ (since $\lambda_2(0)=0$ and $\lambda_2(\theta_2)>0$ for some θ_2) and, therefore, $\beta_2^{Acc}(1)=1$, a contradiction.

To sum up, we have $\beta_2^{Acc}(1)>1/2$ and, therefore, $\rho_2(1,0)=1$. Given $\lambda_2(\theta_2)>0$ for some θ_2 and $\pi_2<1/2$, $\beta_2^{Acc}(1)>1/2$ requires $\lambda_2(1)>\lambda_2(0)$, meaning $\lambda_2(1)>0$. Hence, IG$_2$'s ex ante expected equilibrium payoff is such that $EU_2^{N=2}\geq\pi_2\cdot(1-f)$.

Thus, we have $EU_i^{N=2}\geq\pi_i\cdot(1-f)$ for both IGs. Since we know from claim 2 that $EU_i^{N=1}<\pi_i\cdot(1-f)$ for at least one IG, we have $EU_i^{N=2}>EU_i^{N=1}$ for at least one IG. ■

[28] An example of such an equilibrium is one in which $\lambda_1(\theta_1)=1$ for each θ_1 and $\lambda_2(1)=1>\lambda_2(0)>0$.