



Delay as Agenda Setting

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Delay as Agenda Setting*

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Abstract

We examine a dynamic decision-making process involving unrelated issues in which a decision may be endogenously delayed by the allocation of influence resources. Delay is strategically interesting when decision makers with asymmetric preferences face multiple issues and have limited resources to influence outcomes. A delayed decision becomes part of the subsequent agenda, thereby altering resource allocation. The opportunity to delay decisions leads the players to act against their short-run interests by changing the expected decision delay. We characterize delay equilibria and explore how delay affects agenda preferences and, when possible, bargaining.

1 Introduction

Delay of decisions is ubiquitous. As a justification for more informed decision making, delay would be important, yet unremarkable. But the prospect of decision delay in a dynamic, multi-decision setting, by changing the decision agenda for a subsequent period, also has strategic implications for the equilibrium allocation of resources applied to influence decisions and, hence, decision outcomes. In short, through delay a player may gain advantage by changing the incentives under which other parties to the decisions allocate their influence resources.

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Consider the promotion decisions of committees in organizations such professional partnerships, academic institutions, and firms. Even apparently independent promotion decisions are linked through resource constraints (e.g., attention) that limit the amount of influence interested parties exert for or against multiple candidates. For example, in an academic promotion setting, suppose a candidate in Field 1 and a candidate in Field 2 are scheduled for a promotion decision in this year and next year, respectively, and each is supported strongly by their own field faculty (e.g., labor and econometrics or marketing and finance). This timing would result in a particular allocation of effort regarding the respective candidates. But if the decisions were to occur in the same year, the allocation could be quite different as both departments would split their effort between the two candidates, presumably expending much more effort on their own candidate. Hence, if the Field 2 faculty believes that under the current staggered timing the Field 1 faculty would exert effort to oppose the Field 2 candidate, that faculty has an incentive to push for a delay of the Field 1 candidate’s decision. Delay could save a promotion.

Delay can result from a variety of factors. Familiar examples include a purposeful choice to postpone a decision, absence of a follow-through needed to implement a decision,¹ or because resolution of a decision requires action by an outside player (e.g., a decision to make a bid for an acquisition is resolved if the bid is accepted, but may not be if rejected). The possibility of delay raises the prospect that it can be strategically exploited. In the multiple decision context which this paper addresses, the allocation of attention or influence resources across those decisions constitutes a core factor influencing outcomes. To be sure, another key factor frequently involves information asymmetries regarding, for example, player preferences or capabilities which, in turn, raises issues of disclosure and signaling. Our model abstracts away from informational concerns and focuses on the importance of delay for resource

¹In corporate settings, a failed proposal that can be reintroduced is an example of a decision that lacks commitment. For example, rejected proposals of subordinates are sometimes quietly maintained in hope that changed circumstances will allow the proposal to be revisited. Burgelman (1991) [7], for example, argues that the RISC processor project at Intel was kept alive despite the company’s explicit strategy of not pursuing such a processor. Our model can also be used to explore the dynamics of whether a proposal is placed on the agenda in the first place. Proposals that do not make it on the agenda have not been officially killed and can therefore be interpreted as “delayed.” In the political system, rejection of legislation may be viewed as a decision that lacks commitment as such bills are frequently reintroduced in subsequent legislative sessions. Similarly, passed bills are also open to reshaping or even repeal (“Nothing ever gets settled in this town” George Shultz, former U.S. Secretary of State, quoted in R. W. Apple, “A Lesson from Shultz,” *NY Times*, December 9, 1986).

allocation under complete information. Why is delay strategically valuable and who will initiate it? Does conflict lead to more delay and how does the order of issues considered affect delay, efficiency and outcomes?

Our model's structure isolates the effect of delay while allowing for endogenous interaction. We abstract from the specifics of various decision structures and build a spartan strategic ark involving two players, two decisions, and two periods. Each player allocates a stock of non-storable influence resources (e.g., attention) over the available decisions and seeks to maximize their two-period payoff. In the first period, resource allocations affect the likelihood that a proposal is adopted. Opposing (reinforcing) use of resources increase (decrease) the probability of delay. Absent adoption, the proposal is deferred to the second period when it is considered with an unrelated proposal. In the second period, players allocate resources and all proposals on the table are resolved permanently.

Actions that alter the agenda through delay are strategically valuable because they shape the actions of the other decision makers. The endogenous possibility of delay leads the agents to allocate their resources differently than they would in a single-period setting. Two main tactics emerge: *pinning* and *focusing*.

In equilibria characterized by pinning, one player expends first-period resources against static self-interest to decrease the probability that the first-period decision is resolved (and hence decrease the probability that the decision will leave the agenda). The pinning player pursues this strategy when the second-period issue involves conflict and the first-period issue as compared to the second-period issue is relatively less important to the pinning player. Pinning increases the probability that the rival's resources will continue to be allocated to the first issue, leaving less resources for the rival to contest the pinning player on the second issue.

If delaying on the first issue is sometimes valuable, then resolving that issue should be valuable in other circumstances. Suppose, for example, the players' interests align on the second issue. Then it may be optimal for a player to decrease the likelihood of delay to free the other player's resources for (supportive) use on the second issue. We refer to this dual of pinning as *focusing*. The focusing incentive can be sufficiently strong that a player will support the other player's efforts to secure the initial proposal's acceptance, even though that player prefers the proposal's rejection. In effect, the focusing player sacrifices one decision outcome to focus the other player's attention and resources on the other decision. Focusing has the desirable feature of avoiding waste associated with the offsetting use of resources and provides a time-consistent explanation for logrolling which does not rely

on reputations or other considerations beyond the immediate interaction. A necessary condition for focusing is that preferences directionally align on the second-period issue, while a necessary condition for pinning requires conflict on the second-period issue. When these necessary conditions are met, we show that focusing and pinning occur when the players differ significantly regarding which issue is relatively more important. Furthermore, pinning and focusing also emerge in a model in which both issues are considered in the first period but can be delayed to the second period. With the pinning and focusing mechanisms and equilibria in hand, the paper then explores the implications of pinning and focusing for issue content, issue order, and then bargaining.

An intriguing property of focusing and pinning equilibria is that an ostensibly more attractive proposal may be strategically disadvantageous. Given the choice between two versions of a second-period issue proposal, the version that provides both players a weakly higher utility payoff if it is adopted may encounter a significantly lower chance of adoption due to the players' endogenous actions. For example, a focusing outcome will prevail with the lower-utility proposal while the higher-utility proposal leaves agents following static self-interest. Since focusing increases the chances of adoption, the equilibrium payoff is higher with the lower-utility proposal. This outcome reflects the implicit 'threat' regarding future action that the higher-utility proposal embodies, namely, that an agent will devote more effort to supporting that proposal. When this is a proposal on which both players interests directionally align, the other agent loses the incentive to focus since strong support on the alignment issue will be forthcoming anyway should delay occur. In contrast, the lower-utility proposal implies weaker support on the alignment issue and the other agent has an incentive to focus and remove the competing proposal from the future period.

The paper also examines the value to an agenda setter of reordering the sequence in which two decisions are considered across periods. The order question is most interesting when the players have partially conflicting and strong relative preferences so that one order would lead to focusing while the other would lead to pinning. Because focusing operates through the focusing player exerting all of her first period resources against static self interest to support an issue that the focused player likes, the focused player always prefers the focusing agenda.

When bargaining is feasible, our non-cooperative equilibrium results provide a foundation for understanding the threat points for bargaining. Decision outcomes based on static rather than dynamic self-interest do not provide appropriate threat points when there are strong relative preferences and some underlying conflict. For example, under Nash bargaining we show that pinning and focusing

threats lead the players to experience discontinuous shifts in their shares of a smoothly changing overall surplus when the equilibrium changes from one in which pursuit of static self-interest is optimal to either a focusing or pinning regime.

In addition to the particular implications of focusing and pinning for issue content, issue order, and bargaining, a general point of the analysis is that there is frequently strategic value to resolution in a world with possible delay and multiple decisions. Even if a current issue is of limited concern to one player, delaying that issue's resolution creates a claim on future resources for the other player. Therefore, a player may be quite willing to expend significant resources to secure resolution of an issue of no direct importance. The mere fact of resolving an issue may carry more significance than the specific manner of the resolution.²

Pinning and focusing activities exist in a wide range of situations. Perhaps the most common setting involves committee decisions such as the promotion decisions discussed previously. A related application involves political dynamics. One intriguing example that can be interpreted through a pinning lens involves the events just after the Watergate scandal. In 1974, amid pressure from the Watergate scandal which would ultimately scuttle his presidency, an embattled Richard Nixon proposed a comprehensive national health insurance plan in his State of the Union address. President Nixon's support gave national health care insurance legislation, a traditionally Democratic issue, a real chance for passage, but Democratic support did not materialize and a plan was never passed. The timing of Administration's formal support coupled with the bill's substantive attractiveness to the Democrats have led some cynics to interpret Nixon's proposal as strategic.³ If the Democrats wanted genuine progress on such legislation, they needed to focus their attention on health care and they needed the support of the Republican administration. Had they pursued this course of action,

²Delay is representative of a class of decision problems involving endogenous commitment. Deferring a decision until the next decision point is equivalent to no commitment, while a decision, if irreversible, constitutes full commitment. In the former case, the delayed decision becomes part of the subsequent decision agenda and potentially changes each decision maker's allocation of influence activity.

³Light (1991; p. 256) [13] states, for example, that "struggling to distract a Democratic Congress from the Watergate crisis, Nixon offered national health insurance as a last-second bargain to save his Presidency." National health care insurance legislation was more attractive to the Democratic party than the Republican party, though Nixon had supported it as well. The leading Democrat advocating national health care insurance was Ted Kennedy who had run for President in 1972. The 1974 failure to pass a national health care insurance plan was reportedly Kennedy's "biggest regret." (Washington Post, August 28, 2009)

Congressional action on Watergate would likely have been delayed through the remaining two years of Nixon’s term and would certainly have been reduced in intensity.⁴

While delayed actions and deferred decisions rarely involve the toppling of a president, they are commonplace in business, politics, and even personal life. Elements of pinning, for example, also are found in litigation between horizontal competitors in which the first-period decision involves expenditures on litigation and the second-period decision involves subsequent expenditures relevant to the ongoing competition. Litigation expenditures influence the duration and outcome of the legal dispute. Resolution or non-resolution, in turn, affects the marginal value of investments in competition through, for example, the impact of uncertainty regarding the outcome of litigation on the players’ abilities to attract complementary investments from third parties.⁵ Similarly, firms that compete across multiple product or geographic markets frequently pin each other’s resources by opening second fronts in markets that are important to their rivals. Although, such market-based competition lacks the explicit timing of a final resolution point, one can interpret it as an attempt to delay a rival’s entry into a key market.⁶

Focusing, which requires an issue over which no conflict exists, is most applicable to settings involving some level of explicit or implicit cooperation, e.g., a business joint venture or a political coalition. Both types of organizations almost invariably navigate proposals over which there are areas of agree-

⁴In terms of our model, Nixon’s State of the Union address adds national health insurance (NHI) into the active legislative agenda alongside the possibility of Watergate impeachment hearings. Nixon’s gambit can be interpreted as an attempt to use influence resources to increase the probability that NHI would become sufficiently attractive as a legislative option that the Democrats would divert their influence resources towards NHI and away from Watergate hearings (i.e., pinning), with hopes that NHI would not be resolved by the end of his term. Ultimately, however, the fate of the Nixon NHI proposal was resolved early when Kennedy failed to support it, so the attempt to pin did not succeed.

⁵The protracted litigation between AMD and Intel regarding AMD’s access rights to Intel intellectual property as a former second source for the 286 microprocessor can be interpreted as Intel pinning AMD to more expensive R&D and customer development under conditions of uncertainty. This litigation finally settled after the access to the rights was no longer competitively significant.

⁶MacMillan, van Putten, and McGrath (2003) [14] call this class of tactics “feints” in which an attack in one market diverts resources from another market. They describe how Philip Morris attacked R.J. Reynold’s U.S. position in premium cigarettes and, thereby, diverted RJR’s resources away from important Eastern European markets. The authors also discuss a competitive interaction between Gillette and Bic in which Gillette, by withdrawing from the disposable lighter market, induced Bic to invest more in the disposable lighter market and to pull resources out of disposable razors.

ment and disagreement. By sequencing the consideration of the proposals to create incentives for one party to focus the other, both parties can more easily support each other's key proposals without the need for other enforcement mechanisms.⁷ Focusing also highlights when partnering firms sometimes help each other solve problems that are unrelated to the partnership itself. Finally, returning to the hypothetical promotion decision, suppose that instead of opposing the Field 2 candidate, the Field 1 department intrinsically favors that candidate's promotion. Then the Field 2 department has an incentive to focus the Field 1 department by assisting the Field 1 department to secure its candidate's promotion in the earlier period, thereby, freeing the Field 1 department's resources in the following year for possible use to support the Field 2 candidate.

Little, if any, research has used analytical models to explore the effects of limited attention and delay on organizational decision making. Our analysis connects research on influence activity to that of agenda setting. The influence activity models of Milgrom and Roberts (1988 [16], 1990 [17]) focus on the design of incentives for agents who, given the incentive structure, optimally split their time across current production and influence activities that impact all of the agents' payoffs. Our interest in strategic decision delay and their interest in organizational design lead to quite different models. We build a dynamic model to explore deferred decisions, but do not address various optimal organizational designs that structure the nature of the intra and inter-period decision-maker interactions.⁸

Agenda setting models in the economics and the formal political science literatures (see, e.g. Plott and Levine 1978 [20]) explore the effects of decision order. While we explore select consequences of the ordering of decisions, our primary focus is not with agenda design. Instead we focus on how an existing agenda is altered as the result of strategic choices. Agenda-setting models also typically focus on the influence of decision order when decision payoffs and outcomes are linked across decisions. By contrast, our focus on the impact of deferred commitments on the allocation of influence does not require any outcome or payoff link across decisions. Stated alternatively, we focus on across-meeting decisions whereas most of the agenda setting literature focuses on within-meeting decisions.

Some of the tensions between conflict and cooperation among decision making parties which we

⁷In presidential and parliamentary political systems with modest party discipline, influence activities involve keeping party members in line with party positions regarding the current legislative agenda. Where party discipline is very strong, keeping party members in line is easy and a key use of party leadership resources involves allocating leadership attention to issues that require negotiation prior to their introduction.

⁸See also, Dessein and Santos (2006 [9]), Gilligan and Krehbiel (1987 [11]), and Powell (2015 [21]).

address in this paper are explored in a number of articles. In the evolution of cooperation literature, for example, Skaperdes (1992) [23] examines how different levels of marginal productivity in the use of resources can lead to varying degrees of equilibrium cooperation in a two-player static model where each player divides its resources between joint production of a product and increasing the probability that it will “win” the value of that product. In the literature on moral hazard in teams, Bonatti and Hörner (2011) [2] build a dynamic model of moral hazard in which (possible) team production of a public good is delayed because the equilibrium time path of investment is slowed by free-riding incentives and pessimistic updating of the value of investment. Both of these papers focus on a single good and, therefore, cannot address the use of strategic delay to manipulate a rival’s use of resources across issues. In Bonatti and Rantakari (2015 [3]), the organization decides to adopt the first completed project or wait until the other project becomes available. The prospect of delay arises because one agent can postpone adoption of a competed project until their own project is ready. In this setting, delay influences both the type of project and the effort level chosen by an agent.

In the next two sections we develop and analyze our basic model. Section 4 discusses which combination of preferences leads to pinning and to focusing and then characterizes the conditions under which an order that induces pinning is preferred to an order that induces focusing. Section 5 examines some implications of the analysis for bargaining and Section 6 examines a symmetric model of decision making and establishes that strongly asymmetric and partially conflicting preferences necessarily result in an equilibrium with simultaneous pinning and focusing. In Section 7 we discuss the organizational context of our analysis as well as applications and limitations. Section 8 concludes.

2 Model

Our model consists of two players, A and B, who, over two periods, independently allocate their respective attention resources to influence the outcomes of two unrelated proposals, X and Y . Two players is usually considered the smallest number needed for decision conflict; two periods is the minimal time structure that can capture the effects of delay; while two decisions is the smallest number that forces an allocation of attention.

We begin with a sequential model in which one proposal is on the agenda in the first period while the other is added in the second period. The allocation choices in the first period result in the proposal being accepted or delayed to the second period, while in the second period the allocation

choices result in proposals being either accepted or rejected. We denote by $X \rightarrow Y$ and $Y \rightarrow X$ the sequential models in which proposals X and Y , respectively, are first on the agenda. These simple sequential models are sufficient for focusing and pinning to emerge in equilibrium and also allow us to examine the implications of such strategic actions for the preferred ordering of the proposals. When two issues are on the agenda, we have the additional complication that focusing and pinning may occur simultaneously with player A attempting to focus player B on one issue at the same time player B is attempting to pin the player A on the other issue. For this reason, we begin with sequential models where only one issue is on the agenda in period one. In Section 6 we examine a more general symmetric model in which both proposals are on the agenda in period one and each proposal may be accepted, rejected or delayed.

The advantages and disadvantages of delaying a decision depend on the nature of conflict between the two players. We focus on the strategically interesting case of *partial conflict* in which the players' preferences conflict on issue X , but align on issue Y . Within this general context, of course, substantial variation may exist regarding the relative intensities of conflict or alignment. We assume that player A has a utility $u_X < 0$ when proposal X is accepted and $u_Y > 0$ when proposal Y is accepted. Player B 's utilities upon acceptance are similarly represented by $v_X > 0$ and $v_Y > 0$.

Condition 1 $v_X > 0 > u_X$ (*Conflict on X*), $u_Y > 0$ and $v_Y > 0$ (*Alignment on Y*).

Utility for the rejection of a proposal is normalized to 0. Consequently, the acceptance utilities are more precisely viewed as the incremental utility or disutility of accepting versus rejecting the proposal. Additionally, we make three simplifying assumptions: no discounting occurs; the utility associated with each proposal is independent of the outcome of the other proposal; and the preferences of each player are known to the other player. Each player maximizes the two-period sum of expected utility.

In each period a player allocates resources (e.g., attention or effort) to influence the outcome of proposals on the agenda. We model each player as choosing probability influence increments.⁹ A player supports (opposes) a proposal when she chooses a positive (negative) probability increment. We assume that each player's allocations have a direct effect which is linear and additive and that

⁹This structure with probability increments and the assumed properties for the resource frontier can be derived as endogenous properties for an underlying model of effort choice in which additional effort yields a diminishing marginal effect on probability and the agent is equally effective at influencing adoption of one issue or the other.

influence is neither cumulative nor storable across periods. This simple structure has the advantage of isolating the across-period strategic effects since additivity eliminates strategic interaction in a static single-period setting. Thus, when proposal i is on the agenda and player A chooses a_i and B chooses b_i , proposal i is accepted with probability

$$p_i = z + a_i + b_i \tag{1}$$

where z is a shift parameter reflecting exogenous factors that affect the probability of acceptance.¹⁰ We differentiate first-period and second-period actions by using lower case and upper case proposal-identifying subscripts, respectively.

When the agenda only contains proposal i , A chooses a_i while B chooses b_i . When the agenda contains both proposals, player A chooses probability increments a_X and a_Y and B chooses b_X and b_Y . To reflect the assumption that total influence is constrained in a multi-issue setting, we assume that there is a probability influence frontier g .

Condition 2 *Influence choices for player A (similarly for B) satisfy $|a_Y| \leq g(|a_X|)$ for $a_X \in [-\bar{p}, \bar{p}]$, where the probability frontier g satisfies (i) g is decreasing and concave over the interval $[0, \bar{p}]$, with $g(0) = \bar{p}$ and $g(\bar{p}) = 0$, (ii) g is symmetric around the 45° line: $a_Y = g(a_X) \Leftrightarrow a_X = g(a_Y)$, and (iii) $g'(0) = 0$ and $g'(\bar{p}) = -\infty$.*

Under this resource constraint, the maximum probability influence on a single issue is equal to \bar{p} . The advantage of g 's concave frontier structure is that influence allocation choices in a multiple issue setting will be interior to the interval $(-\bar{p}, \bar{p})$. Symmetry of g with respect to the 45° line comparably situates each issue. In the first period, Condition 2 reduces to the requirement that influence choices on the single issue lie in $[-\bar{p}, \bar{p}]$.

Finally, we assume that uncertainty cannot be eliminated.

Condition 3 $2\bar{p} < z < 1 - 2\bar{p}$ (*feasible influence choices never lead to deterministic outcomes*).

Thus, for any choices a_i and b_i on proposal i , the probability p_i is always in $(0, 1)$. In the sequential agenda model, the first period has no reject possibility, so the probability of delaying proposal i is $1 - p_i$. In the second period, there is no delay state, so the probability of rejection is also $1 - p_i$.

¹⁰For example, in a hierarchical setting with two subordinates seeking to influence a superior, z would constitute the superior's initial bias regarding the decisions at issue.

2.1 The Static Equilibrium Benchmark

The optimal second-period actions provide building blocks for the dynamic analysis and a benchmark case in which strategic interaction is absent. These actions depend on whether delay occurred in the first period. We begin with the simplest case of no delay. If only the aligned issue Y remains in period 2 (i.e., given the $X \rightarrow Y$ agenda, X was accepted), then the players have directionally common interests as u_Y and v_Y are both positive. Clearly, each player will choose \bar{p} such that the likelihood of accepting Y is maximized. The resulting payoffs associated with Y are then $U_Y = u_Y(z + 2\bar{p})$ and $V_Y = v_Y(z + 2\bar{p})$. If, instead, only the conflict issue remains (i.e., Y was accepted under the $Y \rightarrow X$ agenda), then the players have opposing interests since $u_X < 0 < v_X$ and they will take offsetting actions ($a_X = -\bar{p}$, $b_X = \bar{p}$). This results in payoffs of $U_X = u_X z$ and $V_X = v_X z$.

Now consider the two-proposal case which arises whenever the first-period proposal has been delayed. We solve for a Nash equilibrium in which each player allocates their own probability influence across each of the two issues. Given a choice by player A , say a_X and a_Y , player B 's problem is to choose influence levels to $\max_{(b_X, b_Y)} v_X [z + a_X + b_X] + v_Y [z + a_Y + b_Y]$ over feasible influence levels relative to the probability frontier. Since player A 's actions only have an additive effect on this payoff, the optimal choice by player B is given by

$$-\frac{v_X}{v_Y} = g'(b_X^*) \quad (2)$$

on issue X and $b_Y^* = g(b_X^*)$ on issue Y . Player A faces a similar problem except that A will seek to oppose proposal X . Thus, $-a_X \in [0, \bar{p}]$ and the solution is

$$\frac{u_X}{u_Y} = g'(-a_X^*) \quad (3)$$

on issue X and $a_Y^* = g(-a_X^*)$ on issue Y . The magnitude of a choice depends only on the preference intensity, defined by $u \equiv \left| \frac{u_X}{u_Y} \right|$ and $v \equiv \left| \frac{v_X}{v_Y} \right|$. Optimal choices equalize the probability trade-off and utility trade-off between X and Y . As the preference intensity for X rises, an increase in u or v , the magnitude of the action on X rises, while that for Y falls. The sign of a choice always follows the sign of the utility effect.

These choices constitute the Nash equilibrium for the static game. It is precisely because the other player's action does not impact the marginal benefit of one's own action that the two players optimize independently of each other and there is no strategic interaction. Critically, however, each player's payoff does depend on the other player's actions. This is the channel for dynamic strategic

effects in our model: anticipating that another player will support or oppose an issue that remains unresolved, an incentive exists to take action today to influence the other player's future move. To analyze this channel, we need the payoff outcomes for the simple static Nash equilibrium and we define $U_{XY} = u_X(z + a_X^* + b_X^*) + u_Y(z + a_Y^* + b_Y^*)$ and $V_{XY} = v_X(z + a_X^* + b_X^*) + v_Y(z + a_Y^* + b_Y^*)$.

2.2 Dynamic Equilibrium Choice

The static equilibrium strategies described above are also the optimal second-period equilibrium strategies. We now turn to the first-period actions. Consider the $X \rightarrow Y$ sequence ($Y \rightarrow X$ is analogous). From our analysis of the static case, we have the continuation payoffs for the players across the two possible states according to whether proposal X was delayed to the second period. The probabilities of each state are given by: $\{Y\}$ with p_x and $\{X, Y\}$ with $(1 - p_x)$. The payoffs for the players at a candidate set of period 1 choices are then given by the sum of the expected period 1 and 2 payoffs:

$$U^a \equiv [u_X + U_Y](z + a_x + b_x) + U_{XY}(1 - (z + a_x + b_x)) \quad (4)$$

$$V^b \equiv [v_X + V_Y](z + a_x + b_x) + V_{XY}(1 - (z + a_x + b_x)) \quad (5)$$

The incentives for players A and B to allocate influence in period one are, respectively:

$$\frac{\partial U^a}{\partial a_x} = u_X + U_Y - U_{XY} \quad (6)$$

$$\frac{\partial V^b}{\partial b_x} = v_X + V_Y - V_{XY}. \quad (7)$$

We are now ready to examine equilibrium choices and strategic delay in period 1.

3 Player Preferences and Strategic Delay

We first analyze focusing in a $X \rightarrow Y$ agenda and then analyze pinning in a $Y \rightarrow X$ agenda.

3.1 Partial Conflict and Focusing ($X \rightarrow Y$ Agenda)

The first step is to determine the optimal second-period allocations of attention. This was done in the static benchmark analysis above. The next step is to analyze the optimal first-period allocations. The linear structure of influence implies that the objective functions for players A and B are maximized by allocating all influence to support issue X if and only if $u_X + U_Y - U_{XY} > 0$ and $v_X + V_Y - V_{XY} > 0$, respectively. See (6) and (7).

Lemma 1 *Under the $X \rightarrow Y$ agenda, player B 's optimal first-period allocation b_x is \bar{p} . (See Appendix for all proofs).*

Lemma 1 shows that B 's strategic and myopic interests coincide. If B were to use negative influence, she would increase the probability that issue X will be delayed in the first period, which is costly. The effect in the second period would also be negative because there would now be a higher probability that both X and Y are on the agenda in which case B will be opposed by A on issue X .

Player A has a direct incentive to oppose X in the first period. But if X is off the agenda in the second period, player B will allocate all of its attention to supporting issue Y which benefits A . This incentive to *focus* player B 's attention on issue Y becomes stronger as A 's relative intensity of preference is greater for issue Y than issue X .

Definition 1 (*Focusing*) *A player focuses his rival on proposal j when the player's first-period allocation on i is greater than his static optimal allocation. A player follows static self-interest when the player chooses a first-period allocation equal to his static optimal allocation.*

The incentives for focusing can be usefully characterized as a function of the ratios of the preference intensities for X to Y for each of the two players.

Proposition 1 *Under the $X \rightarrow Y$ agenda: (a) For any preference ratio v for player B , there exists a focusing cut-off preference ratio \bar{u}_F below which in equilibrium it is optimal for player A to focus B by selecting $a_x = \bar{p}$ and above which A follows static self-interest by selecting $a_x = -\bar{p}$; B always follows static self-interest by selecting $b_x = \bar{p}$; (b) The focusing cut-off for Player A , $\bar{u}_F(v)$, is increasing in v , satisfies $\bar{u}_F(0) = 0$ and $\bar{u}_F(v) < v$ for $v > 0$, and is bounded above by $2\bar{p}/(1-z)$; (c) Focusing only occurs when both players' preferences are aligned over the issue that is first introduced in the second period; (d) For $u < \bar{u}_F(v)$, the unique equilibrium involves A focusing B where we have $a_x = \bar{p}$ and $b_x = \bar{p}$; For $u > \bar{u}_F(v)$, the unique equilibrium has both players following static self-interest.*

Proposition 1 establishes that a region of preferences always exists for A and B in which A will uniquely focus B . Let \mathcal{E}_F denote this region, the set of (u, v) with $u \leq \bar{u}_F(v)$. Figure 1 depicts this region in preference-intensity space illustrating focusing and no focusing regions under an $X \rightarrow Y$ agenda. These regions are separated by the cutoff function $\bar{u}_F(v)$.

Player A 's incentive to focus B depends on both the intensity of preference A has for its key issue (Y) and the relative gain A gets from focusing—the difference in the payoff to the $\{Y\}$ state and the

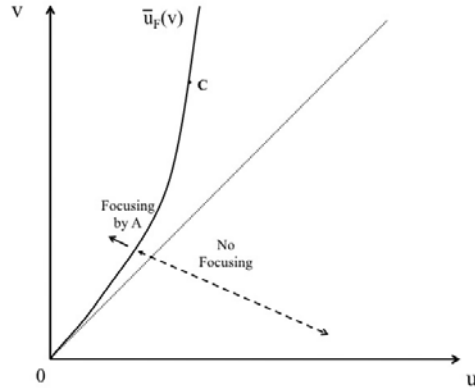


Figure 1: Equilibrium Taxonomy Under $X \rightarrow Y$ Agenda

$\{X, Y\}$ state. Because the $\{X, Y\}$ state payoff depends on B 's intensity of preference, as v increases B allocates less resources to issue Y in the $\{X, Y\}$ state and hence the benefits to A of focusing increase (part b). If, instead, B cared much more about issue Y than issue X , the gain to focusing B on issue Y would not be great, as B would have been relatively focused on Y regardless of any focusing efforts. Thus, as depicted in Figure 1, the focusing region grows with v . Part (c) establishes that preference alignment on issue Y is necessary for a focusing equilibrium.¹¹ Focusing increases the probability that the second-period agenda will consist solely of issue Y . Y alone is attractive under alignment since both players work together, whereas under conflict their efforts will offset.

Focusing is inherently cooperative, but the strategic outcome achieves neither social efficiency nor Pareto-optimality because there is always a positive probability that in the second period both issues will be on the agenda with the resulting wasteful offset of resources on the conflict issue X . Focusing is, however, an efficiency improvement over the static benchmark. Clearly, the focusing player is better off since focusing is an optimal strategy. The focused player benefits because of the increased probability that the focused player's favored issue is accepted in the first period. One interpretation of focusing is that it is endogenous incentive-compatible log-rolling. Focusing also facilitates an agenda design that can support stable coalitions.

¹¹It is not, however, necessary that a conflict exists regarding the first issue. This is because the benefit of focusing derives from taking issue X off the agenda and is greatest to a player when it has a preference intensity ratio strongly favoring Y while the other player does not.

When we move from a single issue to a multiple-issue first-period setting (Section 6), first-period choices interact strategically and this leads to a more subtle set of incentives than in our base model. The incentive for focusing remains, but it is less dramatic than that of our base structure in which optimal first-period choices are cornered.

We now develop a focusing example with a preference structure that we will also use to illustrate pinning and to discuss agenda preferences.

Example 1 (*X* → *Y* Agenda): Suppose that resources are traded off according to $g(a, \bar{p}) = \sqrt{\bar{p}^2 - a^2}$ with $\bar{p} = 0.1$, $z = 0.2$, and let the preferences be $u_X = -0.075$, $u_Y = 1$, $v_X = 1$, and $v_Y = 0.075$. Then the equilibrium allocations are

<i>Eq Alloc</i>	<i>1st period</i>	<i>2nd {Y}</i>	<i>2nd {XY}</i>
<i>Issue X</i>	$a_x = 0.1$	NA	$a_X = -.007$
	$b_x = 0.1$	NA	$b_X = 0.099$
<i>Issue Y</i>	NA	$a_Y = 0.1$	$a_Y = 0.099$
	NA	$b_Y = 0.1$	$b_Y = 0.007$

In this example both players have strong preferences regarding the outcome of one proposal but not the other, and the primary concern of one player is the secondary concern of the other. The intensity ratio v is large which means that, when faced with both proposals in the second period, B would allocate most of her resources to proposal X . Player A , therefore, receives an incremental benefit from focusing B on proposal Y . Of course, player A 's low intensity of preference regarding proposal X makes it less costly to support proposal X against his static interest. In the example, player A 's payoff is about five percent greater under focusing than under a myopic (suboptimal static self-interest) strategy. Focusing boosts player B 's payoff by about thirty percent.

3.2 Partial Conflict and Pinning (*Y* → *X* Agenda)

Now consider the $Y \rightarrow X$ agenda. The analysis is analogous to that for $X \rightarrow Y$, except that the issue order has been reversed. The conflict issue X is now the *second* issue and the alignment issue Y is the first issue. Note that by Proposition 1c focusing cannot occur with this configuration of preferences.

If player B followed her preferences, she would support issue Y in the first period. However, dynamic considerations will sometimes cause B to oppose Y in the first period to improve the strategic situation in the second period. Essentially, B works to keep issue Y on the agenda because if both

X and Y are on the agenda in period two, then A will allocate more influence to supporting Y and less influence to opposing B on issue X . B pins A to an issue that is important to A .

Definition 2 (*Pinning*) *A player pins her rival to proposal i when the player's first-period action is less than the player's static optimal action.*

Player B 's decision to resist her static preferences depends on the relative strengths of the incentive to accept issue Y and the dynamic benefits of pinning player A to issue Y by delaying it to the second period. B chooses b_y to maximize $(v_Y + V_X)(z + a_y + b_y) + V_{XY}(1 - (z + a_y + b_y))$ where $v_Y + V_X$ captures the value of accepting Y in the first period and V_{XY} the value of delaying Y to the second period. It is clear from the objective function that $V_{XY} > v_Y + V_X$ is a necessary and sufficient condition for $b_y = -\bar{p}$ (which goes against B 's preference).

Because there is conflict over X , $V_X = v_X z$. V_{XY} , of course, depends on the optimal static allocations (see (2) and (3)). Following a similar solution approach as above, we establish existence of a unique pinning equilibrium, a comparative static result, and a necessary condition for pinning.

Proposition 2 *Under the $Y \rightarrow X$ agenda: (a) For any preference ratio u for Player A , a pinning cut-off preference ratio $\bar{v}_P(u)$ exists above which in equilibrium it is optimal for B to pin A by selecting $b_y = -\bar{p}$ and below which B follows static self-interest $b_y = \bar{p}$; (b) The pinning cut-off for Player B , $\bar{v}_P(u)$, is increasing in u and satisfies $\bar{v}_P(u) > u$ for $u \geq 0$; (c) Pinning can only occur when both players' preferences conflict over an issue that is first introduced in the second period; (d) For $v > \bar{v}_P(u)$, the unique equilibrium involves B pinning A where we have $b_y = -\bar{p}$ and $a_y = \bar{p}$; For $\bar{v}_P(u) > v > u$, the unique equilibrium has both players following static self-interest.*

The key element here is the relative size of the preference intensities. Existence requires that v is large relative to u : we must have preference intensities in the set $\mathcal{E}_P \equiv \{(u, v) \mid v \geq \bar{v}_P(u)\}$. That is, compared to player A , player B has a stronger relative preference for X . In turn, this relative preference implies that in the static $\{XY\}$ game, the net impact of influence on issue X will be positive and $a_X^* + b_X^* > 0$ holds. In contrast, with X alone the player allocations cancel out each other. Thus, B pins A by going negative on Y in period 1, acting against (static) interest, to increase the likelihood that issue Y is alive for the second period. Figure 2 provides a graphical representation of the pinning regions in preference-intensity space. Even as $v \rightarrow \infty$, such that player B does not care at all about issue Y , B will still have an incentive to affect the outcome associated with Y because of that outcome's indirect resource implications for the outcome of issue X . Thus, one should not

be surprised to see a player exert influence activity on an issue of little relative importance to that player.

The gain to B from delaying issue Y depends on how A splits his resources in period 2 when both of X and Y are on the agenda. B 's gain is largest when $u = 0$ since A will then fully support Y and devote no resources to opposing X . As u rises, A shifts resources from supporting Y to opposing X and, consequently, the gain to B from pinning A will decline. This makes pinning unattractive for a wider range of B preferences and the cutoff, \bar{v}_P , must rise with u (part b). Finally, a preference conflict on the second issue is necessary for a pinning equilibrium (part c).¹²

Here, in contrast to the focusing equilibrium, there is no direct analog of Lemma 1 to guarantee that the other player will always act in accord with preference and support issue Y . Instead, it is easy to show that Players A and B are symmetric with respect to pinning incentives.¹³ Hence, there are two pinning regions in Figure 2. For any pair of u and v utility preference intensities, however, at most one of the players will have an incentive to pin since pinning requires that one intensity be sufficiently greater than the other. When the intensities are comparable in magnitude both players will follow static self-interest (part d).

A pinning strategy is inherently defensive. Therefore, given opposition on the alignment issue Y in the first period and wasteful offsetting use of resources regarding issue X in the second period, pinning equilibria are not socially efficient. Finally, pinning equilibria, unlike focusing equilibria, are not Pareto-improving versus static allocations. While the pinning player's expected utility is improved, the pinned player's expected utility declines.

The same preference structure and parameters in Example 1 can be used to illustrate pinning in the $Y \rightarrow X$ agenda. In this $Y \rightarrow X$ agenda example, player B has a weak relative preference for Y and, as such, will pin player A to proposal Y in the second period. The optimal first period allocation of player B is $b_y = -0.1$ which is the opposite of B 's static self-interest choice of 0.1. Player A 's

¹²Pinning can also occur in $Y \rightarrow X$ settings involving pure conflict. Suppose player B prefers to accept both issues whereas player A prefers to reject both issues. When, for example, B 's preference intensity ratio heavily favors issue X while player A 's intensity ratio heavily favors issue Y , then it is optimal for player B to delay issue Y . By so doing, B increases the probability that player A will be pinned to issue Y .

¹³We employ notation that identifies which player is pinning, but there is a common cut-off function, $\bar{u}_P(w) = \bar{v}_P(w)$, for any utility intensity $w \geq 0$. In part (d) of Proposition 2 we need only interchange u and v to identify when A pins B .

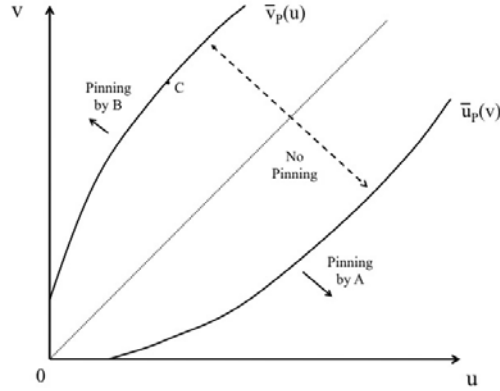


Figure 2: Equilibrium Taxonomy Under $Y \rightarrow X$ Agenda

first-period allocation of $a_y = 0.1$ is consistent with A 's static self-interest.¹⁴

3.3 Preferences and Issue Pair Content

One key feature of focusing and pinning equilibria was that they were more and less efficient, respectively, compared to a static self-interest benchmark. These results suggest that issue pairs that are nearly equivalent in terms of both players' preference intensities may differ substantially in terms of expected payoffs. Consequently, there may be a strong incentive for a player to get even a small change in issue pair content, when possible. The most interesting candidates for such a change would be issue pairs that result in preference intensity combinations which fall just inside or just outside of the focusing and pinning regions.

In this subsection we first explore the relative attractiveness of two issue pairings for which the associated preference intensities locate the first pair *at* the focusing boundaries and the second pair *just outside* of the focusing region. We make direct comparisons between the expected payoffs associated with the two issue pairs, thereby avoiding modeling the process by which a player could obtain a revision of an issue pair. But the analysis does provide a sense of the incentives for a player to obtain a minor revision to an original issue pair. Accordingly, we make comparisons between issue pairs in which the more desirable issue pair merely involves one player with a lower utility on Y , the alignment

¹⁴The second-period $\{XY\}$ allocations are $a_X = -0.007$, $a_Y = 0.099$, $b_X = 0.099$, and $b_Y = 0.007$. The second-period $\{X\}$ allocations are $a_X = -0.1$ and $b_X = 0.1$.

issue, while holding all other utility levels constant.

More formally, each of the issue pairs compared contain the same issue X , but they differ in the other issue with Y^- and Y^+ in pairs 1 and 2, respectively. We first analyze an X to Y agenda pair in which $u_{Y^-} = u_{Y^+}$ but $v_{Y^-} < v_{Y^+}$. Hence, player A 's utility from any accepted issue is the same for both pairs, but player B 's utility from an accepted issue Y is less in the case of pair 2. In Figure 1, pair 2 lies directly south of pair 1 (point C) because a decrease in the issue Y utility of v_Y means an increase in the preference intensity v . Corollary 1 shows that for preference intensities that place the issue pair just “south” of the focusing boundary, an issue pair with the lower utility (v_{Y^-}) will be preferred by B in equilibrium to the issue pair with the higher utility (v_{Y^+}).

Corollary 1 *Equilibrium payoffs are everywhere continuous in (u_X, u_Y, v_X, v_Y) with the exception of (i) the focusing boundary in the $X \rightarrow Y$ agenda where the payoff of the focused player has an upward jump of $2\bar{p}[v_X + V_Y - V_{XY}]$ at $(\bar{u}_F(v), v)$ as we cross from self-interest to focusing; and (ii) the pinning boundary in the $Y \rightarrow X$ agenda where the payoff of the pinned player has a downward jump of $2\bar{p}[U_{XY} - U_Y - u_X]$ at $(u, \bar{v}_P(u))$ as we cross from self-interest to pinning.*

While the Corollary is agnostic regarding the origins of the comparison pairs, the issue-pair comparison illustrates how focusing affects the attractiveness of particular issue-pairs and, therefore, provides a partial guide to understanding settings where issue content is (locally) endogenous. Furthermore, the specific comparisons encompass a class of revisions which seem quite feasible: the revision to Y , the issue that both players would like to be accepted, only reduces player B 's direct utility value on Y without affecting any other relevant values. The gains from focusing along with continuity in the payoff for player A then help to identify minor utility changes in issue X that would leave both players better off in equilibrium. As implied by Corollary 1, a similar comparison applies to the $Y \rightarrow X$ agenda and pinning.

The Corollary thus describes a threshold effect at each of the focusing and pinning boundaries. With a single issue on the current agenda, a small change in preferences (issue content) leads one player to switch positions and this has a large (discontinuous) impact on the other player. At one level, this is not surprising since resources cannot be stored for future use—with a single current issue, a player will always choose an extreme position.¹⁵ However, the intuition and rationale for the switch

¹⁵In Section 6 both issues are on the agenda in period 1 and influence action varies smoothly with changes in utility. There, the emergence of focusing and pinning in equilibrium is gradual as players do not jump between \bar{p} and $-\bar{p}$. The

do not reflect intense “single-issue” preferences. Rather, it is the prospect of influencing future events that triggers the switch to focusing and pinning behavior.

4 Decision Order, Payoffs, and Agenda Selection

The analysis of partial conflict in the previous section highlighted the dynamic incentives associated with decision delay in a multi-issue setting. In this section we examine the effect of issue order on player payoffs.

In our model, there is a potential structural advantage to a player to have his favored issue considered first because overall more resources are potentially available to influence acceptance of that issue relative to the other issue. However, strategic actions may offset such benefits. In period 2 the single-issue state is a liability when the players conflict over the issue, but that single-issue state is a possible benefit when the players’ interests align. The incentive of A to expend initial resources on X in the $X \rightarrow Y$ agenda thus depends on the sign of $u_X + U_Y - U_{XY}$ in (6). When positive, player A will focus player B to increase the probability of $\{Y\}$. Focusing is possible because the prospect of possible cooperation in the second period may induce “cooperation” in the first period over an otherwise contentious issue X . Now consider the $Y \rightarrow X$ agenda. If $v_Y + V_X - V_{XY}$ in (7) is negative, then a player B with a strong intensity of preference regarding issue X has an incentive to delay issue Y to increase the probability of the $\{X, Y\}$ state through pinning.

Figure 3 combines Figures 1 and 2 to reveal the regions in preference-intensity space for which different types of equilibria exist under both the $X \rightarrow Y$ and the $Y \rightarrow X$ agendas. For the $Y \rightarrow X$ agenda addition, there are three regions: pinning by B (demarcated by $\bar{v}_P(u)$), pinning by A (demarcated by $\bar{u}_P(v)$), and no pinning by either player. Proposition 1c (2c) rules out focusing (pinning) for the $Y \rightarrow X$ ($X \rightarrow Y$) agenda. Figure 3 illuminates agenda choice consequences because, for a given set of preference intensities, one can better understand whether focusing or pinning will occur.

In the upper left (northwest) region of Figure 3 we see that a $X \rightarrow Y$ agenda results in focusing by A while a $Y \rightarrow X$ agenda results in pinning by B . This region is given by $\mathcal{E}_{FP} \equiv \{(u, v) \mid v \geq \max \{[\bar{u}_F]^{-1}(u), \bar{v}_P(u)\}\}$. We now explore this region to determine how anticipated strategic action affects the ordering preferred by each player. Analysis of the regions where static

larger point regarding efficiency gains from inducing focusing and avoiding pinning is unchanged.

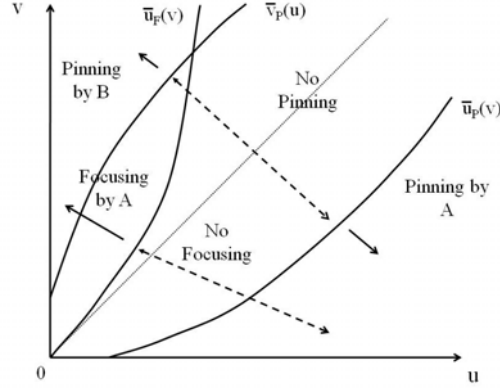


Figure 3: Equilibrium Taxonomy Under Both $X \rightarrow Y$ and $Y \rightarrow X$ Agendas

self-interest prevails is straightforward.

In \mathcal{E}_{FP} the question of order preference hinges on whether it is better to put the conflict or the alignment issue first. Player A , for example, must consider whether it is better to be pinned by B under $Y \rightarrow X$ or to focus B under $X \rightarrow Y$. This choice has several subtle aspects since A must act against static self-interest to focus B , while pinning has B taking action to neutralize A 's efforts. In contrast, B 's choices are intuitively much simpler since the focusing equilibrium has A going against myopic interest to support X and this should redound to B 's benefit.

Proposition 3 *Suppose $(u, v) \in \mathcal{E}_{FP}$ so that equilibrium under the $X \rightarrow Y$ agenda has focusing by player A and equilibrium under the $Y \rightarrow X$ agenda has pinning by B . Then B always prefers $X \rightarrow Y$ (focusing). A always prefers $Y \rightarrow X$ (pinning) if either (i) $z \leq 2/5$ or (ii) $z > 2/5$ and $z + 2\bar{p} < 1 - 2\bar{p}^2/z$.*

In \mathcal{E}_{FP} , B strongly favors X , while A strongly favors Y . Under the $X \rightarrow Y$ agenda the conflict issue arises first and A will focus B by helping to accept X . Under the $Y \rightarrow X$, B will pin A . By choosing to pin, clearly, B prefers the payoff associated with the $\{X, Y\}$ second-period state to that associated with $v_Y + V_X$. Then, since the worst outcome for B in the $X \rightarrow Y$ agenda is bounded below by the payoff associated with the $\{X, Y\}$ state, a preference configuration that leads B to pin implies that B always prefers the $X \rightarrow Y$ agenda.

The comparison for A is more subtle. There is a natural bias in favor of $Y \rightarrow X$ and pinning because $u_Y + U_X > u_X + U_Y$. But the cooperative element in focusing means that X is accepted and,

therefore, period 2 has only the Y issue, with probability $z + 2\bar{p}$; under pinning the corresponding probability for Y and then X only is z . Proposition 3 provides a strong result regarding the relative importance of these effects: pinning is preferred to focusing by A for any preferences in \mathcal{E}_{FP} provided only that $z + 2\bar{p}$ is not too close to 1. Even when (i) and (ii) do not hold, A still prefers pinning to focusing whenever it is near the focusing boundary (where $u_X + U_Y - U_{XY} = 0$). Intuitively, focusing only dominates pinning for A when we have near certainty in the outcome ($z + 2\bar{p} \rightarrow 1$) and only Y matters ($u \rightarrow 0$). In this limiting case, the probability effect overwhelms the natural bias for pinning under $Y \rightarrow X$ since focusing under $X \rightarrow Y$ leads to Y being accepted with probability one. Except for this limiting case, A will prefer pinning.

To see the effect of various agenda orders, consider again Example 1 and its $Y \rightarrow X$ analog from the previous sections. The individual payoffs for those examples are in the Table 1 below. For comparison, we also provide the payoffs to a disequilibrium set of strategies in which each player merely allocates according to myopic self-interest. In both of these agendas, the incentives for focusing and pinning for the “strategic” player are modest, but the effects of those actions on the other player are substantial.

Table 1: Payoffs under Example 1 Preferences with $X \rightarrow Y$ and $Y \rightarrow X$ Agendas

Agenda	Strategy	A payoff	B payoff
$X \rightarrow Y$ (<i>Ex. 1</i>)	A focuses B	0.301	0.601
	myopic	0.293	0.458
$Y \rightarrow X$	B pins A	0.425	0.307
	myopic	0.565	0.299

Table 1’s comparison of various agenda orders provides insight into the value of being able to change the agenda or being able to impose costs on those that do.¹⁶ First, Proposition 3 asserts that conflict between the parties regarding agenda choices will be common, especially with asymmetric issue preferences. Even when the parties have aligned preferences regarding some proposals, strategic action implies that conflict rather than consensus will prevail with regard to agenda choice. In addition, and as the example illustrates, the value of an agenda to a player has a subtle component as the preference

¹⁶Of course, decision situations are rarely fully malleable to changes in the agenda. Timing frequently reflects some underlying flow of relevant information that provides a natural ordering to decisions and oftentimes one proposal is clearer in its likely parameters at an earlier time than other proposals.

across agendas does not hinge upon creating an opportunity to engage in strategic behavior but, rather, it turns on positioning the other player so that the other player will be led to focus or to pin.

5 Bargaining and Asymmetric Preferences

When the ability to strike cooperative agreements is limited, equilibrium outcomes such as focusing or pinning are predicted by our model. In circumstances where bargaining is possible, focusing or pinning outcomes serve as threat points or disagreement outcomes. In such cases, predictions employing threat points based on static self interest will be misleading. One critical element here is the payoff impact on the focused or pinned player that arises as one transitions from preference cases where all players follow static self-interest to the more asymmetric preference cases that lead to focusing and pinning in equilibrium (recall Figure 3). We find that even with movements in preference space that increase social surplus, focusing and pinning lead to discontinuous decreases in negotiational payoffs for one player and corresponding increases for the other.

The Nash bargaining solution (NBS) provides a convenient and familiar framework for addressing the division-of-surplus issue. Even under other bargaining protocols, we expect similar results because the NBS result stems from changes in the threat points of the bargaining parties. To begin, we specify the threat points and set of feasible agreements. Assume that the threat points are given by the equilibrium payoffs of the $X \rightarrow Y$ agenda, denoted by t_A for A and t_B for B ; these threat points involve focusing whenever $u < \bar{u}_F(v)$ and static self-interest otherwise. A feasible agreement can specify (i) the agenda, either $X \rightarrow Y$ or $Y \rightarrow X$, (ii) the actions for each player in period 1 and also in period 2, contingent on period 1 outcomes, and (iii) a transfer payment between A and B .¹⁷ Social surplus, S , is defined as the sum of the expected utilities for the players and under (i-iii) we solve directly for the maximized social surplus, S^* . The generalized NBS is the division of S^* with shares for each player such that $s_A = t_A + \alpha(S^* - t_A - t_B)$ for A and $s_B = t_B + (1 - \alpha)(S^* - t_A - t_B)$ for B where α parameterizes the bargaining power of A .

To find S^* , we begin with the period-2 contingent actions. Since Y is the alignment issue, we have $w_Y \equiv u_Y + v_Y > 0$ and positive actions of $a_Y = b_Y = \bar{p}$ are optimal when only issue Y is on the agenda. For the conflict issue X , suppose that $w_X \equiv u_X + v_X > 0$; then actions of $a_X = b_X = \bar{p}$

¹⁷For simplicity, we assume transferable utility which then implies a linear Pareto frontier. While deriving the set of feasible payoffs with non-transferable utility is possible, the resulting structure is much more complicated.

are optimal when only issue X is on the agenda (we omit the case where $w_X < 0$ as it has a similar analysis). Finally, when both issues are on the agenda, we need only apply the logic of the static benchmark choice with two issues to the social surplus values of w_X and w_Y . This logic yields the optimal actions of $a_i = b_i > 0$ for $i = X, Y$ via $g'(a_X) = -w_X/w_Y \equiv -w$ and $a_Y = g(a_X)$; denote these solutions by $a_i(w)$. The joint payoffs for the period-2 states are then

$$\begin{aligned} W_i &= (z + 2\bar{p})w_i & \text{for } i = X, Y \\ W_{XY} &= (z + 2a_X(w))w_X + (z + 2g(a_X(w)))w_Y. \end{aligned}$$

Maximized social surplus is then found by solving

$$S^* = \max_{(X \rightarrow Y, Y \rightarrow X)} \{S_{X \rightarrow Y}^*, S_{Y \rightarrow X}^*\}$$

where

$$\begin{aligned} S_{X \rightarrow Y}^* &\equiv \max_{(a_x, b_x)} \{(w_X + W_Y)p_x + W_{XY}(1 - p_x)\}, \\ S_{Y \rightarrow X}^* &\equiv \max_{(a_y, b_y)} \{(w_Y + W_X)p_y + W_{XY}(1 - p_y)\}. \end{aligned}$$

The resulting optimal agenda is then $X \rightarrow Y$ when $w_X > w_Y$ and $Y \rightarrow X$ when $w_X < w_Y$ and in each case the optimal actions on the first issue are \bar{p} . We focus on the case of $w_X > w_Y$. The case of $w_X < w_Y$, though omitted, follows a similar logic.

We now undertake the comparative statics exercise on bargaining outcomes with respect to preference asymmetry. First, consider a point on the 45° line where $u = v$. (See Figure 1.) From Proposition 1, we know the threat outcome will be the static self-interest (SI) equilibrium for $X \rightarrow Y$, with payoffs $t_A^{SI} = (u_X + U_Y)z + U_{XY}(1 - z)$ and $t_B^{SI} = (v_X + V_Y)z + V_{XY}(1 - z)$. Now suppose u_X rises (becomes less negative) and, hence, that issue Y becomes more important relative to X for A . We then move to the left from the 45° line but, initially, remain to the right of the focusing cut-off level of $\bar{u}_F(v)$. In this range, the threat payoffs vary smoothly with u_X ; at the same time, maximal social surplus rises smoothly, reflecting the added value from the rise in u_X . Once u_X rises sufficiently that we hit the focusing boundary, the threat outcome shifts to focusing (F) with payoffs $t_A^F = (u_X + U_Y)(z + 2\bar{p}) + U_{XY}(1 - z - 2\bar{p})$ and $t_B^F = (v_X + V_Y)(z + 2\bar{p}) + V_{XY}(1 - z - 2\bar{p})$. At the boundary, when player A is just willing to shift from static self-interest regarding X in period 1 to focusing, we necessarily have $u_X + U_Y - U_{XY} = 0$ and t_A varies smoothly with u_X (i.e., $t_A^F = t_A^{SI}$ on the focusing boundary). The maximal social surplus also continues to rise smoothly. In contrast, t_B

jumps up in value by $(v_X + V_Y - V_{XY})2\bar{p} > 0$, by Corollary 1, once focusing commences. As a result, at the boundary the NBS for player B jumps up while that for A jumps down.

Thus, focusing leads to a strong shift in the bargaining outcome. When B faces a rival who has a strong preference for the alignment issue Y relative to B 's preference, the shift in equilibrium behavior to focusing corresponds to a shift in the threat points that favors B . Interestingly, even though A 's increased preference for Y implies an increase in the social surplus that can be shared, the focusing effect on bargaining threats leads to a lower payoff for A .

The formal version of this comparative statics result identifies the role of the variation in preference intensity, (u, v) , relative to the boundary for self-interest and focusing, $\bar{u}_F(v)$, and that for pinning, $\bar{v}_P(u)$. To keep track of the optimal agenda choice it is helpful to define the set

$$\mathcal{F} \equiv \{(u, v) \mid v \geq 1 + (1 + u)(u_Y/v_Y)\};$$

given any u_Y and v_Y for the alignment issue, $X \rightarrow Y$ is the efficient agenda for (u, v) in \mathcal{F} as the defining condition reduces to $w_X > w_Y$. Finally, $\omega \equiv (u_Y + v_Y)/(v_Y - u_Y)$ is where the lower boundary of \mathcal{F} intersects the 45° line. The role of ω is to provide a reference point in \mathcal{F} so that as we perform the comparative static, by varying u or v , we know that $X \rightarrow Y$ remains the optimal agenda and that the threat point shifts from self-interest to focusing or to pinning. We then have

Proposition 4 *Consider any given Y preferences where $v_Y > u_Y$. Then, (a) \mathcal{F} contains all points on the 45° line where $u = v \geq \omega$; (b) For any $v \geq \omega$, \mathcal{F} contains all (u, v) such that $u \leq v$ and, hence, \mathcal{F} contains the focusing boundary $\bar{u}_F(v)$; (c) For any $u \geq \omega$, \mathcal{F} contains all (u, v) such that $v \geq u$ and, hence, \mathcal{F} contains the pinning boundary $\bar{v}_P(u)$; (d) For any $(u, v) \in \mathcal{F}$ on the focusing boundary, $u = \bar{u}_F(v)$, the NBS shares are discontinuous with*

$$s_B^F - s_B^{SI} = -(s_A^F - s_A^{SI}) = \alpha 2\bar{p}(v_X + V_Y - V_{XY}) > 0;$$

where F and SI index the shares for focusing and static self-interest threat points, respectively; (e) For any $(u, v) \in \mathcal{F}$ on the pinning boundary, $v = \bar{v}_P(u)$, the NBS shares are discontinuous with

$$s_B^P - s_B^{SI} = -(s_A^P - s_A^{SI}) = (1 - \alpha)2\bar{p}(u_X + U_Y - U_{XY}) > 0$$

where P and SI index the share for the pinning and static self-interest threat points, respectively.

Apart from the focusing and pinning boundaries, we have continuity in (u, v) for the threat payoffs. The shift in strategic behavior when focusing or pinning commences, however, always has a discrete

impact on the focused or the pinned player. Thus, player B benefits by being focused, through the shift in t_B ; A suffers by being pinned, through the shift in t_A . This proposition also identifies the critical aspect of preference intensity, as measured by the position of (u, v) relative to the focusing and pinning boundaries, rather than preferences with respect to one issue for one player.¹⁸

6 A Symmetric Model of Acceptance, Rejection, and Delay

In this section we show that the intuition from the asymmetric model carries over to symmetric decision settings. To establish the robustness of our earlier results, we modify the asymmetric model to include both proposals in the first period and to allow each proposal to be accepted, rejected or delayed in the first period, effectively eliminating the role of issue order. We find that focusing and pinning continue to emerge in such settings and that for sufficiently asymmetric preferences the equilibrium necessarily involves focusing by one player and pinning by the other player.

Including both issues in the first period introduces an initial tradeoff between X and Y regarding the optimal use of resources (recall Condition 2 and the g function). To include rejection, we model delay, acceptance and rejection of the decision as follows: first, with probabilities d_i and $1 - d_i$, respectively, decision i is delayed to the second period or it is resolved. If resolved, then the proposal is accepted with probability p_i and rejected with probability $1 - p_i$.¹⁹ Delay is modeled as $d_i = z_D - \gamma a_i b_i$ where z_D is the exogenous decision delay probability and γ is a scaling factor for the endogenous delay effect caused by conflict or agreement over issue i . The multiplicative functional form employed here implies that agreement reduces delay while disagreement increases delay.²⁰ We rule out deterministic

¹⁸A number of the special assumptions we made can easily be modified without affecting the main insight regarding the jump in bargaining outcomes. If $Y \rightarrow X$ is the surplus maximizing agenda, then we need only observe that this also varies smoothly with (u, v) . We can then do a comparative static with player B in which the (u, v) variation is due to changes in u_Y and v_Y ; for instance, when v_Y falls, so does social surplus, B 's share will again jump up as we cross the pinning boundary.

¹⁹Given that the sum of the probabilities of the possible decision consequences must sum to one, this particular acceptance-rejection-delay structure distributes the changes in delay probabilities proportionately across accept and reject outcomes.

²⁰Most observers have found a positive correlation between the desire to attain decision consensus and delay. Conflict which makes consensus more difficult would then also seem positively correlated with delay. Our delay assumption seems particularly appropriate for environments in which decision makers favor some degree of consensus over pure

outcomes and assume that $\gamma\bar{p}^2 < z_D < 1 - \gamma\bar{p}^2$.

The optimal static equilibrium strategies are, as before, also the optimal second-period equilibrium strategies for this symmetric model. With both X and Y in the first period, we now have four possible agenda states in the second period. The probabilities of each state are given by: \emptyset with $(1 - d_X)(1 - d_Y)$, only $\{X\}$ with $d_X(1 - d_Y)$, only $\{Y\}$ with $(1 - d_X)d_Y$, and $\{X, Y\}$ with d_Xd_Y . The payoff for player A (similarly for player B) at a candidate set of period 1 actions is then given by

$$U^a \equiv (1 - d_X)d_Y [p_X u_X + U_Y] + d_X(1 - d_Y) [p_Y u_Y + U_X] + d_X d_Y U_{XY} + (1 - d_X)(1 - d_Y) [p_X u_X + p_Y u_Y]. \quad (8)$$

The incentives for player A for allocating influence across the two proposals are:

$$\begin{aligned} \frac{\partial U^a}{\partial a_x} &= u_X - u_X d_X + \gamma b_x [-U_X + (U_X - U_Y - U_{XY})d_Y + p_x u_X] \\ \frac{\partial U^a}{\partial a_y} &= u_Y - u_Y d_Y + \gamma b_y [-U_Y + (U_X - U_Y - U_{XY})d_X + p_y u_Y] \end{aligned}$$

with analogous incentives for player B .

Consider first the benchmark case of no endogenous delay ($\gamma = 0$). Here, players maximize an objective function strictly analogous to that faced in the second period (static) setting. Hence we have

Lemma 2 *Consider the symmetric model. If delay is exogenous, $\gamma = 0$, then the optimal first-period actions are the same as the corresponding optimal actions in the static equilibrium when issues X and Y are both on the agenda.*

This result means that the effect of exogenous delay on optimal actions is isolated in the model from the effects of strategic delay. Hence, we can attribute changes in first-period actions relative to the optimal static equilibrium actions as resulting from strategic choices.

We now show that focusing and pinning occur in the symmetric model with sufficiently extreme relative preferences.

formal authority or adherence to strict voting rules. For example, in a study of a medical school, Bucher (1970 p. 45 [6]) observed that “most of the opposition to an idea is worked through...or else the proposal dies.” The positive relationship between conflict and delay is not, however, uncontroversial. Eisenhardt’s (1989) [10] study of decision making speed in microcomputer firms found examples where conflict slowed decisions and where it did not depending on whether the firms valued or did not value consensus, respectively.

Proposition 5 *For u sufficiently small ($u \rightarrow 0$) and v sufficiently large ($v \rightarrow \infty$), every equilibrium involves (i) A focusing B on issue Y , by acting against static self-interest on X in period 1, $a_x^* > 0$ and $b_x^* > 0$ and (ii) B pinning A on Y by acting against static self-interest on Y in period 1, $a_y^* > 0$ and $b_y^* < 0$.*

Proposition 5 highlights preference-intensity settings in which pinning and focusing necessarily occur in equilibrium (for sufficiency, an existence result is provided in the appendix). In Figure 3, the case of a small u for A and a large v for B corresponds to the regions for focusing and pinning equilibria under the $X \rightarrow Y$ and $Y \rightarrow X$ agendas, respectively. Weaker forms of focusing and pinning occur when a player does not allocate resources at the static self-interest levels but does maintain a direction of support (or opposition) that is consistent with static self-interest.

7 Discussion

In this section we consider how the model provides insight for a broad range of decision settings and, in so doing, address some limitations of the analysis. Throughout this paper we have emphasized strategic opportunities posed by decisions which may be delayed rather than resolved. The strategic use of focusing and pinning to influence delay can be interpreted more broadly as action that increases or decreases the probability of a commitment. Under this commitment interpretation, delay includes “resolved” decisions that are easy to revisit (e.g., a private decision to launch a product with no immediate supporting actions, in contrast to a public commitment to launch a product combined with purchase of specialized assets). In the asymmetric model p_i (probability of acceptance) would then be a measure of the likelihood of first-period commitment regarding matter i , while in the symmetric model this measure would be $1 - d_i$ (one minus the probability of delay). Modeling more nuanced levels of commitment is potentially an interesting extension.

Our model applies to settings in which players who choose to influence decisions (or that make decisions) have limited resources such as constraints regarding time and attention. Such constraints have been emphasized by the organizational decision-making literature as central to decision making. Simon (1947, p.294) [24], for example, views “[a]ttention...[as] the chief bottleneck in organizational activity” and argues that “the bottleneck becomes narrower and narrower as we move to the tops of organizations...”²¹ The importance of attention for organizational decision making has also been

²¹Divided attention is a common theme in the decision making literature. Wood and Peake (1998) [26] find, for

highlighted in more political conceptualizations of organizations such as Pfeffer's (1978) [19] micropolitics model or the organized anarchy (garbage-can) model of Cohen, March, and Olsen (1972) [8]. Elaborating upon the latter model, March and Olsen (1979) [15] regard participation in various choice decisions as dependent on organizational obligations, various symbolic aspects of decision making, and rational action regarding the allocation of attention across various alternatives.

“There are almost no decisions that are so important that attention is assured...The result is that even a relatively rational model of attention makes decision outcomes highly contextual....Substantial variation in attention stems from other demands on the participants' time (rather than from features of the decision under study). If decision outcomes depend on who is involved..., if the attention structures are relatively permissive and unsegmented, and if individuals allocate time relatively rationally, then the outcomes of choices will depend on the availability and attractiveness of alternative arenas for activity. The individuals who end up making the decision are disproportionately those who have nothing better to do...” (March and Olsen 1979 [15], pp. 46-47).²²

While March and Olsen's comment regarding the influence of the idle reflects an element of whimsy, it reflects a serious undercurrent regarding the use of resources that are non-storable. Our model adopts the starkest version of attention resources: there is no marginal cost of use up to a fixed maximum. As such, our model is directly applicable when the benefit or cost of the less important decision outcome exceeds the marginal cost associated with influence activities. Because our results depend on relative rather than absolute issue preferences, this zero marginal cost-of-use assumption is not particularly limiting. Alternatively, one could treat the marginal cost of effort as a filter that limits the number of decisions that are sufficiently important to attract the attention of parties with

example, that presidential attention to important unresolved foreign policy issues declines when other foreign policy issues become more prominent. Redman (1973) [22] (pp. 55-57) also delineates numerous examples illustrating the effects of divided attention in the legislative setting. He describes, for example, how an “amendment in committee” strategy for grafting a National Health Service Corps onto another health bill in 1970 was derailed by the U.S. invasion of Cambodia. More recently, attention to health care reform was seen by some legislative aides as “sucking all the oxygen out of the room” and distracting legislative attention away from fully understanding various potential loopholes that lobbyists were introducing in financial reform legislation (Hirsh 2013 [12]).

²²See Bendor, Moe, and Shotts (2001) [1] for a critical review of the research program addressing the garbage-can model of organizational decision making.

significant influence resources.

In terms of decision-making settings, our model would apply to decision making both by committee and within a hierarchy.²³ Consider a committee structure. While committee decision making typically involves more than two players, the impact of different preferences on the incentives to allocate influence resources to affect delay in committee decision settings is arguably captured in our two-player model. In our model a player A with unbalanced preferences has an incentive to take a strategic action against myopic interest when another player B also has unbalanced preferences. Other involved players who have more balanced preferences have an incentive to take actions consistent with their static self-interest. The actions of these “other” committee members can then be interpreted as being captured by z , the exogenous probability parameter.

Next consider an extension of the two-player model to accommodate N decision makers each of whom may have unbalanced preferences. We conjecture that equilibria exist in such models which involve multiple players taking focusing or pinning actions while others act with static self-interest. When expanding from a two-player setting to multiple-player settings, one must account for a more complex preference set. Recall that two factors determine whether a player will focus (or pin): the relative intensity of own preferences and the incremental value of such a strategic action relative to the baseline of acting with static self-interest. Incremental value depends on the anticipated actions which the other players will take in the single-issue-only and in the multiple-issue states. One can propose a multi-player equilibrium and then check deviations by examining each player’s incentives based on their respective preferences and the “net” actions implied by the equilibrium for the other players. The additive separability inherent in the model’s structure facilitates such an analysis.

Hierarchical decision making represents the other extreme in which a single person is the decision maker. Within this context, each of the two players in our model can be interpreted as taking actions to influence the ultimate decision maker. Subordinates commonly have considerable latitude regarding the influence and attention they devote to any given decision. Bower (1970) [4], for example, describes strategy choice as a resource-allocation process in which a firm’s strategy emerges from a decision making system in which upper management primarily controls organizational level decisions (e.g., a firm’s overall direction or its culture) but implicitly relies on the judgment of middle managers who compete over project-level decisions. Decision making from this perspective is seen as “decidedly

²³See Persico 2004 [18] and Visser and Swank 2007 [25] for research that focuses on information issues in committee decisionmaking.

multilevel and multiperson,” (Bower, Doz, and Gilbert 2005, p.13) [5]. In this interpretation z would constitute the bias of the decision maker.

8 Conclusion

“In a minute there is time [f]or decisions and revisions which a minute will reverse.”

(*The Love Song of J. Alfred Prufrock*, T.S. Eliot 1915)

When the outcome of a decision does not involve real commitment, the decision remains either explicitly on the agenda because the decision was deferred or implicitly on the agenda because the decision is reversible (e.g., 2010 Affordable Care Act). Important but reversible decisions continue to attract decision making attention thereby affecting future influence allocations and, therefore, future outcomes. Consequently, anticipating such future effects, decision makers may alter their allocation of current resources. Such decision dynamics prompt two closely-related strategies: taking actions against myopic interest to pin a rival’s future attention to a proposal carried over from the current round or taking actions against myopic interest to remove a distracting issue and focus a rival’s future attention on a particular issue. These strategic actions emerge in equilibrium when decision participants have strong relative preferences for one issue over another. Strategies of pinning and focusing also alter the value of having one issue precede another issue. The analysis, therefore, has implications for across-meeting agenda setting, rather than for the more commonly analyzed problem of within-meeting agenda setting.

There is much room to extend the theoretical analysis to multiple participants with varying resources as well as to consider additional issues. In addition to exploring the effect of deferring decisions empirically, other arguably interesting avenues would be to examine the effect of related decisions in which adoption of one proposal changes the utilities associated with other proposals and to further explore design of proposal content to take dynamic advantage of decision participant preferences. Finally, allowing for incomplete information regarding preferences on issues would naturally lead to a role for signaling and reputations.

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Appendix

The following simple result characterizes the optimal static actions for any configuration of player preferences. We make frequent use of this result in subsequent proofs, including those for Propositions 1 and 2.

Lemma A1 Let $u \equiv \left| \frac{u_X}{u_Y} \right|$ and $v \equiv \left| \frac{v_X}{v_Y} \right|$ denote the preference intensities. Then, the strategies in the static Nash equilibrium when X and Y are on the agenda are given by

- i) $g'(|a_X|) = -u$ and $g'(|b_X|) = -v$
- ii) $g(|a_X|) = |a_Y|$ and $g(|b_X|) = |b_Y|$
- iii) $sgn(a_i) = sgn(u_i)$ and $sgn(b_i) = sgn(v_i)$ for $i = X, Y$.

Proof: We prove the results for Agent A; the proof for B involves a simple change of labels. Property (iii), $sgn(a_i) = sgn(u_i)$, is trivial. If $u_i > 0$ but $a_i < 0$, then $u_i a_i < 0 < -u_i a_i$ and $-a_i > 0$ is a better choice for A. Similarly, if $u_i < 0$ but $a_i > 0$, then $-a_i < 0$ is again a better choice. For (ii), $g(|a_X|) = |a_Y|$, suppose not. Then, by feasibility, we have $g(|a_X|) > |a_Y|$. If $u_Y > 0$, then a choice of a_X and $\hat{a}_Y = g(|a_X|)$ yields a higher payoff. Similarly, if $u_Y < 0$, then using the slack in resources to set $\hat{a}_Y = -g(|a_X|)$ increases the payoff. Because the objective, $u_X a_X + u_Y a_Y$, is linear and the constraint set, $g(|a_X|) \geq |a_Y|$ for $0 \leq |a_X| \leq \bar{p}$, is symmetric, Properties (ii) and (iii) of Lemma A1 imply that we can solve A's choice problem for any (u_X, u_Y) by first solving the problem for the case of $u_X > 0$ and $u_Y > 0$ and then making an adjustment of sign on the optimal influence choices. Thus, for $u_X > 0$ and $u_Y > 0$ the choice problem of A reduces to

$$\max [u_X a_X + u_Y g(a_X)] \quad s.t. \quad 0 \leq a_X \leq \bar{p}$$

This is a continuous objective on a compact set and therefore has a solution. Since g is strictly concave, the solution is uniquely determined by the first-order condition $u_X + u_Y g'(a_X) = 0$. By part (iii) of Condition 2 for g , the solution is interior. For reference, we use $a_X(u)$ and $a_Y(u)$ to denote the solution for any ratio $u \equiv |u_X/u_Y| > 0$. Comparative statics are straightforward. Defining $G(u) \equiv [g']^{-1}(-u)$, these are given by $a'_X(u) = -1/g''(G(u)) > 0$ and $a'_Y(u) = u/g''(G(u)) < 0$. Finally, note that $u a'_X(u) + a'_Y(u) = 0$ (Envelope Theorem). ■

Proof of Lemma 1: By Condition 1, we have $V_X = z v_X$ since $a_X = -\bar{p}$ and $b_X = \bar{p}$ are the optimal choices. Similarly, $V_Y = (z + 2\bar{p})v_Y$, since $a_Y = b_Y = \bar{p}$. Finally, $V_{XY} = v_X(z_X + a_X^* + b_X^*) + v_Y(z_Y + a_Y^* + b_Y^*)$, by the optimal static choices (denoted by *) from Lemma A1 when X and Y are both on the agenda. Player B chooses b_x to maximize $(z + a_x + b_x)(v_X + V_Y) + [1 - (z + a_x + b_x)]V_{XY}$. Clearly, since the objective is linear, $b_x = \bar{p}$ iff $v_X + V_Y > V_{XY}$. Simplifying, this inequality reduces

to

$$v_X + (z + 2\bar{p})v_Y > (z + a_X^* + b_X^*)v_X + (z + a_Y^* + b_Y^*)v_Y$$

This is valid because (1) $1 > z + a_X^* + b_X^*$, by Condition 3; (2) $z + 2\bar{p} \geq z + a_Y^* + b_Y^*$ by $\bar{p} \geq a_Y$ and $\bar{p} \geq b_Y$, and (3) each of $v_X > 0$ and $v_Y > 0$ holds by Condition 1. ■

Proof of Proposition 1, Part A: Player A chooses a_x to maximize $\{(z + a_x + b_x)(u_X + U_Y) + [1 - (z + a_x + b_x)]U_{XY}\}$. The solution is $a_x = \bar{p}$ iff $u_X + U_Y > U_{XY}$ (it is $a_x = -\bar{p}$ when $u_X + U_Y < U_{XY}$). Substituting for U_Y and U_{XY} with the optimal static actions, rearranging terms, and dividing by $u_Y > 0$, we have

$$u_X + U_Y > U_{XY} \Leftrightarrow (2\bar{p} - a_Y^* - b_Y^*) + \frac{u_X}{u_Y}(1 - z - a_X^* - b_X^*) > 0.$$

Now, using the definitions of $u \equiv -\frac{u_X}{u_Y} > 0$ and $v \equiv \frac{u_X}{v_Y} > 0$, and writing the the optimal choices in the $\{XY\}$ state in terms of the solutions to the first-order conditions from Lemma A1, that is $(a_X^*, a_Y^*) = (-a_X(u), a_Y(u))$ and $(b_X^*, b_Y^*) = (b_X(v), b_Y(v))$, our condition for $a_x = \bar{p}$ becomes

$$h(u, v) \equiv [2\bar{p} - a_Y(u) - b_Y(v)] - u[1 - z + a_X(u) - b_X(v)] > 0.$$

We claim that, for any $v > 0$, the function $h(u, v)$ is (1) decreasing in u , (2) positive at $u = 0$, (3) negative as $u \rightarrow \infty$, and, hence, (4) there $\exists!$ $u \ni h$ crosses 0. To show (1), differentiate h w.r.t. u and apply the envelope theorem, $a_Y'(u) + ua_X'(u) = 0$, to find $h_u = -[1 - z + a_X(u) - b_X(v)] < 0$, as follows from Condition 2 for interior probabilities. For (2), let $u \rightarrow 0$ and note that $a_X(u) \rightarrow 0$ and $a_Y(u) \rightarrow \bar{p}$, so that $h(0, v) = [\bar{p} - b_Y(v)] > 0$. For (3), letting $u \rightarrow \infty$ in $h(u, v)$ and noting $a_X(u) \rightarrow \bar{p}$ and $a_Y(u) \rightarrow 0$, we see $h(u, v) \rightarrow -\infty$. Then, (4) follows by continuity and $h(u, v)$ crosses zero one time at a unique $u = \bar{u}_F(v) \in (0, \infty)$. Thus, $h(u, v) > 0$ holds for $0 < u < \bar{u}_F(v)$ and then $a_x = \bar{p}$, while $h(u, v) < 0$ holds for $u > \bar{u}_F(v)$ and then $a_x = -\bar{p}$.

Part (b): To verify that $\bar{u}_F(v)$ is increasing, simply note that $\bar{u}_F'(v) = -h_v/h_u$, the ratio of partials for h . From above, we know $h_u < 0$. Calculating, we find $h_v = ub_X'(v) - b_Y'(v) > 0$. Hence, $\bar{u}_F'(v) > 0$ holds. To verify that $\bar{u}_F(0) = 0$, observe that $b_x(0) = 0$ and $b_y(0) = \bar{p}$ so that $h(u, 0) = \bar{p} - a_Y(u) - u[1 - z + a_X(u)]$. At $u = 0$, we have $a_X(0) = 0$ and $a_Y(0) = \bar{p}$. This implies $h(0, 0) = 0$ and, hence, $\bar{u}_F(0) = 0$. To show that $\bar{u}_F(v) < v$ for any $v > 0$, it is sufficient to show that $h(v, v) < 0$ since this implies h crosses zero to the left of v . Simplifying $h(u, v)$ at $u = v$, we have

$$h(v, v) = 2[\bar{p} - b_Y(v)] - v[1 - z].$$

Since g is concave, we have $\bar{p} - b_Y(v) < -g'(b_X(v))b_X(v) = vb_X(v)$, where the last step is by the first-order condition for B . This implies $2\bar{p} < 2vb_X(v) + 2b_Y(v)$. Since $1 - z > 2\bar{p}$ by Condition 3 and $\bar{p} \geq b_X(v)$, we have $v[1 - z] > 2vb_X(v)$ and, thus, the inequality for $h(v, v) < 0$ is valid. Finally, for the upper bound on $\bar{u}_F(v)$, write $h(\bar{u}_F(v), v) = 0$ as (suppressing arguments) $\bar{u}_F = [2\bar{p} - a_Y - b_Y]/[1 - z + a_X - b_X]$. Since a_Y and b_Y are non-negative and $a_X(\bar{u}_F) < b_X(v)$ for $\bar{u}_F < v$, the upper bound of $\bar{u}_F < 2\bar{p}/(1 - z)$ follows directly.

Part (c): Suppose Y is a conflict issue. In a focusing equilibrium, player A chooses $a_x = \bar{p}$ against own interest based on $u_X < 0$. The choice $a_x = \bar{p}$ is optimal iff $u_X + U_Y - U_{XY} > 0$. Substituting for U_Y and U_{XY} , noting that $\hat{a}_Y + \hat{b}_Y = 0$ [where \hat{a}_Y and \hat{b}_Y are the optimal actions when only (the conflict) issue Y is on the second-period agenda] as players A and B choose oppositely in Y , and rearranging terms yield $u_X + U_Y - U_{XY} > 0 \Leftrightarrow$

$$u_X[1 - (z + a_X^* + b_X^*)] - (a_Y^* + b_Y^*)u_Y > 0. \quad (9)$$

To show that alignment in Y is necessary, we show that the first order condition for focusing (9) cannot hold when players A and B conflict on issue Y . There are two cases for conflict (A) $u_Y > 0 > v_Y$ and (B) $u_Y < 0 < v_Y$.

Case A ($u_X < 0$ and $u_Y > 0 > v_Y$): Consider (9). Substitute with $u = -u_X/u_Y > 0$ and simplify with the solutions to the first-order conditions, $(a_X^*, a_Y^*) = (-a_X(u), a_Y(u))$ and $(b_X^*, b_Y^*) = (b_X(v), -b_Y(v))$, to see that (9) holds iff

$$[b_Y(v) - a_Y(u)] - u[1 - (z - a_X(u) + b_X(v))] > 0$$

This expression is strictly decreasing in u since the partial (applying the Envelope Theorem) is $-[1 - (z - a_X(u))] < 0$. At $u = 0$, the expression reduces to $b_Y(v) - \bar{p} < 0$. Hence, the expression is never positive, which is a contradiction.

Case B ($u_X < 0$ and $u_Y < 0 < v_Y$): Consider (9). Substitute with $u = u_X/u_Y > 0$ and simplify with the solutions to the first-order conditions, $(a_X^*, a_Y^*) = (-a_X(u), -a_Y(u))$ and $(b_X^*, b_Y^*) = (b_X(v), b_Y(v))$, to see that (9) holds iff

$$[b_Y(v) - a_Y(u)] - u[1 - (z - a_X(u) + b_X(v))] > 0.$$

Since this is the same expression as in Case A, we have a contradiction.

Part (d): By Lemma 1, B always chooses $b_x = \bar{p}$. Since A chooses a_x according to the cut-off function, $\bar{u}_F(v)$, the equilibrium result follows directly. Finally, note that in the knife-edge case when

(u, v) lies on the focusing boundary we have $u_X + U_Y - U_{XY} = 0$; any $a_x \in [-\bar{p}, \bar{p}]$ is then optimal and part of an equilibrium. ■

Proof of Proposition 2, Part (a): The partial conflict pinning assumptions are: $v_X > 0 > u_X$, $u_Y > 0$ and $v_Y > 0$. Player B chooses b_y to maximize $(z + a_y + b_y)(v_Y + V_X) + [1 - (z_Y + a_y + b_y)]V_{XY}$. Thus, $b_y = -\bar{p}$ iff $v_Y + V_X < V_{XY}$. Substituting for V_X and V_{XY} with the optimal static actions, rearranging terms and dividing through by $v_Y > 0$, we have

$$v_Y + V_X < V_{XY} \Leftrightarrow 1 - [z + a_Y^* + b_Y^*] - \frac{v_X}{v_Y}(a_X^* + b_X^*) < 0.$$

Using $u \equiv -\frac{u_X}{u_Y} > 0$ and $v \equiv \frac{v_X}{v_Y} > 0$, and writing the the optimal choices in the $\{XY\}$ state in terms of the solutions to the first-order conditions, that is $(a_X^*, a_Y^*) = (-a_X(u), a_Y(u))$ and $(b_X^*, b_Y^*) = (b_X(v), b_Y(v))$, our condition for $b_x = -\bar{p}$ becomes

$$k(v, u) = 1 - [z + a_Y(u) + b_Y(v)] - v [b_X(v) - a_X(u)] < 0.$$

Next, we claim that, for any $u > 0$, the function $k(v, u)$ is (1) increasing in v for $v < u$ and decreasing in v for $v > u$, (2) positive at $v = 0$, (3) negative as $v \rightarrow \infty$, and, hence, (4) there $\exists!$ $v \ni k$ crosses 0. To show (1), differentiate k w.r.t. v and apply the envelope theorem, $b_Y'(v) + v b_X'(v) = 0$, to find $k_v = a_X(u) - b_X(v)$. From the proof of Lemma A1, we know that $a_X(u) \geq b_X(v)$ as $u \geq v$ since both are increasing in the utility intensity. Then, (1) follows directly. For (2), let $v \rightarrow 0$ and note that $b_X(v) \rightarrow 0$ and $b_Y(v) \rightarrow \bar{p}$, so that $k(0, u) = 1 - [z + a_Y(u) + \bar{p}] > 0$, by Condition 2. For (3), letting $v \rightarrow \infty$ in $k(v, u)$ and noting $b_X(v) \rightarrow \bar{p}$ and $b_Y(v) \rightarrow 0$, we see $k(v, u) \rightarrow -\infty$. Then, (4) follows by continuity and $k(v, u)$ crosses zero one time at a unique $v = \bar{v}_P(u) \in (0, \infty)$. Thus, $k(v, u) > 0$ holds for $0 < v < \bar{v}_P(u)$ and then $b_y = \bar{p}$, while $k(v, u) < 0$ holds for $v > \bar{v}_P(u)$ and then $b_y = -\bar{p}$. Note that, by property (1), for a given u , the maximum of k over all $v \geq 0$ occurs at $v = u$. Since $k(u, u) > 0$, it follows that k crosses zero in v to the right of $v = u$ and we therefore have $\bar{v}_P(u) > u$. Finally, note that $k(0, 0) > 0$, so that we have $\bar{v}_P(0) > 0$.

Part (b): Implicit differentiation of $k(\bar{v}_P, u) = 0$ yields $\bar{v}_P'(u) = -k_u/k_v$, the ratio of partials. We know $k_v < 0$ holds when $k(\bar{v}_P, u) = 0$. Also, we easily find that $k_u = -a_Y'(u) + v a_X'(u) > 0$. Hence, $\bar{v}_P'(u) > 0$. Finally, $\bar{v}_P(u) > u$ was shown just above.

Part (c): Suppose X is an alignment issue. In a pinning equilibrium player B chooses $b_y = -\bar{p}$ against own interest based on $v_Y > 0$. We know $b_y = -\bar{p}$ is optimal when the condition $v_Y + V_X - V_{XY} < 0$ holds. Substituting for V_X and V_{XY} and rearranging terms $v_Y + V_X - V_{XY} < 0 \Leftrightarrow$

$$v_Y[1 - (z + a_Y^* + b_Y^*)] + v_X(\hat{a}_X + \hat{b}_X) - v_X(a_X^* + b_X^*) < 0 \quad (10)$$

where \hat{a}_X and \hat{b}_X are the optimal actions where only issue X is on the second-period agenda. There are two cases of alignment for X :

Case 1 ($u_X > 0, v_X > 0$): This implies $\hat{a}_X = \hat{b}_X = \bar{p}$. But then $v_Y[1 - (z + a_Y^* + b_Y^*)] + v_X(2\bar{p} - a_X^* - b_X^*) > 0$, which contradicts (10).

Case 2 ($u_X < 0, v_X < 0$): This implies $\hat{a}_X = \hat{b}_X = -\bar{p}$. Then $v_Y[1 - (z + a_Y^* + b_Y^*)] - v_X(2\bar{p} + a_X^* + b_X^*) > 0$, which again contradicts (10).

Hence, pinning cannot occur with alignment over the second issue.

Part (d): A completely symmetric argument shows that Player A also has a cut-off value, denoted by $\bar{u}_P(v)$ and it is defined by the condition $k(\bar{u}_P, v) = 0$. The claim regarding a pinning equilibrium now follows directly. For $v > \bar{v}_P(u)$, we know Player B optimally chooses $b_y = -\bar{p}$. Because $\bar{v}_P(u) > u$, we see that $v > u$ holds. We then have $\bar{u}_P(v) > v > u$ and Player A optimally chooses $a_y = \bar{p}$. ■

Proof of Corollary 1: Continuity away from the pinning or focusing boundary follows trivially from continuity of the period-2 actions in u and v . For $X \rightarrow Y$ and the focusing boundary, we calculate the payoff difference via

$$\begin{aligned} V_F^b - V_{SI}^b &= [(z + 2\bar{p})(v_X + V_Y) + (1 - z - 2\bar{p})V_{XY}] - [z(v_X + V_Y) + (1 - z)V_{XY}] \\ &= 2\bar{p}[v_X + V_Y - V_{XY}] \end{aligned}$$

which is strictly positive, by Lemma 1. For $Y \rightarrow X$ and the pinning boundary, a similar calculation yields the difference as stated in the Corollary for $U_P^a - U_{SI}^a$. To see that this is strictly negative, simplify to obtain $(1 - z - a_Y^* - b_Y^*)u_Y > (a_X^* + b_X^*)u_X$. The left-hand side is positive by feasibility and $u_Y > 0$ while the right-hand side is negative since $(a_X^* + b_X^*) > 0$ holds as $\bar{v}_P(u) > u$ and $u_X < 0$. ■

Proof of Proposition 3: The payoff comparison for B across the two agendas, $X \rightarrow Y$ and $Y \rightarrow X$, is given by

$$\begin{aligned} V_F^b &\equiv (z + 2\bar{p})(v_X + V_Y) + [1 - (z + 2\bar{p})]V_{XY} > z(v_Y + V_X) + (1 - z)V_{XY} \equiv V_P^b \\ &\Leftrightarrow (z + 2\bar{p})(v_X + V_Y - V_{XY}) > z(v_Y + V_X - V_{XY}). \end{aligned}$$

By Lemma 1, we have $v_X + V_Y - V_{XY} > 0$. By existence of the pinning equilibrium, we have $v_Y + V_X - V_{XY} < 0$. Thus, the inequality holds.

The payoff comparison for A across the two agendas is more subtle. To begin, we have

$$\begin{aligned} U_F^a &\equiv (z + 2\bar{p})(u_X + U_Y) + [1 - (z + 2\bar{p})]U_{XY} < z(u_Y + U_X) + (1 - z)U_{XY} \equiv U_P^a \\ &\Leftrightarrow (z + 2\bar{p})(u_X + U_Y - U_{XY}) < z(u_Y + U_X - U_{XY}). \end{aligned}$$

Note that this inequality always holds at $u = \bar{u}_F(v)$ since this implies $u_X + U_Y - U_{XY} = 0$ while the right-hand side is positive since

$$u_Y + U_X - U_{XY} > 0 \Leftrightarrow u_Y[1 - (z + a_Y(u) + b_Y(v))] - u_X(b_X(v) - a_X(u)) > 0,$$

as follows from $u_Y > 0 > u_X$, $1 > z + a_Y(u) + b_Y(v)$ by feasible probabilities, and $b_X(v) > a_X(u)$ by $v > u$. To extend this to all (u, v) for which focusing and pinning equilibria exist, first simplify the inequality for $U_F^a < U_P^a$ by substituting for the U_X , U_Y and U_{XY} terms and note that $U_F^a < U_P^a$ iff

$$D(u, v) \equiv (z + 2\bar{p})^2 - z - 2\bar{p}(z + a_Y(u) + b_Y(v)) - u[z - z^2 + 2\bar{p} - 2\bar{p}(z - a_X(u) + b_X(v))] < 0.$$

Note that $D(u, v)$ is strictly decreasing in u and strictly increasing in v since the partial derivatives satisfy:

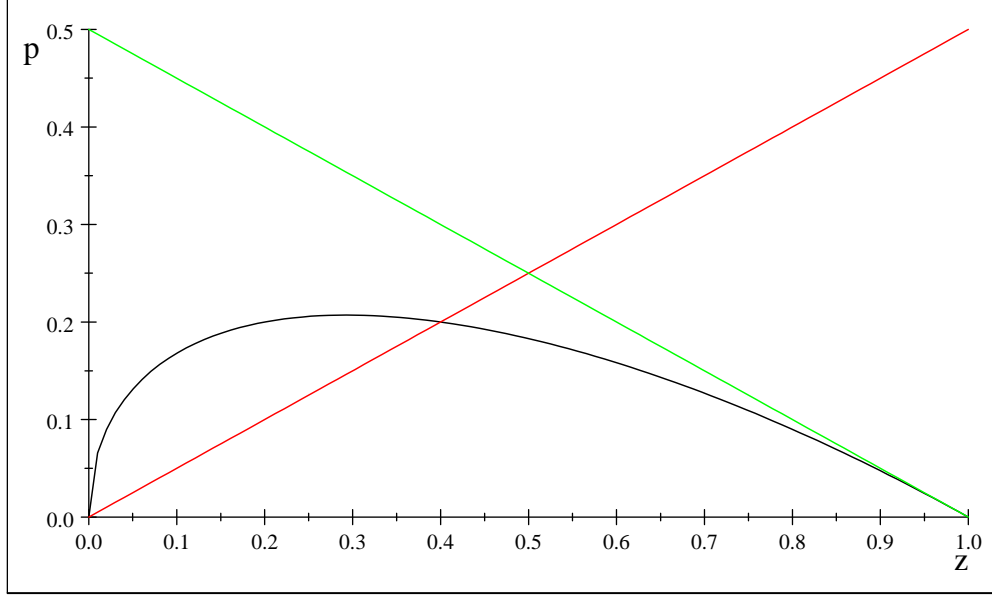
$$\begin{aligned} D_u &= -z(1 - z) - 2\bar{p}[1 - (z - a_X(u) + b_X(v))] < 0 \\ D_v &= 2\bar{p}[ub'_X(v) - b'_Y(v)] > 0, \end{aligned}$$

as follows from feasible probabilities and $b'_X(v) > 0 > b'_Y(v)$. If we can show $\lim_{v \rightarrow \infty} D(0, v) < 0$, then we will have $D(u, v) < 0$ for any $u \leq \bar{u}_F(v)$ since monotonicity in u and v implies $\lim_{v \rightarrow \infty} D(0, v) > D(0, v) > D(u, v)$. From the definition, we find

$$\lim_{v \rightarrow \infty} D(0, v) = 2\bar{p}(z + \bar{p}) - z(1 - z)$$

since $a_X(u) \rightarrow 0$ and $a_Y(u) \rightarrow \bar{p}$ as $u \rightarrow 0$, and $b_X(v) \rightarrow \bar{p}$ and $b_Y(v) \rightarrow 0$ as $v \rightarrow \infty$.

To characterize the limiting value of D in terms of the z and \bar{p} parameters, recall that our feasible set is given by z and \bar{p} in $(0, 1)$ for which $2\bar{p} < z < 1 - 2\bar{p}$ or, equivalently, $0 < \bar{p} < z/2$ for $z \leq 1/2$ and $0 < \bar{p} < (1 - z)/2$ for $z > 1/2$. Solving for \bar{p} in the implied quadratic $2\bar{p}(z + \bar{p}) - z(1 - z) = 0$ from the $\lim_{v \rightarrow \infty} D(0, v)$ expression, we see that $\lim_{v \rightarrow \infty} D(0, v) < 0$ holds when $\bar{p} \leq [\sqrt{2z - z^2} - z]/2$. As is easily verified, this necessarily holds when $z < 2/5$. Over the full feasible parameter set for z and \bar{p} , we calculate that $\lim_{v \rightarrow \infty} D(0, v) < 0$ holds for approximately 89% of the region. Refer to the figure below. ■



Proof of Proposition 4: For part (a), we need only verify that any (u, v) with $v \geq u \geq \omega$ satisfies the condition for inclusion in \mathcal{F} . Since $v \geq u$, this reduces to $u \geq 1 + (1 + u)(u_Y/v_Y)$. This simplifies to $u \geq (u_Y + v_Y)/(u_Y - v_Y) = \omega$ and we are done. Note that an immediate implication is that \mathcal{F} contains all (u, v) where $0 \leq u \leq v$ for any $v \geq \omega$ as well as all (u, v) where $v \geq u$ for any $u \geq \omega$, since the lower boundary of \mathcal{F} is linear with slope less than 1 and crosses the 45° line at $u = v = \omega$. For part (b), we know from Proposition 1 that utility intensities in \mathcal{E}_F consist of (u, v) such that $u \leq \bar{u}_F(v) \leq v$. Since we have $v \geq \omega$, we know from part (a) that \mathcal{F} contains all $u \leq v$ and, therefore, that any (u, v) in \mathcal{E}_F is also an element of \mathcal{F} when $v \geq \omega$. For part (c), we know from Proposition 2 that \mathcal{E}_P consists of (u, v) such that $v \geq \bar{v}_P(u) \geq u$. Since we have $u \geq \omega$, we know from part (a) that \mathcal{F} contains all $v \geq u$ and, therefore, that any (u, v) in \mathcal{E}_P is also an element of \mathcal{F} when $u \geq \omega$.

For part (d), the value of the discontinuity is a simple calculation from the NBS share formula using the threat point and social surplus, as described in the text. In order to be valid, however, we need to verify consistency with the underlying optimal agenda choice of $X \rightarrow Y$ as we cross the focusing boundary. This holds by construction: with $(u, v) \in \mathcal{F}$ we necessarily have $w_X > w_Y$ and, since Y is the alignment issue where $w_Y > 0$, we then have $w_X > 0$. Hence, $X \rightarrow Y$ is optimal in \mathcal{F} . The proof for part (e) is analogous as we need only employ the pinning threat payoffs in the calculation. ■

Proof of Lemma 2: $\gamma = 0$ implies that $d_X = d_Y = z_D$. $U^a = z_D^2 U_{XY} + z_D(1 - z_D)[U_X +$

$p_Y u_Y] + (1 - z_D)z_D[p_X u_X + U_Y] + (1 - z_D)^2[p_X u_X + p_Y u_Y]$ which, after rearranging terms and simplifying gives $U^a = z_D[U_X + U_Y] - z_D^2[U_X + U_Y - U_{XY}] + (1 - z_D)[p_X u_X + p_Y u_Y]$. Similarly, $V^b = z_D[V_X + V_Y] - z_D^2[V_X + V_Y - V_{XY}] + (1 - z_D)[p_X v_X + p_Y v_Y]$. Maximizing U^a and V^b involves solving $\max_{a_X, a_Y} \{p_X u_X + p_Y u_Y\}$ and $\max_{b_X, b_Y} \{p_X v_X + p_Y v_Y\}$ with solutions that are the same as those for the static actions when both issues X and Y are on the agenda. ■

Proof of Proposition 5: To begin, we simplify U^a from the text and the analogous expression for V^b by collecting terms to obtain

$$\begin{aligned} U^a &= d_X d_Y U_{XY} + (1 - d_X) d_Y U_Y + d_X (1 - d_Y) U_X + (1 - d_X) p_X u_X + (1 - d_Y) p_Y u_Y \\ V^b &= d_X d_Y V_{XY} + (1 - d_X) d_Y V_Y + d_X (1 - d_Y) V_X + (1 - d_X) p_X v_X + (1 - d_Y) p_Y v_Y. \end{aligned}$$

The values when only X or only Y are on the agenda in period 2 are unchanged from before; also, values for U_{XY} and V_{XY} are determined by the preference ratios. We prove the proposition by taking limits as $u \rightarrow 0$ and $v \rightarrow \infty$. Since the relevant terms involve strict inequalities, our result holds in a neighborhood of these limiting values. For convenience, adopt the normalization of $u_Y = v_X = 1$ and let $u_X \uparrow 0$ while $v_Y \downarrow 0$. Then the limiting values for the $\{X, Y\}$ state in period 2 are $U_{XY} = (z + \bar{p})$ and $V_{XY} = (z + \bar{p})$, since the actions of A follow $a_X(u) \rightarrow 0$ and $a_Y(u) \rightarrow \bar{p}$ while those of B follow $b_X(v) \rightarrow \bar{p}$ and $b_Y(v) \rightarrow 0$. Substituting in the payoffs above and simplifying yield

$$\begin{aligned} U^a &= d_Y [z + 2\bar{p} - d_X \bar{p}] + (1 - d_Y) p_Y \\ &= z + a_Y + b_Y + [z_D - \gamma a_Y b_Y] [2\bar{p} - a_Y - b_Y - \bar{p} (z_D - \gamma a_X b_X)] \end{aligned}$$

and

$$\begin{aligned} V^b &= d_X [z + d_Y \bar{p}] + (1 - d_X) p_X \\ &= z + a_X + b_X + [z_D - \gamma a_X b_X] [\bar{p} (z_D - \gamma a_Y b_Y) - a_X - b_X]. \end{aligned}$$

We can now employ a revealed preference argument to show that at any best response we have $a_Y \geq 0$ for A and $b_X \geq 0$ for B . For A , fix any given (b_X, b_Y) by B and compare the payoff U^a at (a_X, a_Y) where $a_Y > 0$ to that at $(a_X, -a_Y)$. Note that when (a_X, a_Y) is feasible then so is $(a_X, -a_Y)$. The payoff is larger with a_Y if and only if

$$2a_Y \{1 - z_D - \gamma b_Y [2\bar{p} - b_Y - \bar{p} d_X]\} > 0.$$

Since $a_Y > 0$ we need only show the bracketed term is positive. By feasibility, we have $1 - z_D > \gamma \bar{p}^2$ so it is sufficient to show $\bar{p}^2 > b_Y [2\bar{p} - b_Y - \bar{p} d_X]$. Over all $w \in [-\bar{p}, \bar{p}]$, the function $w [2\bar{p} - w - \bar{p} d_X]$

is strictly concave with an interior maximum at $w = \bar{p}(2 - d_X)/2$ where the function assumes its maximum value of $(\bar{p}(2 - d_X)/2)^2$. Our sufficient condition then reduces to $4 > (2 - d_X)^2$, which is clearly valid since we always have $d_X \in (0, 1)$. Thus, A will never choose $a_Y < 0$ in any best response.

The proof that $b_X \geq 0$ in any best response of B is similar and therefore omitted.

The following properties are straightforward to verify:

$$\begin{aligned}
\text{A1:} \quad & \frac{\partial U^a}{\partial a_X} = \gamma \bar{p} b_X d_Y \geq 0 \quad \text{if } b_X \geq 0 \text{ (strict if } b_X > 0\text{);} \\
\text{A2:} \quad & \frac{\partial U^a}{\partial a_Y} = 1 - z_D - \gamma b_Y [\bar{p}(2 - d_X) - 2a_Y - b_Y] > 0 \quad \text{if } b_Y \leq 0; \\
\text{B1:} \quad & \frac{\partial V^b}{\partial b_X} = 1 - z_D - \gamma a_X [\bar{p} d_Y - a_X - 2b_X] > 0 \quad \text{if } a_X \geq 0 \text{ and } b_X \geq 0; \\
\text{B2:} \quad & \frac{\partial V^b}{\partial b_Y} = -\gamma \bar{p} a_Y d_X \leq 0 \quad \text{if } a_Y \geq 0 \text{ (strict if } a_Y > 0\text{).}
\end{aligned}$$

Building on these properties, we can now show that i) in any best response to (b_X, b_Y) where $b_X \geq 0$, A always chooses such that $a_X \geq 0$, and ii) in any best response to (a_X, a_Y) where $a_Y \geq 0$, B always chooses such that $b_Y \leq 0$. We prove i) and omit the proof of ii), which is similar. There are two cases: $b_X > 0$ and $b_X = 0$. For $b_X > 0$, compare U^a at $a_X > 0$ and at $-a_X < 0$ for given (b_X, b_Y) and a_Y . Then the payoff at $a_X > 0$ is larger if and only if $2\gamma a_X b_X \bar{p} d_Y > 0$. As $b_X > 0$ is given, $a_X > 0$ is by construction, and $d_Y \in (0, 1)$, we are done. For the case of $b_X = 0$, the payoff is independent of a_X since U^a simplifies to $U^a = d_Y [z_Y + 2\bar{p} - z_D \bar{p}] + (1 - d_Y) p_Y$. Now, if $b_Y \leq 0$, then we see from property A2 above that U^a is strictly increasing in a_Y . Hence, $a_Y = \bar{p}$ is optimal and, therefore, $a_X = 0$. If $b_Y > 0$, then observe that $\partial^2 U^a / \partial a_Y^2 = 2\gamma b_Y > 0$ and U^a is convex. The optimal choice of a_Y by A must then be one of the endpoints, either \bar{p} or $-\bar{p}$. Comparing U^a at these two choices, we find that \bar{p} is optimal if $\bar{p}^2 > b_Y [\bar{p}(2 - z_D) - b_Y]$. The maximum value for the right-hand side is $[\bar{p}(2 - z_D)/2]^2$, which occurs at $b_Y = \bar{p}(2 - z_D)/2$, and this is clearly less than \bar{p}^2 . Thus, A will never choose $a_X \leq 0$ in a best response and i) is established.

Summarizing, we have shown that in any equilibrium we necessarily have: $a_X \geq 0$, $a_Y \geq 0$, $b_X \geq 0$, and $b_Y \leq 0$. From this pattern, we now show that all of these inequalities are strict in equilibrium and, furthermore, that each agent does at least e on their dominant issue, where e is defined by $g(e) = e$, where g crosses the 45° line. Note that $g'(e) = -1$ and $g(e) > \bar{p}/2$.

We begin with B . Since we have $a_X \geq 0$ and $b_X \geq 0$ in equilibrium, property B1 implies that V^b is strictly increasing in b_X . This implies that $b_Y = -g(b_X)$ in any equilibrium. To see why, recall that $b_Y \leq 0$ holds in equilibrium. If we ever had $b_Y < -g(b_X)$ then the slack could be used to increase b_X

and this would lead to a strict increase in V^b . Next, substituting with $b_Y = -g(b_X)$ for b_Y in V^b , the resulting variation with b_X is given by

$$\frac{\partial V^b}{\partial b_X} - g'(b_X) \frac{\partial V^b}{\partial b_Y}.$$

At $b_X = 0$, $g'(b_X) = 0$ holds (note that $\partial V^b / \partial b_Y$ is bounded by 1 in magnitude). Since $\partial V^b / \partial b_X > 0$ from B1, we see that B always chooses $b_X > 0$ in equilibrium. Incorporating $b_X > 0$, a similar argument allows us to conclude that $a_Y = g(a_X)$ and that $a_X > 0$ also holds. In turn, we can then show $a_Y > 0$ and $b_Y < 0$.

To show that each of a_Y and b_X exceed e , it is straightforward to substitute with g and reduce each of U^a and V^b to a function of only b_X and a_Y . We can then show that each of these functions is strictly increasing (in the action on the player's dominant issue) over the interval $[0, e]$. For A we calculate

$$\begin{aligned} U^a(a_Y, b_X) &= z + a_Y - g(b_X) + [z_D + \gamma a_Y g(b_X)] [\bar{p}(2 - z_D) - a_Y + g(b_X) + \gamma \bar{p} g(a_Y) b_X] \\ \frac{\partial U^a}{\partial a_Y} &= [1 - z_D + \gamma \bar{p}(2 - z_D)g(b_X) + \gamma g(b_X)^2] - 2\gamma g(b_X)a_Y \\ &\quad + \gamma \bar{p} z_D b_X g'(a_Y) + \gamma^2 \bar{p} b_X g(b_X)[g(a_Y) + a_Y g'(a_Y)] \\ \frac{\partial^2 U^a}{\partial a_Y^2} &= -2\gamma g(b_X) + \gamma \bar{p} z_D b_X g''(a_Y) + \gamma^2 \bar{p} b_X g(b_X)[2g'(a_Y) + a_Y g''(a_Y)] < 0 \end{aligned}$$

Since U^a is concave in a_Y , we need only show that $\partial U^a / \partial a_Y$ is positive at $a_Y = e$ for all $b_X \in [0, \bar{p}]$ to conclude that A chooses $a_Y > e$ in any best response. Evaluating and simplifying, we have

$$\left(\frac{\partial U^a}{\partial a_Y} \right)_{a_Y=e} = 1 - z_D + \gamma [\bar{p}(2 - z_D)g(b_X) + g(b_X)^2 - 2eg(b_X) - \bar{p}z_D b_X]$$

where we have used the properties $g(e) = e$ and $g'(e) = -1$.

Differentiating the above expression with respect to z_D yields $-1 - \gamma \bar{p}[g(b_X) + b_X] < 0$ and, therefore, the expression is bounded below by the value at $z_D = 1 - \gamma \bar{p}^2$, which is the maximum feasible value for z_D . Substituting with $z_D = 1 - \gamma \bar{p}^2$ in the original expression and simplifying, it is then sufficient to show

$$\bar{p}^2 + \bar{p}(1 + \gamma \bar{p}^2)g(b_X) + g(b_X)^2 - 2g(b_X)e - \bar{p}(1 - \gamma \bar{p}^2)b_X > 0$$

This expression is increasing in γ since $\bar{p}^3[g(b_X) + b_X] > 0$ and, therefore, it is bounded below by the value at $\gamma = 0$. It is then sufficient to show

$$\bar{p}^2 + \bar{p}g(b_X) + g(b_X)^2 - 2g(b_X)e - \bar{p}b_X > 0$$

This expression is increasing in \bar{p} since $2\bar{p} + g(b_X) - b_X > 0$ and is therefore bounded below by the value at $\bar{p} = 0$. As a result, it is sufficient to show $g(b_X)[1 - 2e] > 0$. Since feasibility implies $e < \bar{p}$ and $\bar{p} < 1/2$, we are done. This establishes that $\partial U^a / \partial a_Y > 0$ at $a_Y = e$ for all $b_X \in [0, \bar{p}]$.

To show that B always chooses a b_X that exceeds e , we calculate

$$\begin{aligned} V^b(b_X, a_Y) &= z_X + g(a_Y) + b_X + [z_D - \gamma g(a_Y)b_X] [\bar{p}z_D - g(a_Y) - b_X + \gamma\bar{p}a_Yg(b_X)] \\ \frac{\partial V^b}{\partial b_X} &= [1 - z_D - \gamma\bar{p}z_Dg(a_Y) + \gamma g(a_Y)^2] + 2\gamma g(a_Y)b_X \\ &\quad + \gamma\bar{p}z_Da_Yg'(b_X) - \gamma^2\bar{p}a_Yg(a_Y)[g(b_X) + b_Xg'(b_X)] \\ \frac{\partial^2 V^b}{\partial b_X^2} &= 2\gamma g(a_Y) + \gamma\bar{p}z_Da_Yg''(b_X) - \gamma^2\bar{p}a_Yg(a_Y)[2g'(b_X) + b_Xg''(b_X)] \end{aligned}$$

V^b is not necessarily concave in b_X and the proof that $\partial V^b / \partial b_X > 0$ for $b_X \in [0, e]$ and $a_Y \in [0, \bar{p}]$ is more complicated than that for agent A . To begin, differentiating $\partial V^b / \partial b_X$ with respect to z_D yields $-1 - \gamma\bar{p}g(a_Y) + \gamma\bar{p}a_Yg'(b_X) < 0$. Hence, $\partial V^b / \partial b_X$ is decreasing in z_D and, therefore, bounded below by the value at $z_D = 1 - \gamma\bar{p}^2$, the maximum feasible value for z_D . Substituting and simplifying in $\partial V^b / \partial b_X$, it is sufficient to show

$$\bar{p}^2 - \bar{p}(1 - \gamma\bar{p}^2)g(a_Y) + g(a_Y)^2 + 2g(a_Y)b_X + \bar{p}(1 - \gamma\bar{p}^2)a_Yg'(b_X) - \gamma\bar{p}a_Yg(a_Y)[g(b_X) + b_Xg'(b_X)] > 0.$$

We claim this expression is increasing in γ . Differentiating with respect to γ , we need to show

$$\bar{p}^2g(a_Y) - \bar{p}^2a_Yg'(b_X) - a_Yg(a_Y)[g(b_X) + b_Xg'(b_X)] > 0.$$

This last expression is positive at $b_X = 0$ since $\bar{p}(\bar{p} - a_Y)g(a_Y) > 0$ and it is increasing in b_X since, differentiating with respect to b_X , we have

$$-\bar{p}^2a_Yg''(b_X) - a_Yg(a_Y)[2g'(b_X) + b_Xg''(b_X)] > 0.$$

Thus, we have shown the sufficient condition is increasing in γ .

As a result, the sufficient condition is bounded below by the value at $\gamma = 0$ and, in turn, it is now sufficient to show

$$\bar{p}^2 - \bar{p}g(a_Y) + g(a_Y)^2 + 2g(a_Y)b_X + \bar{p}a_Yg'(b_X) > 0$$

for $b_X \in [0, e]$ and $a_Y \in [0, \bar{p}]$. Observe that this last condition is increasing in \bar{p} since, by differentiation in \bar{p} , we have $2\bar{p} - g(a_Y) + a_Yg'(b_X) > 0$, as follows from $g'(b_X) \geq -1$ for $b_X \leq e$. Hence, $\bar{p} = 0$ provides a lower bound for the sufficient condition and we need only show $g(a_Y)^2 + 2g(a_Y)b_X > 0$,

which clearly holds. We have thus established that V^b is increasing in b_X for $b_X \in [0, e]$ and that a best response by B will necessarily involve an action above e .

Existence of Equilibrium: we provide a simple pure-strategy existence result. To begin, note that the players have symmetric best-responses to extreme choices. It is straightforward to verify that the best-response of A to $b_X = 0$ is $a_Y = \bar{p}$ and, similarly, that the best-response of B to $a_Y = 0$ is $b_X = \bar{p}$. At the other extreme, the best response of A to $b_X = \bar{p}$ is interior and solves the first-order condition

$$0 = \left(\frac{\partial U^a}{\partial a_Y} \right) \Big|_{b_X = \bar{p}} = 1 - z_D + \gamma \bar{p}^2 z_D g'(a_Y).$$

Similarly, in response to $a_Y = \bar{p}$, the best-response problem for B is identical to that of A once we substitute $a_Y = \bar{p}$ in V^b .

As noted above, U^a is concave and A has a continuous best-response function that always exceeds e and is characterized by the unique solution to the first-order condition at any $b_X \in (0, \bar{p}]$, with $a_Y = \bar{p}$ in response to $b_X = 0$. It can be shown that A 's best response is decreasing in b_X for $b_X \in [0, e]$ but this need not hold at larger b_X values.

The complication with B is that V^b is not necessarily concave. If we make the stronger assumption on g that

$$\bar{p}(z_D - \gamma e \bar{p}) g''(t) < -2 + \gamma e \bar{p} g'(t)$$

holds for $0 \leq t \leq \bar{p}$, then V^b is concave, as is easily verified from the above expression for $\partial^2 V^b / \partial b_X^2$. As a result, B now has a continuous best-response function, characterized by the solution to the first-order condition. We know from above that every best response of B is above e .

It follows directly from continuity and the common values of A and B in response to 0 and \bar{p} that the best-response functions cross each other and an equilibrium exists. ■