Coordination in Bureaucratic Policy-Making*

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Abstract

Many public policies rely on multiple agencies, raising the question of how agencies with overlapping policy responsibilities coordinate their decisions. We consider a model of coordination in which a political executive can provide subsidized coordination between two agencies and consider how this possibility affects both the agencies' incentives and, ultimately, social welfare. Our model of subsidizing coordination is very simple: an executive can invest her own resources in a *coordination protocol* that the agencies can (but need not) use to align their decisions. We consider the impact of scarce attention at the agency level and demonstrate that, while coordination between the agencies is maximized by the agencies having aligned policy preferences, the fact that the executive can invest in the coordination protocol undermines these incentives.

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> The Interior Department is in charge of salmon while they're in freshwater, but the Commerce Department handles them when they're in saltwater. I hear it gets even more complicated once they're smoked.
>
> — Former President Barack Obama, *2011 State of the Union address*

> The Federal government's need for a uniform set of principles on the question of the use of tests and other selection procedures has long been recognized. The Equal Employment Opportunity Commission, the Civil Service Commission, the Department of Labor, and the Department of Justice jointly have adopted these uniform guidelines to meet that need, and to apply the same principles to the Federal Government as are applied to other employers.
>
> — *Uniform Guidelines On Employee Selection Procedures*[1]

1 Coordination in Bureaucratic Policy-Making

In terms of how the state affects the daily lives of its citizens, most policy-making is bureaucratic policy-making. Bureaucratic policy-making both reflects, and is often justified by, *expertise* (*e.g.*, Gailmard and Patty (2012*b*)). One important potential downside of relying on experts is that few, if any, people or agencies are "general experts." Rather, both individual expertise and most agencies' statutory authorities are domain-specific.

Meanwhile, many modern policy questions do not fit neatly into exactly one agency's jurisdiction (Herrera, Reuben and Ting (2017)). Examples of such questions range from the relatively mundane (*e.g.*, regulations governing the operation of garbage trucks) to the quite serious (*e.g.*, Hurricane Katrina in 2005, the 2010 Deepwater Horizon disaster, the 2014 Flint, Michigan water crisis, and the 2023 Norfolk Southern derailment in East Palestine, Ohio). The emergence of such issues on the national level has even prompted both overhauls of existing agencies (*e.g.*, the dismantling of the Mineral Management Service (MMS) following the Deepwater Horizon disaster), creation of new ones (*e.g.*, the Consumer Financial Protection Bureau (CFPB) after the financial crisis of 2007-08), and combinations of the two (*e.g.*, the Department of Homeland Security (DHS) following the September 11th, 2001 terrorist attacks).

Indeed, even implementing any given statute frequently requires coordination between multiple agencies. For example, at least five agencies were involved in drafting hiring guidelines to implement the Departments of Justice and Labor, the Equal Employment Opportunity Commission, the

[1] August 25, 1978, 43 FR 38297. The *Uniform Guidelines* were precipitated, in part, by the passage of Title VII of the Civil Rights Act of 1964 (Public Law 88–352, enacted July 2, 1964) and the amendments therein enacted in the Equal Employment Opportunity Act of 1972 (Public Law 92-261, enacted March 24, 1972).

Civil Service Commission (which has been succeeded in relevant part by the Office of Personnel Management), and the Office of Revenue Sharing, Treasury Department

Such major realignments of the administrative state are relatively rare. But the general issue at play in them — the need for coordination between agencies — is omnipresent. This has been recognized for many years, of course. In the United States, this is seen as early as the early New Deal (1933-1935). For example, prior to passage of the Federal Register Act in 1935,[2] the US Federal Government did not even have a central repository for its agencies' regulations. As the federal administrative state grew in size and complexity (largely mirroring the dynamics of society and the economy as a whole), legal and policy scholars observed that agencies had little incentive to coordinate their more quotidian policy choices, in spite of growing evidence that coordination failures could eventually produce *policy failures*.

This fact arguably led to the creation of agencies explicitly charged with coordinating other agencies' activities. Examples include the Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA), and the Department of Homeland Security (DHS). At the same time, some coordination problems are arguably "baked into" the structure of the executive branch of the Federal Government. For example, the National Transportation Safety Board (NTSB) and Federal Aviation Administration (FAA) have split, but overlapping, authority for air travel safety in the United States, the EPA and the Army Corps of Engineers have similarly complicated overlapping authority with respect to water pollution, and the list of agencies with overlapping authority in law enforcement is very long: legal scholars have identified multiple clear statutory sources of administrative overlap (*e.g.*, Marisam (2011)) and some have argued that such overlap can, in theory, allow agencies to police and/or lobby one another,[3] while others have argued that delegating shared authority to multiple agencies might serve Congressional interests in the separation of powers system embodied in the Constitution.[4] However, the broad consensus appears to be that coordinating policy decisions is generally costly to agencies, detracting from both their performance and accountability.[5]

1.1 Agency Coordination in Practice

The problem of agency coordination in the US Federal Government (and elsewhere) has been recognized by for over a century, but has only recently attracted sustained scholarly attention.[6] This is not surprising in some ways, given the unique nature of the bureaucracy in the constitutional

[2] 49 Stat. 500, enacted July 26, 1935.

[3] See, for example, DeShazo and Freeman (2005) and Biber (2009).

[4] See, for example, Moe (1989) and Lewis (2003).

[5] For example, see Freeman and Rossi (2012).

[6] Early works in this vein include DeShazo and Freeman (2005), Gersen (2006), O'Connell (2006), Katyal (2005), Bradley (2011), Doran (2011), Freeman and Rossi (2012), and Marisam (2013).

structure of the United States Federal Government. However, as governance has become more complicated and both the US Code (USC) and the Code of Federal Regulations (CFR) have each become larger and more complex, the relevance of the problem of inter-agency coordination has become more acture and apparent. Indeed, as this article was being written, the United States Supreme Court (SCOTUS) further muddied the relevant waters in *Loper Bright Enterprises v. Raimondo*[7], overruling the notion of "*Chevron* deference" established in *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.* (1984).[8] While our theory sets aside the question of judicial review,[9] the insights from our theory can be applied to considering the potential impacts of the *Loper* decision.

Agency Efforts. In his seminal study of bureaucracy, Wilson argued that formalization and centralization are common agency-level responses when facing uncertainty and/or external pressure (Wilson (2000)). Along these lines, Frumkin and Galaskiewicz (2004) explored the determinants of government agencies' internal management processes. Considering three measures of management — centralization of decision-making, formal record keeping, and departmentalization of responsibilities — Frumkin & Galaskiewicz find that government agencies tend to be more bureaucratized than non-governmental organizations[10] and that this tendency was stronger in agencies where individuals reported that the organization tends to pay attention to how other similar organizations operate ("mimetic isomorphism"). At the same time, Frumkin & Galaskiewicz also find that "there was no clear norm ... different institutional pressures were having different effects."[11] This heterogeneity is not surprising, given the wide array of problems that government agencies are tasked with (*e.g.*, Patty (2024)). Finally, Frumkin & Galaskiewicz also find that agencies in which individuals reported that the agency was subject to external oversight (such as licensing, accreditation, *etc.*) were more likely to use formalized and centralized procedures. Along the same lines, Krause and Park (2023) consider federal agencies' efforts to enforce equal employment opportunity (EEO) policy, a process that legally requires coordination between the agency in question and the Equal Employment Opportunity Commission (EEOC). Their empirical analysis supports the notion that formal coordination mechanisms ("coordinated reporting organizational arrangements") promote both efficient dispute resolution and perceptions of fairness within the agency.

[7] 603 U.S. __ (2024).

[8] 467 U.S. 837 (1984).

[9] For theories of judicial review of agency policy-making in the post-*Chevron*/pre-*Loper* regime, see Gailmard and Patty (2017) and Bils, Carroll and Rothenberg (2024).

[10] Specifically, they found that government agencies' processes tended to be more centralized, formally documented, and departmentalized than in firms and non-profit organizations.

[11] Frumkin and Galaskiewicz (2004), p. 303.

Executive Efforts. To the degree that coordination is required for policy success and/or re-election, the president has an incentive to promote coordination among agencies must also be considered in conjunction with the agencies' own coordination efforts. The executive can influence agency choices through various channels, including unilateral appointments (Hollibaugh and Rothenberg (2024)), consultation provisions (Meazell (2011)), inter-agency agreements (Farber and O'Connell (2017)), negotiated rule-making (Coglianese (2002)), or centralized White House reviews (Kagan (2001)). Historically, Congress has frequently acknowledged the President's unique role in coordination through the passage of various reorganization acts (Arnold (1998, 2009), Hogue (2012)).[12] Several presidents have appointed policy "czars" over the past century, beginning with President Woodrrow Wilson's appointment of Bernard Baruch to head the War Industries Board in 1916. In line with the arguments we present below, the War Industries Board was created by Congress at President Wilson's urging to begin coordinating public and private efforts for a national mobilization as World War I raged in Europe. Baruch was referred to in the press as the "industry czar," and the term was also used informally to describe several officials in President Franklin D. Roosevelt's cabinet during the New Deal and World War II. [13]

These efforts only accelerated after World War II. For example, President Richard M. Nixon appointed Jerry Jaffe as the Special Consultant to the President for Narcotics and Dangerous Drugs in 1971. This position was eventually codified by the bipartisan Anti-Drug Abuse Act of 1988,[14] which created the Office of National Drug Control Policy within the Executive Office of the President. The position exists to this day and is responsible for advising the president on, and coordinating agencies' organizational, budgetary, and personnel policies related to anti-drug policy efforts. Then, in July of 1973, President Nixon appointed John Love the Director of the Energy Policy Office, who was quickly referred to the nation's "energy czar." The 1973 oil embargo began shortly thereafter, at which point President Nixon appointed William Simon to replace Love as the Director of the newly created Federal Energy Office. In announcing the appointment and the creation of the new executive level agency, Nixon described Love's role as

> "...develop[ing] the necessary policies to meet what was then essentially a long-term problem which had important short-term consequences."[15]

While Love served only 5 months and Simon served only 6 months, the office and role was reified in statute by Congress with the creation of the Federal Energy Administration in 1974,[16] As

[12]Of course, Congress also plays a role in coordinating and designing agencies (Bressman (2007). The judiciary also clearly plays a role. Manning (1996) provides an excellent overview of this, though the recent *Loper Bright* decision mentioned above obviously makes these waters a good bit murkier now.

[13]See Randy James, September 23, 2009, "A Brief History of White House Czars" *Time*.

[14]Public Law 100–690, enacted November 18, 1988.

[15]President Richard M. Nixon, December 4, 1973.

[16]Federal Energy Administration Act of 1974 (Public Law 93-275, enacted May 7, 1974).

the energy crisis lingered throughout the 1970s, Congress went farther, creating the cabinet level agency, the Department of Energy, in 1977, consolidating several energy related agencies, such as the Federal Energy Administration, the Energy Research and Development Administration, and the Federal Power Commission.[17]

President Clinton created the Domestic Policy Council (DPC) in 1993, which still exists as of the time of this article's writing. Formally chaired by the president, the DPC's principal functions are described as follows:

1. to coordinate the domestic policy-making process;
2. to coordinate domestic policy advice to the President;
3. to ensure that domestic policy decisions and programs are consistent with the President's stated goals, and to ensure that those goals are being effectively pursued; and
4. to monitor implementation of the President's domestic policy agenda.

Furthermore, Clinton's Executive Order directed all agencies to "coordinate domestic policy through the Council."[18] The DPC consists of the heads of over a dozen Cabinet-level agencies and departments in the Federal Government.

Coordination Between Agencies. Presidential efforts to coordinate agency activities extend beyond the creation of "czars." Most such efforts have been focused on more specific policy decisions, as opposed to broad swaths of policy-making and policy outcomes. One example of such a coordination effort is the national program for greenhouse gas emissions and fuel economy standards for light-duty vehicles, which was jointly issued by the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) in 2010. The Obama administration explicitly directed the two agencies to work together to establish a coherent regulatory standard, which led to the creation of a joint rule that significantly reduced the transaction and compliance costs for both the auto industry and the agencies themselves. More broadly, President Obama also created the Interagency Climate Change Adaptation Task Force and required agencies to actively participate in it.[19]

Coordination Within Agencies. While our analysis is framed as considering coordination between two unitary, no agencies are actually monolithic unitary actors. Along these lines, Biber (2009) considers the challenges faced by agencies with multiple goals and Nou (2015) provides an

[17]The Department of Energy Organization Act of 1977 (Public Law 95-91, enacted August 4, 1977).
[18]Executive Order 12859, August 16, 1993.
[19]Executive Order No. 13,514 (Oct. 8, 2009).

excellent discussion of the understudied topic of *intra*-agency coordination. We do not delve too deeply into this fascinating topic in this article but, as we mention in the conclusion, we believe that the framework we develop could be leveraged to provide more insights into the role of agency structure and procedures in shaping both the substance and success of bureaucratic policy-making. With the substantive application of our theoretical framework described, we now turn to a quick overview of our theoretical findings.

1.2 An Overview of Our Theoretical Findings

Intuition might suggest that, to the degree that inter-agency coordination mutually benefits the agencies and the president *and* the president's cost of facilitating such coordination is not too large, the agencies would always prefer to have aligned policy preferences and the president will, to the degree required, help coordinate the agencies on the policy that both agencies prefer. One contribution of this paper is to show that, even if the president and agencies have common preferences over policy, this will generally *not* be the case. In particular, the possibility of presidential subsidy provides the agencies with a second-order incentive to prefer some *mis*alignment of their policy preferences. Moderate amounts of such misalignment of agency preferences essentially passes on the responsibility of coordination to the executive in equilibrium. This is essentially inescapable so long as the president prefers that the agencies successfully coordinate.[20] In order to consider the impact of this equilibrium incentive, we examine two institutional cases.

In the first case, the president can pick a "counterpart" agency for a given agency to coordinate policy with. In such a setting, the president always prefers to pick an agency with aligned incentives in the sense that the agencies share a common optimal policy choice and, furthermore, benefits most from choosing a counterpart with a strong *cardinal* preference for the agency-in-question's most-preferred policy. In the second setting, we consider any given agency's own preference over counterpart agencies. In this setting, the agency always wants its counterpart to have *moderate but ordinally-misaligned* preferences. By choosing an ordinally-misaligned counterpart, the agency induces the president to invest greater effort in helping the agencies coordinate. By choosing a counterpart whose policy preferences are not "too" misaligned with its own in cardinal terms, the agency provides some insurance in the (positive probability) case that the president's coordination efforts are unsuccessful and the agencies must endogenously coordinate policy-making on their own.

Finally, our theory indicates that even when the president is "unbiased" in policy terms (*i.e.*, he or she is indifferent between the possible policy outcomes and merely interested in the agencies successfully coordinating), he or she will generically benefit from using an "unfair" coordinating

[20]In game theoretic terms, the president has a *credible commitment problem* in our setting when he or she prefers that the agencies successfully coordinate.

device in which one of the agencies is more likely than the other to have its preferred-policy chosen when the president's coordination efforts are successful.

Our analysis utilizes two models of subsidized coordination. In our theory, the president knows the two agencies' policy preferences and, based on this, chooses how much to invest in a coordination protocol that coordinates agencies to a particular outcome with a fixed probability. This setup allows us to examine how the alignment of preferences between the agencies affects the executive's optimal level of subsidy. We then consider the impact of *scarce attention* at the agency level. This is consistent with our baseline notion that agency coordination uncertain in equilibrium and allows us to consider the president's induced preferences over the *fairness* of the coordination protocol, which we represent by the relative probabilities that each agency's most-preferred policy outcome is the result when the president's coordination efforts are successful. In this setting, we show how the agencies' incentives to extract more subsidy from the executive, coupled with the executive's incentive to choose a biased coordination protocol, lead to agencies being better off when misaligned with each other. Following the theoretical analysis, we explore the empirical implications of the model and conclude.

2 A Simple Model of Policy Coordination

Our baseline model of bureaucratic coordination is based on **the battle of the sexes game**, pictured in Figure 1. The parameter $\alpha \in (0,1]$, which we refer to as the **alignment** of the agencies' prefer-

	A	B
A	(α, 2-α)	(0, 0)
B	(0, 0)	(2-α, α)

Figure 1: A Family of Asymmetric Coordination Games ($\alpha \in (0,1]$)

ences, is the heart of our focus in this article.[21] As α increases, we say that agencies' preferences are more closely aligned and, if $\alpha = 1$, then we say that their preferences are completely aligned.

Equilibrium Analysis. If Agencies 1 and 2 each choose a policy without knowing what policy the other agency chooses,[22] there are three Nash equilibria of the game in Figure 1. Two of these are in pure strategies (both agencies choosing $a_i^* = A$ and both agencies choosing $a_i^* = B$). The third equilibrium involves both agencies randomizing between $a_i = A$ and $a_i = B$. Letting $\sigma_i \equiv$

[21]The case of $\alpha = 0$ is omitted, because there a continuum of Nash equilibria and, substantively, the game is no longer a coordination game in that case.

[22]In game theoretic terminology, the agencies are choosing policies "simultaneously," but the main point is that each agency is choosing its policy with uncertainty about what the other agency will and the knowledge that the other agency will also be uncertain about the policy the agency in question will choose.

$\Pr[a_i = A]$ denote the probability that agency i chooses policy A, this mixed strategy equilibrium is a function of α:

$$\sigma_1^*(\alpha) = \frac{\alpha}{2}, \qquad \text{and}$$
$$\sigma_2^*(\alpha) = \frac{2-\alpha}{2}.$$

For simplicity, we refer to this equilibrium profile simply as "the equilibrium," and take a slight detour to justify this focus.[23]

Equilibrium Selection. While the game pictured in in Figure 1 has three Nash equilibria, we focus on the mixed strategy equilibrium because it is **anonymous**. The agencies have conflicting preferences over the two pure strategy equilibria, so selecting/focusing on either of the pure strategy equilibria is equivalent to "picking a winner." This is unfortunate, of course, because each of these two equilibria are Pareto superior to the mixed strategy equilibrium. We focus on the mixed strategy equilibrium because it truly reflects the "problem" of coordination.

That said, note that our general analysis does not actually require that agencies must *always* be playing the mixed strategy equilibrium. We could incorporate more structure to allow for the agencies to sometimes have common knowledge which of the pure strategy equilibria will occur (*i.e.*, in the words of Schelling (1957), a positive probability that either of the two pure strategy equilibria is *focal*). For reasons of space, we do not do so in this article. Now we turn to one standard approach to coordination in coordination environments: pre-play communication.

2.1 Coordination & Pre-Play Communication

We are not the first to consider how to foster successful coordination in this type of setting. For example, Farrell (1987, 1988), Rabin (1994), and Farrell and Rabin (1996) incorporate an explicit communication stage in which the players can send cheap talk messages prior to making their simultaneous choices in the coordination game. It is known that such communication in this setting can only increase the probability of achieving one of the pure strategy equilibria. However, this probability depends on how the communication will take place: can both players send messages and if so, do they speak simultaneously or in sequence? If only one player can send messages, the theoretical effect on the probability of cooperation can be quite stark, while the effect is smaller when the two players talk simultaneously.

We agree with Rabin (1994) that the simultaneous messaging structure is unrealistic and, accordingly, suppose that the agencies take turns and send messages sequentially. While the messag-

[23] We thank an anonymous reviewer for pushing us to engage more with this point.

ing protocol is "cheap talk," sending a message is not necessarily free.[24] In line with our argument for focusing on the anonymous mixed strategy equilibrium in the absence of communication, we focus only on equilibria that are similarly anonymous.[25] We present a simple model of an alternating messages communication setting, applying recent results by He, Offerman and van de Ven (2019), in Appendix C. The three main takeaways from that analysis are as follows.

1. An anonymous equilibrium where the probability of coordination is equal to 1 can exist, but
2. The communication process in this equilibrium induces positive expected delay, and
3. This delay decreases in the alignment of the agencies' incentives, $\alpha \in [0, 1]$.

If one presumes that the delay from negotiations is costly to the president, the second conclusion suggests one reason that the president might prefer to use the type of "costly" coordination protocol we examine in this article.[26] Along these lines, the third point mirrors one of the main results of our analysis: the president would prefer that the two agencies have more aligned preferences.[27] Furthermore, this point implies that more misaligned agencies will find the negotiation process more costly themselves as well. Thus, in empirical terms, we believe that our analysis is most pertinent for such agencies. For example, referring to the example of the creation of the DHS in 2002, the misalignment of incentives between the agencies combined within the DHS was widely reported upon.[28] We now turn to the effect of alignment, α, in our baseline model and then turn to the full model of subsidized coordination.

2.2 Alignment and Coordination

Before moving on to a more detailed model setup, we present a proposition that is simple but key to our analysis. It states that coordination is more likely to be successful between agencies with more closely aligned preferences and maximized by agencies with completely aligned preferences.

Proposition 1 *The probability of coordination in the mixed strategy equilibrium is strictly increasing in $\alpha \in [0, 1]$.*

[24] In spite of messaging being costly, *per se*, the communication protocol is cheap talk because all messages are equally costly to send and leave the payoffs from the coordination game otherwise unaffected.

[25] Formally, we consider only equilibria in which, *conditional on coordination occurring*, each of the two possible coordination outcomes, (A, A) and (B, B), occurs with probability 1/2.

[26] In addition, our analysis can be thought of as a "black box" model of communication, subsidized by the president.

[27] Propositions 1 & 2.

[28] The 9/11 Commission's Final Report described counter-terrorism efforts within the FBI in the late 1990s as follows: "relevant information from the National Security Agency and the CIA often failed to make its way to criminal investigators. Separate reviews in 1999, 2000, and 2001 concluded independently that information sharing was not occurring..." (Kean and Hamilton (2004), p. 79.

The implications of Proposition 1 will appear multiple times in our subsequent analysis. In particular, because greater alignment promotes higher success rates in the coordination game between the agencies, it will also reduce the incentive to exert costly effort to augment this probability of success. One of the main conclusions from the analysis below is that, despite Proposition 1, the pair of agencies can have induced preferences for *greater misalignment*, because a third actor, whom we refer to as the "president," may be willing to provide greater subsidies to aid coordination between less closely aligned agencies. We now turn to this extension of the basic model.

2.3 Subsidized Coordination

We now suppose that there is a **president** P who (1) wants the agencies to successfully coordinate and (2) who can subsidize the agencies' efforts to coordinate by deploying a **coordination protocol**, denoted by $\pi \in [0,1]$, and invest effort in implementing the protocol, denoted by $c \in [0,1]$. For reasons of both space and robustness, we model (pre-play) coordination in a "black box" fashion. By choosing π, the president chooses the **fairness** of coordination and, by choosing c, the president chooses the **reliability** of implementation of coordination to the agencies.

Fairness of Coordination. The fairness of the protocol is directly characterized by the probability $\pi \in [0,1]$, which represents *the probability that the coordination protocol will recommend that the agencies coordinate on* A, and $1-\pi$ represents the probability that the protocol will recommend coordination on B. We refer to the protocol as being **fair** if and only if $\pi = {}^1/_2$. If the protocol is unfair ($\pi \neq {}^1/_2$), we refer to Agency 1 as **advantaged** if $\pi > {}^1/_2$ and Agency 2 as **disadvantaged** (the labels switch if $\pi < {}^1/_2$). Below, we allow the president to choose π (Section 3). However, in the baseline model analysis, we begin by assuming that π is exogenous and common knowledge.

Reliability of Coordination. While π represents the fairness of the coordination protocol, the protocol's reliability is a function of the president's unilateral investment in the protocol, the choice of which is denoted by $c \in [0,1]$.[29] The value c represents an investment in procedural policy instruments, ranging from developing new regulatory processes and practices that promote information sharing and inter-agency collaboration to more quotidian efforts to check in on and monitor the agencies' relevant decision processes.[30] For simplicity of discussion, we refer to P investing a positive amount, $c > 0$, into the coordination protocol as "bailing out" the agencies from their coordination problem. The direct cost to P of investing c is c^2. Given any investment $c \in [0,1]$,

[29] To keep matters transparent, the president chooses c after observing both α and π. Throughout, we assume that both π and α are common knowledge to the president and agencies once the agencies make their decisions.

[30] In line with the discussion in Section 2.1, one could interpret higher values of c as the president supporting more rounds of communication in pre-play communication between the agencies. For reasons of space, we leave the linkage of our analysis with such a micro-foundation for future work.

the probability of coordination *failure* is $1 - c$. When the coordination protocol fails, the agencies will play the mixed strategy equilibrium.[31]

Timing of the Game. The timing of information and decision-making is as follows.

1. The alignment value, α, and the coordination protocol, π, are made common knowledge.
2. P chooses a level of investment in coordination, $c \in [0, 1]$.
3. Policy-making by the agencies proceeds as follows:
   (a) With probability $1 - c$, the device fails, and the agencies play the mixed strategy equilibrium.
   (b) With probability $c \cdot \pi$, the device coordinates the agencies on A ($a = (A, A)$).
   (c) With probability $c \cdot (1 - \pi)$, the device coordinates the agencies on B ($a = (B, B)$).
4. The choices (a_1, a_2) are revealed, the game concludes, and players receive their payoffs.

Coordination and Coordination in the Administrative State. Examples of coordination protocols in the real world include presidential memoranda or policy directives sent to both agencies regarding how they should work together, including negotiated rulemaking (Coglianese (1997)). Of course, there are also many informal examples such as transactional and/or relational bargaining both within and across agencies (Carrigan and Coglianese (2011), Carpenter and Krause (2012, 2014)). Our analysis is largely independent of the formality/informality of the coordination protocol: the model of coordination in this article is both minimal/context-free and consistent with "noise" (*e.g.*, coordination failures). We now derive the president's incentives when choosing how much to invest in the reliability of any given coordination protocol, π.

2.4 Equilibrium Reliability

In the baseline model in which the fairness of the coordination protocol, π, is exogenous, we first consider P's incentives when choosing how much to invest, c, in the coordination protocol's

[31] A couple of technical notes are in order. First, we assume that, when the coordination protocol fails, this failure is common knowledge to the two agencies. Secondly, we are considering only equilibria in which neither player conditions on c or π when choosing policy after the message fails. Our equilibrium is indeed an equilibrium — these refinements are in the same spirit as our focus on the mixed strategy equilibrium in the absence of the president having a coordination protocol to use.

reliability. For any given protocol, π, P's equilibrium expected payoff depends on α and c:

$$EU_P^*(c \mid \alpha) = \underbrace{c}_{\substack{\text{Prob. successful}\\ \text{pre-play}\\ \text{coordination}}} + \underbrace{(1-c)}_{\substack{\text{Prob. failed}\\ \text{pre-play}\\ \text{coordination}}} \cdot \underbrace{\frac{\alpha(2-\alpha)}{2}}_{\substack{\text{Probability}\\ \text{of coordination}\\ \text{in MSNE}}} - \underbrace{c^2}_{\substack{\text{Direct cost}\\ \text{of coordination}\\ \text{reliability}}}. \tag{1}$$

P's optimal choice of reliability is thus

$$c^*(\alpha) = \frac{2 - 2\alpha + \alpha^2}{4}.$$

Notice that π is not included in P's payoff function. This is because we assume that P strictly gains from successful coordination but is otherwise indifferent on which outcome (A or B) the agencies coordinate. This simplifying assumption will allow us (in Section 3) to identify conditions under which an *unbiased* P will nonetheless benefit from using a biased coordination protocol (*i.e.*, one with $\pi \neq 1/2$). Our first main conclusion in this baseline model is that P's equilibrium payoff is increasing, and her equilibrium investment level is decreasing, in alignment, α. These are stated in the following proposition.

Proposition 2 *In equilibrium, P's investment in reliability, $c^*(\alpha)$, is strictly decreasing in the agencies' common alignment, α, and P's expected equilibrium payoff is increasing in α.*

Figure 2 illustrates $c^*(\alpha)$ and P's equilibrium expected payoff, $EU_P^*(\alpha)$, for $\alpha \in [0, 1]$. Intuitively, P's equilibrium payoff is increasing in the agencies' alignment, α. Also intuitive is that P's optimal investment, $c^*(\alpha)$, is decreasing in α. Put simply, the two agencies unambiguously gain from higher investment by P in the coordination protocol. While this effect on P's optimal investment $c^*(\alpha)$ is fairly straightforward, we will see below that this induces the agencies to not share the president's preferences for alignment (Proposition 3), in spite of the fact that they do share a common preference for successful coordination.

2.5 Agencies' Induced Preferences Over Alignment

Before extending the model to allow the agencies to have heterogeneous alignments, α_1 and α_2, we first take a short detour to consider what the agencies would the prefer for their (common) alignment, α, to be, given the supposition that P will invest $c^*(\alpha)$. Agency 1 and 2's equilibrium payoffs (*i.e.*, based on $c = c^*(\alpha)$), as a function of π, are contained in Appendix A. The following proposition illustrates that, while P is indifferent about π, *per se*,[32] the agencies are most assuredly

[32] Again, this is because we have assumed that, in terms of outcomes, P is purely interested in the agencies coordinating but is indifferent about which outcome they coordinate upon.

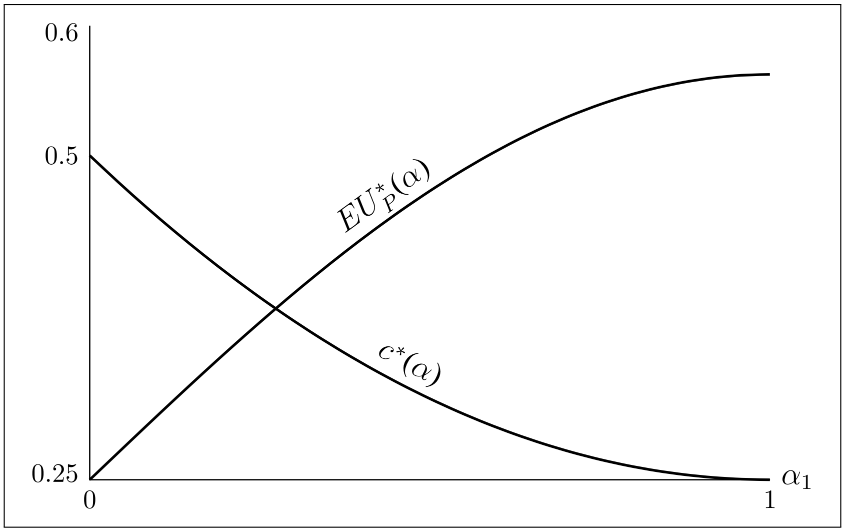


Figure 2: Optimal Fair Coordination Reliability as a Function of Alignment

not indifferent to π. Indeed, an unfair coordination protocol ($\pi \neq {}^1\!/_2$) induces one agency (the one "favored" by the protocol) to prefer some misalignment ($\alpha < 1$) and, in many cases, to most prefer *complete misalignment* ($\alpha = 0$).

Proposition 3 *For any given $\pi \in [0,1]$, Agency 1's equilibrium expected payoff with endogenous reliability is maximized by α^* defined by the following:*

$$\alpha^* = \begin{cases} 1 & \text{if } \pi \leq {}^1\!/_2, \\ \tilde{\alpha}(\pi) \in (0.8, 1) & \text{if } \pi \in ({}^1\!/_2, 0.629382), \\ 0 & \text{if } \pi > 0.629382, \end{cases}$$

where $\tilde{\alpha}(\pi)$ is a strictly decreasing function of π for all $\pi \in ({}^1\!/_2, 0.629382)$.[33]

Proposition 3 has several interesting implications about the agencies' induced preferences over alignment, α, and the fairness of the protocol, π.

Fair Coordination ⇔ Both Agencies Prefer Perfect Alignment. Note that the agencies mutually prefer perfect alignment ($\alpha = 1$) if and only if the coordination protocol is fair (*i.e.*, $\pi = {}^1\!/_2$). The sufficiency of a fair protocol for inter-agency agreement on alignment is not surprising. The necessity, however, is a little surprising: regardless of π, the agencies have a common interest in coordination for any alignment, α.

[33]For completeness, the function $\tilde{\alpha}(\pi)$ is the second root of $4 - 8p + (-2 + 12p)\alpha + (-3 - 6p)\alpha^2 + 2\alpha^3 = 0$; the upper bound of interval for π is the first root of $-53 + 130\pi - 108\pi^2 + 56\pi^3 = 0$.

Disadvantaged Agencies Prefer Alignment. Because the game is symmetric (the agencies share a common alignment, α, a supposition that we relax below), whenever Agency 1 prefers lower levels of alignment, Agency 2 strictly prefers perfect alignment ($\alpha = 1$), and vice-versa. Proposition 3 implies that, when the president can bail out the agencies in their coordination problem by investing c into the protocol, the agency who is *disadvantaged* by the coordination protocol prefers that the agencies have aligned preferences. Thus, Proposition 3 indicates a conflict of interests between the agencies whenever the coordination protocol is biased: the agency that is advantaged by a biased protocol would prefer to raise the stakes of successful coordination. *As π becomes more biased in favor of an agency's preferred outcome, that agency would prefer to have a larger payoff from its preferred outcome*.

Agency Preferences with Probabilistic Recommendations ($\pi \in (0,1)$). For many "unfair" coordination protocols,[34] the two agencies may disagree on whether alignment ($\alpha = 1$) is optimal. In fact, the preferences of the advantaged agency (in this case, Agency 1) over alignment, α, are non-monotonic. As an example, Figure 3 displays the agencies' equilibrium expected payoffs as a function of α for an unfair coordination protocol with $\pi = 0.6$.

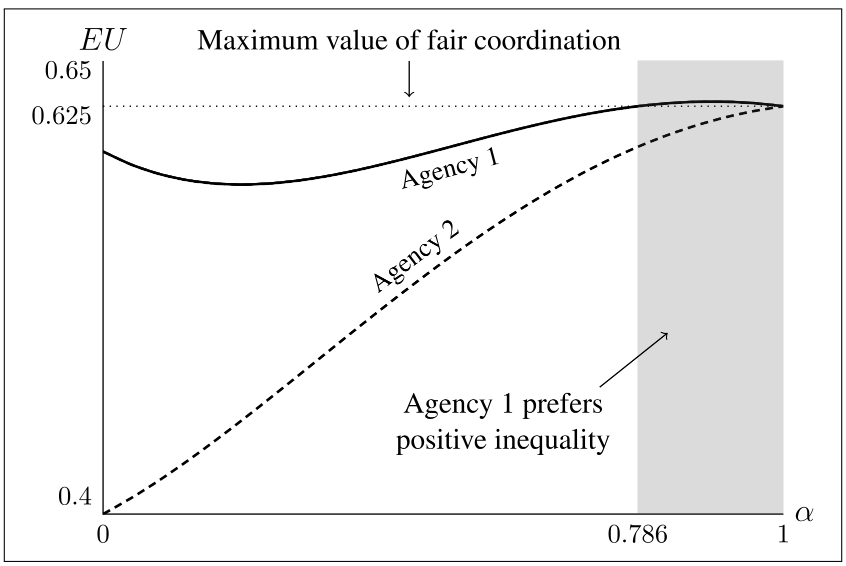


Figure 3: Preferences with Unfair Coordination
$\pi = 0.6$

In Figure 3, the coordination protocol's fairness is assumed to be $\pi = 0.6$, meaning that the coordination protocol is biased in favor of Agency 1. Interestingly, we observe that Agency 1 prefers $\alpha \in [0.786, 1)$ over perfect alignment ($\alpha = 1$). Agency 1 has strong incentives to induce more

[34] In this particular specification, moderately unfair coordination describes any $\pi \neq {}^1/_2$ that lies in the interval $(0.370618, 0.629382)$.

investment from the president (*i.e.*, $c^*(\alpha)$); this is because the coordination protocol is biased, as it will coordinate the agencies on the outcome that Agency 1 prefers. A small degree of misalignment is therefore beneficial for Agency 1 because it can induce more investment from the president while still ensuring a sufficient degree of coordination with Agency 2 in the mixed strategy equilibrium. Agency 2, however, always does better as the agencies are more closely aligned. Agency 2 has less to gain from the president's additional equilibrium investment because the protocol is biased. Therefore, Agency 2 prefers to simply maximize the chances that the agencies successfully coordinate, i.e., have perfectly aligned preferences.

In this regard, Proposition 3 provides one reason for P to prefer to use a fair coordination protocol rather than an unfair one: if agencies expect that P will use an unfair coordination protocol, then the agencies' induced preferences over α are no longer aligned, unlike when the coordination protocol is fair. If the agencies can shape their own preferences, then P has at least one reason to use a fair protocol ($\pi = {}^1\!/_2$). However, if alignment is exogenous, then P can benefit from an unfair coordination protocol when the agencies have different alignments, α_1 and α_2. We now turn to this extension, which also allows us to examine the agencies' incentives to align their own preferences.

3 Subsidized Coordination with Endogenous Fairness

We now extend the model to allow each agency $i \in \{1,2\}$ to value coordination on A and B respectively at $\alpha_i \in [0,2]$. This allows for our model to consider **Pareto-ranked coordination games**. If $\alpha_1 > 1$ and $\alpha_2 < 1$, then both agencies strictly prefer coordinating on A. These payoffs are displayed in Figure 4.

	A	B
A	(α_1, 2-α_2)	(0, 0)
B	(0, 0)	(2-α_1, α_2)

Figure 4: A Bigger Family of Asymmetric Coordination Games: $(\alpha_1, \alpha_2) \in (0,1]^2$

When $\min[\alpha_1, 2-\alpha_2] > 1$ or $\max[\alpha_1, 2-\alpha_2] < 1$, we refer to the agencies as **ordinally aligned**: they share a common ranking of the two coordination outcomes, A or B.[35] When the agencies are ordinally aligned, the equilibrium selection problem is arguably easier (*e.g.*, Pareto efficiency picks a unique outcome), and we will see shortly (Section 3.1) that P essentially recognizes this if she can choose the coordination protocol, π.

Importantly, we further relax the presumption that P knows that the agencies will observe the recommendation with certainty. Instead, we suppose that each agency $i \in \{1,2\}$ has a privately

[35]We omit the special case of $\alpha = (1,1)$ for reasons that will become clear in Section 3.1.

observed **cost of attention**, $\epsilon_i \geq 0$, which it must pay to observe the coordination protocol's recommendation. When this cost is sufficiently high, the agency will simply make policy using a mixed strategy without knowledge of the recommendation. We also assume that the upper bound of the distribution of ϵ_1 and ϵ_2, $k > 0$, is unobserved by P and distributed according to a CDF, $G : \mathbf{R}_+ \to [0,1]$ that assigns positive probability to k being sufficiently large to rule out observation in equilibrium: $G(k^*(\alpha,\pi)) < 1$, where $\alpha = (\alpha_1, \alpha_2)$.[36]

Timing of the Game. The timing of the extended game is as follows.

1. The alignment values, α_1 and α_2, are made common knowledge.
2. P chooses $\pi \in [0,1]$ and a level of investment in coordination, $c \in [0,1]$.
3. P's choices, π and c, are made common knowledge.
4. Each agency i privately observes $\epsilon_i \in \mathbf{R}$.
5. The agencies simultaneously choose whether to observe the recommendation, $\omega_i \in \{0,1\}$.
6. With probability $\omega_1 \cdot \omega_2 \cdot c \cdot \pi$, the device coordinates the agencies on A ($a = (A, A)$).
7. With probability $\omega_1 \cdot \omega_2 \cdot c \cdot (1-\pi)$, the device coordinates the agencies on B ($a = (B, B)$).
8. With probability $1 - \omega_1 \cdot \omega_2 \cdot c$, the agencies play the mixed strategy equilibrium.
9. The choices (a_1, a_2) are revealed and the players receive their payoffs:

$$v_i(\omega_i, a) = u_i(a) - \omega_i \cdot \epsilon_i \quad \text{for each agency } i \in \{1,2\}, \text{ and}$$

$$v_P(a, c) = \begin{cases} 1 - c^2 & \text{if } a_i = a_2, \\ -c^2 & \text{otherwise.} \end{cases}$$

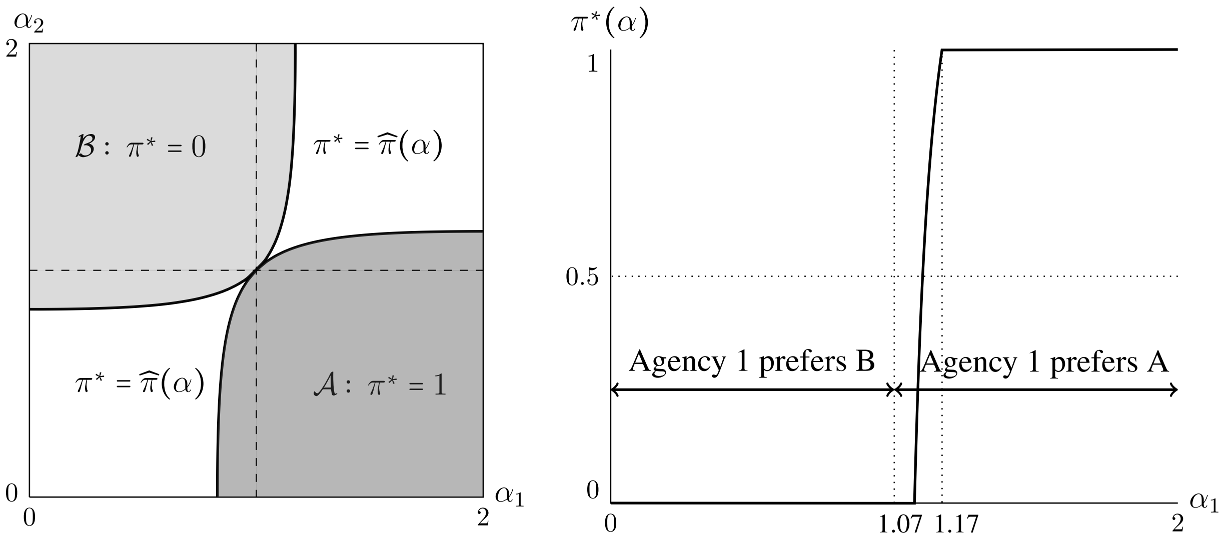
3.1 Equilibrium Coordination Fairness, π

If P can choose the coordination protocol, π, her optimal choice depends on $\alpha = (\alpha_1, \alpha_2)$. When the agencies' preferences are ordinally aligned, P prefers to use a degenerate coordination protocol that always recommends that the agencies choose their (mutually) most preferred coordination outcome.[37] This preference for a degenerate coordination protocol is retained for agency preferences that are not "too far from" ordinal alignment. This is illustrated in Figure 5a, below, which

[36] Note that we presume that, if $k < k^*(\alpha_1, \alpha_2, \pi)$, the agencies play the "complete attention equilibrium" with $\epsilon_i^* = k$ for both agencies $i \in \{1,2\}$. There is a continuum of subgame perfect Nash equilibria in this setting: we are focusing on the unique Pareto efficient equilibrium.

[37] Formally, P prefers $\pi^* = 0$ if $\max[\alpha_1, 2-\alpha_2] < 1$ and P prefers $\pi^* = 1$ if $\min[\alpha_1, 2-\alpha_2] > 1$.

identifies three qualitative regions. The lower right of the figure (dark gray) represents the alignments that P prefers that the protocol recommends the coordination outcome A, and the upper left of the figure (light gray) represents the alignments that P prefers that the protocol recommends the coordination outcome B. The remaining region (white) represents the alignments that prompt P to use a non-degenerate coordination protocol. This third region includes only situations in which neither of the coordination outcomes is uniquely Pareto efficient.



(a) Endogenous Fairness: Regions of π^*

(b) P's Optimal Choice of π ($\alpha_2 = 1.1$)

Figure 5: Equilibrium Fairness, $\pi^*(\alpha)$

In the third region, P's optimal protocol, $\hat{\pi}(\alpha)$, is locally sensitive to changes in the agencies' alignments, α. Specifically, defining the following function:

$$\widehat{\pi}(\alpha) \equiv \begin{cases} 1/2 & \text{if } \alpha_1 = \alpha_2 = 1, \\ \min\left[1, \max\left[0, \frac{1}{8}\left(\alpha_2 - \alpha_1 + \frac{1}{1-\alpha_1} - \frac{1}{1-\alpha_2} + 4\right)\right]\right] & \text{otherwise,} \end{cases} \tag{2}$$

the optimal protocol from P's perspective, as a function of α_1 and α_2 is:

$$\pi^*(\alpha) = \begin{cases} 0 & \text{if} \quad \widehat{\pi}(\alpha) < 0 \\ \widehat{\pi}(\alpha) & \text{if} \quad \widehat{\pi}(\alpha) \in [0, 1] \\ 1 & \text{if} \quad \widehat{\pi}(\alpha) > 1, \end{cases} \tag{3}$$

Figures 5a and 5b (each derived from Equation (2)) both correctly suggest that P's optimal protocol is fair ($\pi = 1/2$) if *and only if* $\alpha_1 = \alpha_2$. Similarly, Equation (2) implies that $\pi^*(\alpha)$ increases in α_1 and decreases in α_2. This is in line with the logic described above regarding the flat regions, $\mathcal{A}$ and $\mathcal{B}$. P optimally sets the fairness level of the protocol such that it favors coordination on the outcome favored by the agency i with the highest value of α_i.

Looking at the same problem from a different angle, Figure 5b illustrates P's optimal choice of π with respect to Agency 1's alignment when Agency 2's alignment $\alpha_2 = 1.1$, i.e., prefers outcome B over A but is sufficiently indifferent between the two outcomes. When $\alpha_1 \leq 1$, agencies are ordinally aligned. P thus always chooses $\pi^*(\alpha) = 0$ that coordinates agencies on outcome B. When α_1 is larger but sufficiently close to 1, P's optimal choice may be non-degenerate and increasing in α_1. Now the agencies are ordinally misaligned; P chooses a value of $\pi^*(\alpha)$ that coordinates the agencies on both outcomes, each with some positive probability. The probability that the agencies are coordinated on outcome A increases as Agency 1 more strongly prefers outcome A, and with sufficiently large α_1 ($\alpha_1 > 1.17$), P chooses $\pi^*(\alpha) = 1$.

We discuss the fairness of the president's optimal coordination protocol in Section 4.1. Before that discussion, we turn to the question of how much the president should invest in the coordination protocol's reliability, c.

3.2 Equilibrium Coordination Reliability, c

With the optimal coordination protocol, $\pi^*(\alpha)$, in hand, we can now derive the equilibrium level of investment. In this setting, P's expected payoff depends on $\alpha = (\alpha_1, \alpha_2)$, π, c, and k:

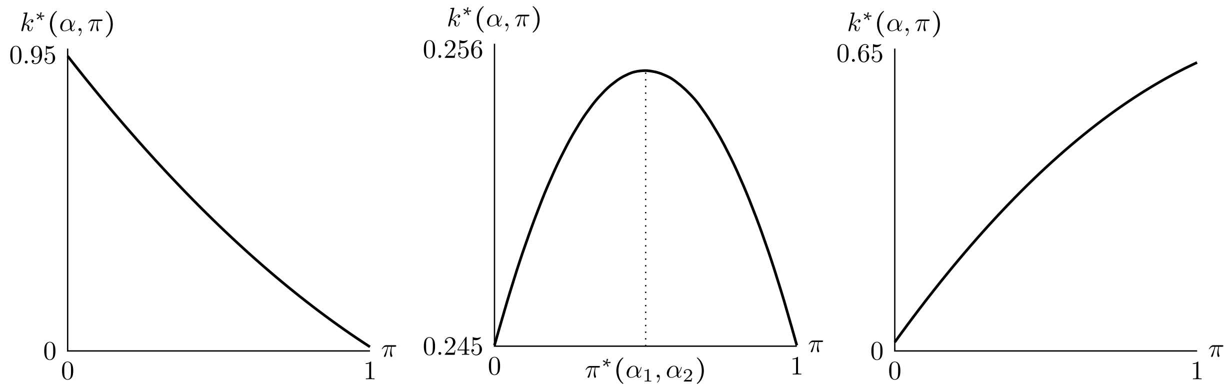
$$u_P(c \mid k) = \begin{cases} c + (1-c)\frac{\alpha_1(2-\alpha_2)+\alpha_2(2-\alpha_1)}{4} - c^2 & \text{if } k < k^*(\alpha,\pi), \\ \frac{\alpha_1(2-\alpha_2)+\alpha_2(2-\alpha_1)}{4} - c^2 & \text{if } k \geq k^*(\alpha,\pi). \end{cases}$$

Note that the investment cost, c, is lost regardless of whether coordination actually occurs, implying that P has a non-trivial trade-off when choosing c as long as P knows that there is a positive probability the agencies will pay attention to the protocol in equilibrium. Accordingly, the optimal investment in this setting will be some number in the interval $(0, c^*(\alpha))$, where $c^*(\alpha)$ is

$$c^*(\alpha) = \begin{cases} \frac{1}{4}(\alpha_1 + 2 - \alpha_2 - \alpha_1(2-\alpha_2)) & \text{if} \quad k < k^*(\alpha,\pi) \\ 0 & \text{if} \quad k > k^*(\alpha,\pi). \end{cases} \tag{4}$$

Because investment is always costly but useful only if $k < k^*(\alpha, \pi^*(\alpha))$, the exact value of the optimal investment in this setting will (intuitively) depend on the distribution of k: the optimal investment will be an increasing function of $G(k^*(\alpha, \pi^*(\alpha))) \in (0,1)$.

The three panes of Figure 6 display the maximum cost of attention $k^*(\alpha,\pi)$ the agencies are willing to incur, given their alignments. P's objective is to choose a value of π that maximizes $k^*(\alpha,\pi)$, as this would maximize the chances that agencies observe the recommendation. When agencies are aligned, P always recommends the outcome that both agencies prefer; P's optimal choice of π is therefore either 0 or 1 (see Figure 6a). P will find it optimal to choose an interior



(a) α_1 = 0.25 (b) α_1 = 1.1 (c) α_1 = 1.75

Figure 6: Maximum Cost of Attention that Agencies are Willing to Incur, $\alpha_2 = 0.9$

value of π only if the agencies are misaligned and neither agency strongly prefers one outcome over another.[38] Figure 6 illustrates two other general properties:

- agencies are less willing to pay attention as they become more indifferent to the two outcomes (see Figure 6b), and
- given that (*i.e.*, $k < k^*(\alpha,\pi)$), both agencies pay full attention: accordingly, P's optimal choice of reliability $c^*(\alpha)$ is the same as in Section 2.4.

Viewed more broadly, Figure 6 implies that the attention problem affects the agencies' payoffs only through its effect on P's choice of fairness. We detail how her choice of fairness $\pi^*(\alpha)$ changes with respect to different alignment values in Appendix B.1. We now turn to the question of who P and the agencies, respectively, would choose the alignment given the equilibrium paths (including P's choice of π and c) for every pair of alignments.

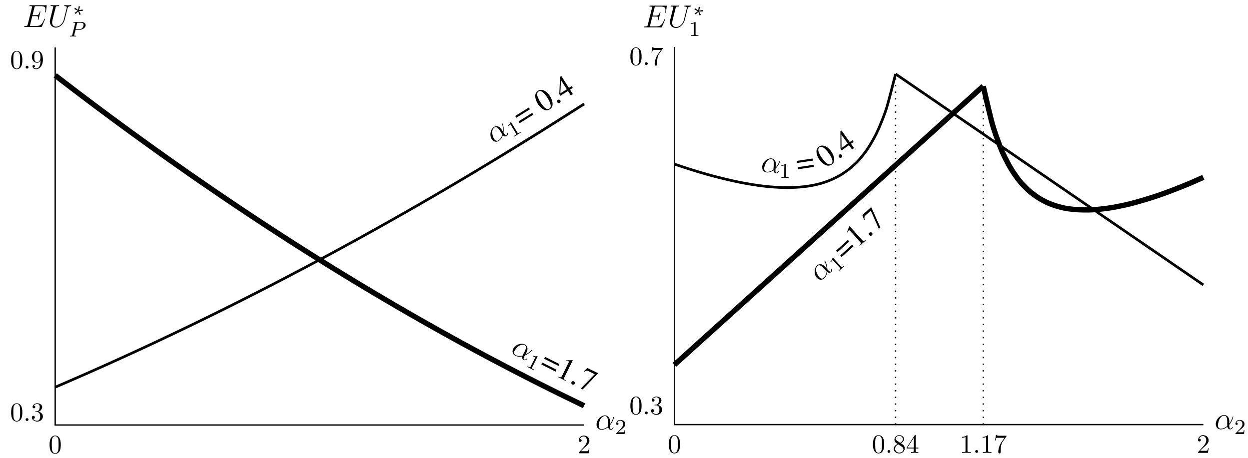
3.3 Choosing Agencies to Coordinate

In this section, we examine both P and Agency 1's induced preferences over the alignment between Agency 1 and Agency 2.[39] Specifically, we suppose that Agency 1 must be involved in policy-making, with an exogenous and known alignment, $\alpha_1 \in [0,1]$. We then consider which agency P and Agency 1, respectively, would choose as the "Agency 2" to work with Agency 1. The main substantive finding of this analysis is that Agency 1 and P would choose a different counterpart agency to serve as Agency 2. This conclusion is illustrated in Figures 7a (showing P's induced

[38] If either agency has sufficiently strong preferences for one of the two outcomes, then P will find it optimal to use a degenerate coordination protocol - see Figure 6c.

[39] Because of the symmetry of the problem, Agency 1's preferences about Agency 2's alignment, α_2, mirror Agency 2's preferences over Agency 1's alignment, α_1.

preferences over the alignment of Agency 2, α_2) and 7b (showing Agency 1's own preferences over α_2).



(a) Principal's Equilibrium Payoff

(b) Agency 1's Equilibrium Payoff

Figure 7: Induced Preferences Over α_2, Given α_1 ("Perfectly Aligned": $\alpha_2 = 2 - \alpha_1$)

Figure 7a illustrates that P's expected payoff is maximized by choosing the agency with policy preferences that are "most highly aligned" with Agency 1 (*i.e.*, the agency $j \neq 1$ with the largest alignment value, $2 - \alpha_j$), *regardless of* Agency 1's alignment value, α_1. P's preferences are straightforward; she always wants agencies to be ordinally aligned, and conditional on alignment, she wants an agency to have a very strong preference toward an outcome. The idea behind this is that P wants to maximize the probability that agencies coordinate via the mixed strategy equilibrium as opposed to through the pre-play coordination device in order to minimize the cost of investment $c^*(\alpha)$. This is visualized in Figure 7a. When $\alpha_1 = 1.7$, P is best off when $\alpha_2 = 0$, in other words, when Agency 2 prefers outcome B and prefers it to the strongest possible degree. Similarly, when $\alpha_1 = 0.4$, P prefers $\alpha_2 = 2$.

Conversely, when Agency 1 is in charge of choosing its counterpart, Agency 1 *always* wants the counterpart to be ordinally-opposed but sufficiently indifferent between the two outcomes. In spite of this being a coordination problem (and therefore, somewhat common value in nature), the agencies may have distinct preferences not only because they actually have differing preferences, but also because they have different marginal values from P's investment in the protocol, c^*, and these marginal values are themselves sensitive to the exact values of the alignments, $\alpha = (\alpha_1, \alpha_2)$. Two examples of this are illustrated in Figure 7b. The thick-lined curve portrays Agency 1's induced preference over Agency 2's alignment, α_2, when Agency 1 prefers coordination on outcome B ($\alpha_1 = 0.4$). In this scenario, Agency 1's expected payoff, conditional on Agency 2's alignment, α_2, given its own alignment is $\alpha_1 = 0.4$, is maximized by $\alpha_2 \approx 0.84$. Under such an alignment by Agency 2, given $\alpha_1 = 0.4$, the two agencies have ordinally-opposed alignments. The agencies are acting in anticipation of P's actions; sufficient misalignment between the agencies induces P to invest more in $c^*(\alpha)$. Similarly, even when Agency 1's relative preference for its preferred coordination outcome is stronger ($\alpha_1 = 1.7$), Agency 1's expected payoff, given its own alignment, $\alpha_1 = 1.7$, is maximized by $\alpha_2 \approx 1.17$.

This contrast between P's and Agency 1's induced preferences over alignment of Agency 2 highlights the importance of *who* gets to pick the agencies to coordinate. The following proposition summarizes this intuition.

Proposition 4 *Consider P and Agency 1's induced preferences over α_1 given α_2.*

- *P always prefers the agencies to be ordinally aligned. When $\alpha_1 \leq 1$, P chooses $\alpha_2^* = 2$; when $\alpha_1 > 1$, P chooses $\alpha_2^* = 0$.*

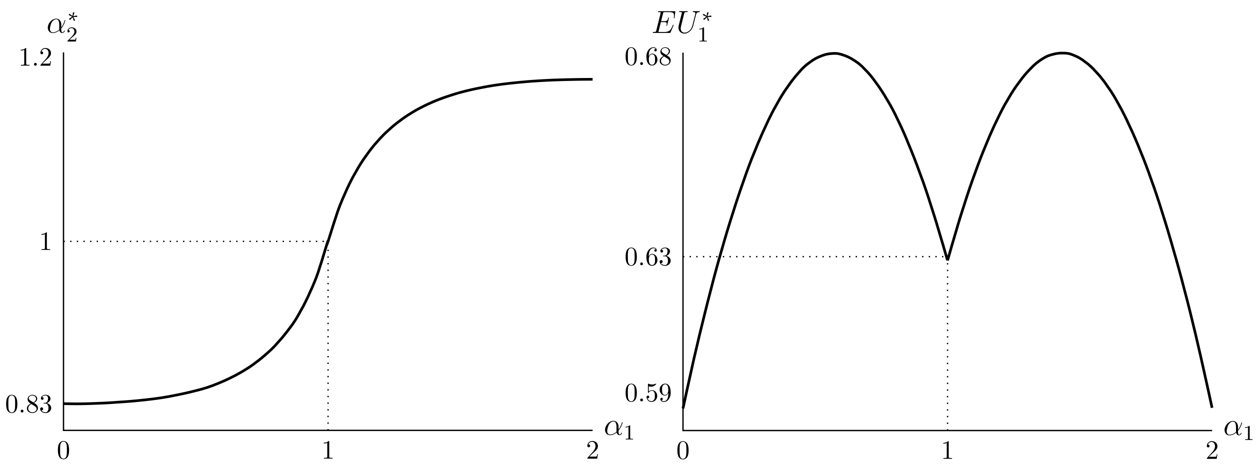
- *Agency 1 always prefers the agencies to be ordinally opposed. Its optimal choice α_2^* increases in α_1.*

Figure 8 illustrates the logic behind Proposition 4 in more detail. We observe from Figure 8a that given Agency 1's alignment α_1, it always chooses an agency that is misaligned in preferences since this induces more subsidy from P. However, Agency 1 doesn't want its counterpart to prefer the other outcome too much, as P would then set the coordination protocol to favor the other agency. In short, it optimally chooses an agency that prefers a different policy outcome but only prefers it mildly over the other. P in equilibrium invests more in c to coordinate the agencies (compared to the case where both agencies are ordinally-aligned) and sets fairness π such that favors Agency 1: this is the best possible scenario for Agency 1. Additionally, its optimal choice of α_2 increases in α_1.

Agency 1's equilibrium payoff given that it can pick "Agency 2" is depicted in Figure 8b. Somewhat surprisingly, Agency 1 is worst off with extreme preferences (α_1 is 0 or 2) even when it has the power to choose who to coordinate with. It might seem that Agency 1's chances of successful coordination will be maximized when it strongly prefers an outcome and chooses the other agency to be more or less indifferent between the outcomes, which would induce P to choose $\pi = 1$ in equilibrium. However, this is suboptimal for Agency 1 because with the given alignments the agencies can successfully coordinate on their own that P is discouraged from investing in reliability c to facilitate their coordination.

4 So Why Are there Organizational Divisions?

As mentioned in the introduction, the problem of policy coordination is well-recognized by policy-makers and scholars alike. This recognition in the United States is demonstrated by the regularity



(a) Agency 1's Optimal Choice of α_2^* (b) Agency 1's Equilibrium Payoff

Figure 8: Agency 1's Induced Preferences With Respect to Agency 2's Alignment, α_2

with which the federal government is reorganized. At least a casual reflection on periods of reorganization (*e.g.*, the advent of regulatory agencies in the late 19th/early 20th century, New Deal, demobilization after WWII, the Great Society, the creation of the EPA and OSHA in the 1970s, creation of DHS after 9/11 (Garicano and Posner (2005)), the reorganization of MMS following the Deepwater Horizon disaster) indicates the potency of policy failures to spur such efforts. Reogrnization efforts are costly and complicated, so that is not too surprising. However, as also alluded to in the introduction, formal divisions of authority remain quite common in the executive branch. For example, the Department of Labor (and OSHA, which is formally located within the Department of Labor) and the National Labor Relations Board (NLRB) have mutually overlapping policy responsibilities. However, the NLRB is an independent agency that, at least in in theory, is insulated from direct presidential control.

There are many theoretical reasons that such organizational divisions might emerge in equilibrium (*e.g.*, Aghion and Tirole (1997)). Here we focus on three that our theory might be seen as augmenting without directly addressing them: adverse selection, constraining executive power, and complementary expertise.

Adverse Selection. In some contexts, "successful coordination" by two agencies might be worrisome. Our theory omits concerns about *adverse selection* (Carpenter (2001, 2002), Gailmard (2002, 2022), Gailmard and Patty (2019*b*)). Specifically, the president's and agencies' policy preferences are common knowledge: the only uncertainty our theory addresses is that of *moral hazard*. The values of redundancy are a standard argument in favor of overlapping jurisdictions (*e.g.*, Ting (2002, 2003, 2008), Gailmard and Patty (2012*a*, 2013, 2019*a*)).

Concerns about moral hazard and/or adverse selection might induce Congress and/or the president to create two "pools of experts" with separate career incentives to help "audit" the recommendations of each agency (Battaglini (2002), Turner (2017), Patty and Turner (2021)). Such pools of experts exist in several forms in the US federal government, including advisory committees (Balla and Wright (2001), Steinbrook (2004), Lavertu and Weimer (2011)), inspectors general (Light (1993)), and — less formally — citizen groups and regulated interests (McCubbins and Schwartz (1984), Boehmke, Gailmard and Patty (2006)). None of these solutions are perfect, as the literature on "agency capture" illustrates (Bendor and Moe (1986), Laffont and Tirole (1991), Carpenter (2004), McCarty (2013)). Our theory sets these concerns to the side principally because our model does not include a "public" to whom the president and/or agencies should be accountable.

Constraining Executive Power. Particularly since the executive branch reorganization described and authorized by the Homeland Security Act of 2002,[40] scholars have become increasingly concerned with the potency of the executive branch, the degree to which it might infringe on civil liberties and, increasingly, worries about a "deep state" in which the structure and decision-making of bureaucrats is too insulated from political & electoral accountability. As presently developed, our theory has very little to say about these concerns because, in addition to not including the public in the model, the model also does not consider the career concerns or other motivations of individuals within each of the agencies (*e.g.*, Gailmard and Patty (2007), Patty and Penn (2020)).

Our theory is more closely related to a thread of the literature that argues that bureaucratic overlap might usefully *constrain* the president's powers. For example, Katyal argues that the normal checks and balances described in Article I, Section 7 of the US Constitution are largely ineffective in terms of empowering Congress to constrain presidential overreach (particularly after a statute has already been enacted). Instead, Katyal argues that assigning overlapping missions to multiple bureaucratic agencies can be more effective in limiting overreach:

> "A well-functioning bureaucracy contains agencies with differing missions and objectives that intentionally overlap to create friction. Just as the standard separation-of-powers paradigms (legislature v. courts, executive v. courts, legislature v. executive) overlap to produce friction, so too do their internal variants." (Katyal (2005), p. 2317)

Katyal is aware of the downside of coordination problems, of course, acknowledging that

> "when there is no neutral decision-maker within the government in cases of disagreement, the system risks breaking down." (Katyal (2005), p. 2317)

We believe our theory is consistent with Katyal's argument, albeit without considering the separation of powers issues and accountability challenges raised by institutional design reforms.

[40]Public Law 107–296, enacted November 25, 2002

Specifically, our theory indicates situations in which the president will find it optimal to *not* assist/subsidize agencies' coordination efforts (Equation (4), when $k > k^*(\alpha, \pi)$). Our parameter k effectively represents "all of the other things that agencies need to do": higher values imply that the agency is likely to be too busy to pay attention to the president's coordination efforts. The effect of k in our argument is similar to Katyal's implementation proposals (Katyal (2005), pp. 2235–42), which rely on reporting requirements to provide transparency and increase the costs of presidential meddling in bureaucratic decision-making and negotiation between agencies.

Complementary Expertise. Our theory is purposely agnostic about why the two agencies must coordinate on the policy decision in question. A traditional notion of why an agency of unelected civil servants is tasked with setting and/or enforcing policy in a given area is that these civil servants possess some expertise in the area in question. Of course, much expertise is task-specific (Gailmard and Patty (2007)), and as the opening quote from the *Uniform Guidelines* indicates, many public policies require multiple tasks, sometimes spanning the expertise and statutory jurisdiction of multiple agencies.

Unsurprisingly, this has been recognized for a long time. We believe that one of the federal policy-making procedural innovations in the late 20th century — negotiated rulemaking — illustrates recognition of some of the broader points of our theory. Negotiated rulemaking emerged in the 1980s,[41] and is seen as central to both the perceptions and realities of modern administration, ranging from issues such as legitimacy (Freeman and Langbein (2000), Patty and Penn (2014)) to policy areas such as education (Holley-Walker (2007)), the environment (Owen (2023)), and transportation (Wiseman (2017)). Our theory is too thin to really engage with the debates about the efficacy of negotiated rulemaking as a coordination device, but it is clearly an example of a procedural innovation driven at least in part to increase coordination between agencies. In this vein, our theory indicates that the desire by the president for agencies to actually engage in negotiated rulemaking (which is essentially voluntary) is higher when the agencies in question have misaligned incentives. This possibly raises an explanation for the mixed empirical assessment of negotiated rulemaking's empirical efficiency (see the discussion between Coglianese (1997, 2000), Harter (2000), and Freeman and Langbein (2000)): negotiated rulemaking is arguably costly and, without extrinsic "carrots and sticks," it is not clear why the agencies that most need negotiated rulemaking — agencies with less well-aligned interests — would find it in their own interest to essentially subsidize this kind of coordinating device *if the president is a potential subsidizer of these efforts as well*.

[41] Negotiated Rulemaking Act of 1990, Public Law 101-648, enacted Nov. 29, 1990.

4.1 Endogenous Inequality

In our model, the president and agencies all benefit from inter-agency coordination and have common preferences over policy. Our theory shows how these incentives to maximize coordination can ironically prompt the agencies to select themselves into a higher degree of latent inequality. In addition, the theory indicates that a president faced with sufficiently misaligned agencies may also endogenously choose an unfair coordination protocol. We discuss each of these conclusions and the logic behind them.

Agency Incentives to Create Misalignment. The possibility of a presidential subsidy creates a second-order incentive for the agencies to be initially misaligned in preferences with one another. When an agency is given the opportunity to choose its counterpart, we expect to observe the agency to *always* choose a partner with different policy preferences; this is because the agency acts in anticipation of the president's coordination effort. By intentionally increasing the latent inequality between the agencies, the agency encourages the president to invest in the protocol, thereby maximizing the ex-post probability of coordination. The agency essentially passes the responsibility of facilitating coordination onto the president.[42]

Unfair Coordination Protocols. Our theory indicates that the president's optimal coordination protocol is almost always "unfair" in the sense that it privileges one of the two outcomes, A or B, unless the agencies preferences over the two coordination outcomes are identical aside from the fact that they are opposed (*i.e.*, $\alpha_1 = \alpha_2$). An unfair coordination protocol is optimal for the president only when the agencies are ordinally misaligned and have the option to not observe the president's recommendation. This possibility of scarce attention induces the president to choose an unfair protocol such that maximizes the probability that the agencies observe the recommendation.

Recalling that the theory assumes that the president is *per se* indifferent between coordination on A and coordination on B, this theoretical conclusion demonstrates a challenge when inferring the president's priorities from his or her choice of coordination protocol. When the coordinating agencies have different cardinal preferences over the possible policy outcomes (A and B) *and* they must pay a cost to pay attention to the coordination protocol, the president will find it optimal to bias the coordination protocol to favor the policy that maximizes the sum of the agencies' payoffs (Figure 5a). In this setting, this will be indistinguishable from the president favoring the agency with the "strongest" preferences between the two coordination outcomes. Empirically, this might be reflected by a president who is otherwise indifferent between the two potential policies to draft

[42] We would be remiss to not recall the sign that President Harry S. Truman famously had on his desk, which read, "The buck stops here."

presidential memoranda, policy directives, or make staffing appointments that may seem as if she favors one agency over the other.

On a related note, this prediction of the theory is also roughly consistent with the president seeking to maximize the sum of the agencies' payoffs (*i.e.*, Benthamite welfare maximization), which is also closely to equilibrium selection/forward induction arguments such as *payoff dominance* (Harsanyi and Selten (1988)). This is not "why" the president finds it optimal to bias the coordination protocol in this setting, but this again illuminates an inferential challenge for scholars attempting to distinguish between different causal mechanisms that might guide presidential priority setting and centralization/coordination efforts.

5 Conclusion

Coordination problems are ubiquitous in bureaucratic policy-making. Accordingly, presidents are inevitably confronted with the task of persuading agencies to work together in pursuit of cohesive policy implementation. In this article, we have provided a game-theoretic explanation of how the alignment of preferences between the agencies changes both the level of effort that the president will exert in achieving coordination (*i.e.*, how "reliable" the efforts will be), the policy "bias" in the president's coordination efforts. (*i.e.*, how "fair" the efforts will be) optimal level of subsidy and, ultimately, how the president's incentives will affect agencies' preferences over the alignment of their interests with the agency that they are tasked with coordinating their policy efforts.

Substantively, the model yields several conclusions. First, even if the president and agencies have common preferences over policy, the possibility of presidential subsidy provides the agencies with a second-order incentive to prefer some misalignment over their policy preferences. This is because the possibility of miscoordination between agencies induces the president to invest in more subsidy to facilitate their coordination. Such incentives highlight the importance of who gets to pick the agencies to coordinate. When the president is given the power to pick a "counterpart" agency for a given agency to coordinate policy with, he or she always prefers an agency with ordinally aligned preferences; conversely, the given agency always prefers its counterpart to be moderate but ordinally misaligned. Lastly, we consider the president's induced preferences over the fairness of the coordination protocol and show that he or she generally benefits from an "unfair" coordinating device in which one of the agencies is more likely than the other to have its preferred-policy chosen.

There are several directions one could extend the model to address related questions. For example, the agencies' decisions are very black-boxed in the simple model we presented in this article. Questions of staffing (*e.g.*, Boehmke, Gailmard and Patty (2006), Patty and Penn (2020)) and investment in expertise (Gailmard and Patty (2007, 2017)) would be interesting explore when these decisions are foreseen as potentially affecting the agency's alignment with other agencies with whom they may be tasked to coordinate in the future. Similarly, it would interesting to consider how the possibility of these coordination efforts affects how voters and regulated interests should lobby legislators and how these legislators should respond to such efforts (Gordon and Hafer (2005, 2007)). Finally, a common link between the various extensions that we see as most interesting is that they extend the dynamic nature of the process modeled here (*i.e.*, the president commits to a coordination protocol prior to the agencies then playing a coordination game). There are many interesting and important phenomena one could include in more dynamic model, such as learning by the agencies and president (Carpenter and Ting (2007)), disasters (Ashworth, Bueno de Mesquita and Friedenberg (2018), Gailmard and Patty (2019*b*)), and agency capacity (Ting (2011), Turner (2020)). One of the appeals of leveraging a framework similar to the one we have presented in this article is that the coordination problem provides a natural way to capture notions such as endogenous uncertainty and/or policy failures.

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A Online Technical Appendix

In this section, we provide derivations and proofs for the claims made in the body of the article.

Proposition 1 *The probability of coordination in the mixed strategy equilibrium is strictly increasing in* $\alpha \in [0,1]$.

Proof: The probability of coordination in the mixed strategy equilibrium is

$$\frac{\alpha}{2} \cdot \frac{2-\alpha}{2} + \frac{2-\alpha}{2} \cdot \frac{\alpha}{2} = \frac{\alpha(2-\alpha)}{2}.$$

Its first partial derivative with respect to α, $1-\alpha$, is larger than 0; the probability is therefore strictly increasing in $\alpha \in [0,1]$. ∎

Proposition 2 *In equilibrium, P's investment in reliability, $c^*(\alpha)$, is strictly decreasing in the agencies' common alignment, α, and P's expected equilibrium payoff is increasing in α.*

Proof: Recall that P's equilibrium expected payoff depends on α and c:

$$EU_P^*(c \mid \alpha) = c + (1-c) \cdot \frac{\alpha(2-\alpha)}{2} - c^2.$$

With this in hand, it is simple to derive P's optimal reliability, $c^*(\alpha)$:

$$c^*(\alpha) = \frac{2 - 2\alpha + \alpha^2}{4},$$

which is decreasing in $\alpha \in [0,1]$, and P's corresponding equilibrium payoff is

$$EU_P^*(\alpha) = \frac{1}{16}\left(\alpha^2 - 2\alpha - 2\right)^2,$$

which is increasing in $\alpha \in [0,1]$. ∎

Proposition 3 *For any given $\pi \in [0,1]$, Agency 1's equilibrium expected payoff with endogenous reliability is maximized by α^* defined by the following:*

$$\alpha^* = \begin{cases} 1 & \textit{if } \pi \le 1/2, \\ \tilde{\alpha}(\pi) \in (0.8, 1) & \textit{if } \pi \in (1/2, 0.629382), \\ 0 & \textit{if } \pi > 0.629382, \end{cases}$$

where $\tilde{\alpha}(\pi)$ *is a strictly decreasing function of* π *for all* $\pi \in (\,^1\!/_2, 0.629382)$.

Proof: Agency 1's equilibrium expected payoff is

$$\frac{2-2\alpha+\alpha^2}{4}\cdot\pi\cdot(2-\alpha)+\frac{2-2\alpha+\alpha^2}{4}\cdot(1-\pi)\cdot\alpha+\left(1-\frac{2-2\alpha+\alpha^2}{4}\right)\cdot\alpha\cdot\frac{2-\alpha}{2}. \tag{1}$$

First, Equation 1 is increasing in α if $\pi < 1/2$. Therefore, Agency 1's equilibrium expected payoff is maximized at $\alpha = 1$. Second, this equation is decreasing in α if π is approximately larger than 0.727083.[43] Therefore, Agency 1's equilibrium expected payoff is maximized at $\alpha = 0$. Lastly, Equation 1 is decreasing then increasing then decreasing in α otherwise. Therefore, we need to consider two maximizer candidates: the second root of the first-order condition and $\alpha = 0$. It follows that the second root maximizes if π is approximately smaller than 0.629382 and $\alpha = 0$ maximizes otherwise. ∎

Proposition 4 *Consider* P *and Agency 1's induced preferences over* α_1 *given* α_2.

- P *always prefers the agencies to be ordinally aligned. When* $\alpha_1 < 1$*, she chooses* $\alpha_2 = 2$*; when* $\alpha_1 > 1$*, she chooses* $\alpha_2 = 0$.
- *Agency 1 always prefers the agencies to be ordinally opposed. Its optimal choice* α_2^* *increases in* α_1.

Proof: In order to prove the proposition, we first provide a detailed analysis of our extended model of subsidized coordination with endogenous fairness. In this version, we (1) allow the agencies to have different alignments, (2) incorporate agencies' privately observed attention cost $\epsilon_i \in R$ drawn from a Uniform$[0, k]$ distribution, and (3) allow the president to choose the fairness of the protocol π.

The Agencies' Incentives. Each agency makes two choices in the process, but we focus on the observation decision. The only restriction we are imposing on the agencies' choice of a_i is that the agencies play the mixed strategy equilibrium unless both agencies pay attention to the recommendation. We now turn to this decision.

[43] The exact value is $(3+2\sqrt{2\sqrt{3}-3})/6$.

Uniformly Distributed Costs of Attention. Supposing that ϵ_1 and ϵ_2 are each independently distributed according to the $\text{Uniform}[0,k]$ distribution for some fixed and known $k > 0$, Agency 1 should observe the recommendation if

$$\epsilon_1 \leq p_1^*(\pi,c)\cdot c^2\cdot\left(\pi\alpha_1+\left(1-\pi-\frac{\alpha_1}{2}\right)(2-\alpha_1)\right)\left(\left(\pi-\frac{\alpha_2}{2}\right)(2-\alpha_2)+(1-\pi)\,\alpha_2\right),$$

and Agency 2 should observe the recommendation if

$$\epsilon_2 \leq p_2^*(\pi,c)\cdot c^2\cdot\left(\pi\alpha_1+\left(1-\pi-\frac{\alpha_1}{2}\right)(2-\alpha_1)\right)\left(\left(\pi-\frac{\alpha_2}{2}\right)(2-\alpha_2)+(1-\pi)\,\alpha_2\right).$$

Thus, in any equilibrium, the agencies' cutoffs, ϵ_1^* & ϵ_2^*, must satisfy the following:

$$\begin{aligned}\epsilon_1^* &= \epsilon_1^*\cdot c^2\cdot\left(\pi\alpha_1+\left(1-\pi-\frac{\alpha_1}{2}\right)(2-\alpha_1)\right)\left(\left(\pi-\frac{\alpha_2}{2}\right)(2-\alpha_2)+(1-\pi)\,\alpha_2\right),\\ \epsilon_2^* &= \epsilon_2^*\cdot c^2\cdot\left(\pi\alpha_1+\left(1-\pi-\frac{\alpha_1}{2}\right)(2-\alpha_1)\right)\left(\left(\pi-\frac{\alpha_2}{2}\right)(2-\alpha_2)+(1-\pi)\,\alpha_2\right),\end{aligned}$$

There is always an equilibrium in which neither agency pays attention $(\epsilon_1^*,\epsilon_2^*) = (0,0)$. When a positive attention equilibrium exists, there is an equilibrium in which both agencies observe the recommendation with probability 1 (*i.e.*, $\epsilon_i^* = k$ for both $i \in \{1,2\}$). Such an equilibrium exists if and only if

$$k < k^*(\alpha,\pi) \equiv \frac{1}{4}\left((\alpha_1-2)^2+4(\alpha_1-1)\pi\right)\left(\alpha_2^2-4(\alpha_2-1)\pi\right).$$

The Principal's Optimal Fairness $\pi^*(\alpha)$. P's optimal protocol design is to maximize k^*. Note that k^* is a convex function of π if agencies are aligned, and a concave function of π if misaligned. $k^*(\alpha,\pi) > 0$ for all π. It follows that P's optimal design when agencies are aligned is

$$\pi^*(\alpha) = \begin{cases} 1 & \text{if} \quad \alpha_1 \geq 1, \alpha_2 < 1 \\ 0 & \text{if} \quad \alpha_1 < 1, \alpha_2 \geq 1. \end{cases}$$

When the agencies are misaligned, P chooses

$$\pi^*(\alpha) = \begin{cases} 0 & \text{if} \quad \widehat{\pi}(\alpha) < 0 \\ \widehat{\pi}(\alpha) & \text{if} \quad \widehat{\pi}(\alpha) \in [0,1] \\ 1 & \text{if} \quad \widehat{\pi}(\alpha) > 1 \end{cases}$$

where

$$\widehat{\pi}(\alpha) \equiv \begin{cases} {}^1\!/_2 & \text{if } \alpha_1 = \alpha_2 = 1, \\ \frac{1}{8}\left(\alpha_2-\alpha_1+\frac{1}{1-\alpha_1}-\frac{1}{1-\alpha_2}+4\right) & \text{otherwise.} \end{cases}$$

The Principal's Optimal Investment $c^*(\alpha)$. Conditional on α, π, and k, P's optimal investment is

$$c^*(\alpha) = \begin{cases} \frac{1}{4}(\alpha_1 + 2 - \alpha_2 - \alpha_1(2 - \alpha_2)) & \text{if } k < k^*(\alpha, \pi), \\ 0 & \text{if } k \geq k^*(\alpha, \pi). \end{cases} \quad (2)$$

Note that Equation 2 implies that $c^*(\alpha)$ is independent of π. This is for two reasons:

1. P is assumed to be focused only on maximizing the probability of successful coordination, independent of which of the two outcomes is achieved (*i.e.*, P is indifferent between (A, A) and (B, B)).

2. P's optimal choice of coordination protocol, $\pi^*(\alpha)$, is chosen to equalize the marginal impact of c on the equilibrium probability that Agency 1 will pay attention and its marginal effect on the equilibrium probability that Agency 2 will pay attention, because the two values are complements from P's perspective.

Second, as either agency's preferences become more aligned, P will in equilibrium invest less in coordination when either or both of the agencies are more aligned:

$$\frac{\partial c^*(\alpha)}{\alpha_i} < 0, \quad \text{for each } i \in \{1, 2\}.$$

Choosing "Agency 2." P's equilibrium expected utility is

$$c^*(\alpha) + (1 - c^*(\alpha))\frac{\alpha_1 + \alpha_2 - \alpha_1\alpha_2}{2} - (c^*(\alpha))^2. \quad (3)$$

Equation 3 is increasing in α_2 if $\alpha_1 < 1$. Therefore, $\alpha_2 = 2$ maximizes the utility. This equation is decreasing in α_2 if $\alpha_1 > 1$. Therefore, $\alpha_2 = 0$ maximizes the utility.

Agency 1's equilibrium expected utility is

$$c^*(\alpha)(\pi^*(\alpha)\alpha_1 + (1 - \pi^*(\alpha))(2 - \alpha_1)) + (1 - c^*(\alpha))\frac{(2 - \alpha_1)\alpha_1}{2}$$

Note that π^* is decreasing in α_2. First, suppose that $\alpha_1 < 1$. Then, the function displays the following features: decreasing in α_2 when $\pi^*(\alpha) = 1$; convex in α_2 when $\pi^*(\alpha) \in (0, 1)$; decreasing in α_2 when $\pi^*(\alpha) = 0$. Therefore, we need to consider two maximize candidates: the smallest α_2 such that $\pi^*(\alpha) = 0$ and $\alpha_2 = 0$. It follows that the maximizer is always the smallest α_2 such that $\pi^*(\alpha) = 0$. Formally, this is α_2 such that satisfies $\widehat{\pi}(\alpha) = 0$: i.e.,

$$\frac{(2 - \alpha_1)(2 - \alpha_1 - \sqrt{8 - (8 - \alpha_1)\alpha_1})}{2(\alpha_1 - 1)}$$

This is always smaller than 1 (ordinally opposed) and increasing in α_1.

Second, suppose that $\alpha_1 > 1$. Then, the function displays the following features: increasing in α_2 when $\pi^*(\alpha) = 1$; convex in α_2 when $\pi^*(\alpha) \in (0,1)$; increasing in α_2 when $\pi^*(\alpha) = 0$. Therefore, we need to consider two maximize candidates: the largest α_2 such that $\pi^*(\alpha) = 1$ and $\alpha_2 = 2$. It follows that the maximizer is always the largest α_2 such that $\pi^*(\alpha) = 1$. Formally, this is α_2 such that satisfies $\widehat{\pi}(\alpha) = 1$: i.e.,

$$\frac{2\sqrt{\alpha_1(4+\alpha_1)-4}}{\sqrt{\alpha_1(4+\alpha_1)-4}+\alpha_1}$$

This is always larger than 1 (ordinally opposed) and increasing in α_1. ∎

B Additional Illustrations of the Model

B.1 Incentive Compatibility in Costly Coordination

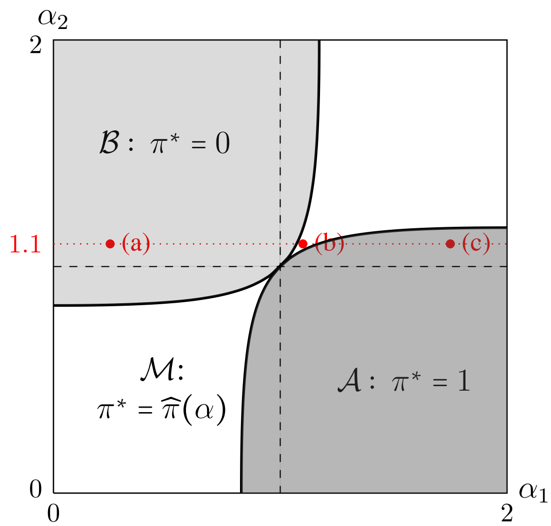
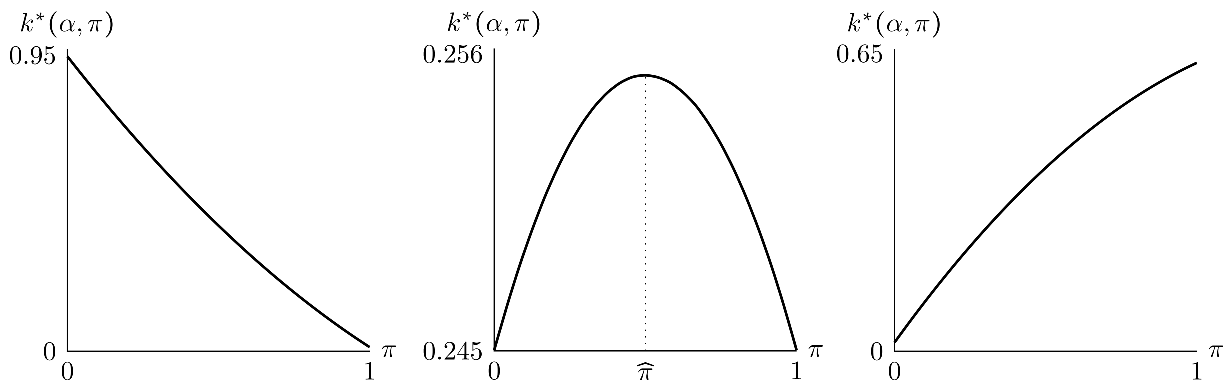


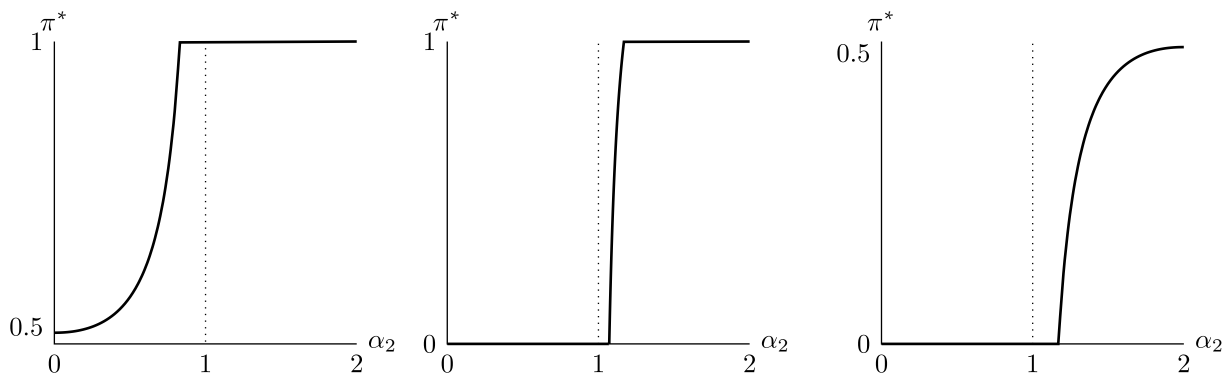
Figure B.1: Regions of π^*



(a) $\alpha_1 = 0.25$ (b) $\alpha_1 = 1.1$ (c) $\alpha_1 = 1.75$

Figure B.2: Maximum Cost of Attention that Agencies are Willing to Incur, $\alpha_2 = 1.1$

Figure B.2 illustrates the maximum costs of attention that agencies are willing to incur when $\alpha_2 = 1.1$, i.e., the red dotted line in Figure B.1. Each subfigure of Figure B.2 corresponds with the labels on the dotted line. Similarly, Figure B.3 denotes P's optimal choice of fairness $\pi^*(\alpha)$ given different alignment values. Note that when the agencies are aligned in terms of their preferences, P's choice is always degenerate. When they are misaligned, P may choose a non-degenerate $\pi^*(\alpha)$ or a degenerate value that favors an agency with a stronger preference. Given these values



(a) $\alpha_1 = 0.25$ (b) $\alpha_1 = 1.1$ (c) $\alpha_1 = 1.75$

Figure B.3: Principal's Optimal Choice of π

of $k^*(\alpha, \pi)$ and $\pi^*(\alpha)$, each agency's expected payoffs from its observation choice are as follows:

$$\begin{aligned}
EU_1(\omega_1 = 1) &= p_2^*(\pi, c) \cdot c \cdot (\pi\alpha_1 + (1-\pi)(2-\alpha_1)) + (1 - p_2^*(\pi, c) \cdot c)\frac{\alpha_1(2-\alpha_1)}{2} - \epsilon_1, \\
EU_1(\omega_1 = 0) &= \frac{\alpha_1(2-\alpha_1)}{2}, \text{ and} \\
EU_2(\omega_2 = 1) &= p_1^*(\pi, c) \cdot c \cdot (\pi(2-\alpha_2) + (1-\pi)\alpha_2) + (1 - p_1^*(\pi, c) \cdot c)\frac{\alpha_2(2-\alpha_2)}{2} - \epsilon_2, \\
EU_2(\omega_2 = 0) &= \frac{\alpha_2(2-\alpha_2)}{2}, \text{ and}
\end{aligned}$$

Thus, Agency 1 should observe the recommendation if

$$\begin{aligned}
\epsilon_1 &\leq p_2^*(\pi, c) \cdot c \cdot \left(\pi\alpha_1 + (1-\pi)(2-\alpha_1) - \frac{\alpha_1(2-\alpha_1)}{2}\right), \\
&\leq p_2^*(\pi, c) \cdot c \cdot \left(\pi\alpha_1 + \left(1 - \pi - \frac{\alpha_1}{2}\right)(2-\alpha_1)\right),
\end{aligned}$$

and, similarly, Agency 2 should observe the recommendation if

$$\begin{aligned}
\epsilon_2 &\leq p_1^*(\pi, c) \cdot c \cdot \left(\pi(2-\alpha_2) + (1-\pi)\alpha_2 - \frac{\alpha_2(2-\alpha_2)}{2}\right), \\
&\leq p_1^*(\pi, c) \cdot c \cdot \left(\left(\pi - \frac{\alpha_2}{2}\right)(2-\alpha_2) + (1-\pi)\,\alpha_2\right).
\end{aligned}$$

Thus, given p_2^*, Agency 1 will pay attention with probability

$$p_1^*(\pi_2^* \mid \pi, c) = F_1\left(p_2^*(\pi, c) \cdot c \cdot \left(\pi\alpha_1 + \left(1 - \pi - \frac{\alpha_1}{2}\right)(2-\alpha_1)\right)\right),$$

and, given p_1^*, Agency 2 will pay attention with probability

$$p_2^*(\pi_1^* \mid \pi, c) = F_2\left(p_1^*(\pi, c) \cdot c \cdot \left(\left(\pi - \frac{\alpha_2}{2}\right)(2-\alpha_2) + (1-\pi)\,\alpha_2\right)\right).$$

B.2 Defining $\mathcal{M}$, $\mathcal{B}$, and $\mathcal{A}$

Here we define the region of alignments, $\mathcal{M} \subset [0,1]^2$, in which P's optimal coordination protocol is locally sensitive to $\alpha \equiv (\alpha_1, \alpha_2)$. To do this, define the following intermediary regions:

$$\begin{aligned} X(\alpha) &\equiv \left\{\alpha \in [0,1]^2 : 2\alpha_1(\alpha_2 - 1) > (\alpha_2 - 2)\left(\alpha_2 + \sqrt{(\alpha_2 - 8)\alpha_2 + 8} - 2\right)\right\}, \\ Y(\alpha) &\equiv \left\{\alpha \in [0,1]^2 : 2\alpha_1\alpha_2 + \alpha_2\sqrt{\alpha_2(\alpha_2+4) - 4} + 4 < 2\alpha_1 + \alpha_2(\alpha_2 + 4)\right\}, \text{ and} \\ Z(\alpha) &\equiv \left\{\alpha \in [0,1]^2 : \alpha_2 + 2 \le 2\sqrt{2}\right\}. \end{aligned}$$

Then, $\mathcal{M}$ is defined by the following:

$$\mathcal{M} \equiv X(\alpha) \cap \left(Y(\alpha) \cup Z(\alpha)\right),$$

and the regions $\mathcal{B}$ and $\mathcal{A}$ are a partition of the complement of $\mathcal{M}$ in $[0,1]^2$:

$$\begin{aligned} \mathcal{B} &\equiv 2\alpha_1(\alpha_2 - 1) + \alpha_2\left(\sqrt{\alpha_2(\alpha_2+4) - 4} - 4\right) + 4 > \alpha_2^2, \text{ and} \\ \mathcal{A} &\equiv 2\alpha_1(\alpha_2 - 1) \le (\alpha_2 - 2)\left(\alpha_2 + \sqrt{(\alpha_2 - 8)\alpha_2 + 8} - 2\right). \end{aligned}$$

C A Strategic Communication Extension

In this appendix, we apply the results of He, Offerman and van de Ven (2019) — who consider one-sided and two-sided pre-play cheap talk communication — to our framework.

Suppose that the players know that they will eventually play the game displayed in Figure 1, for exogenous and commonly known $\alpha \in [0,1]$:

	A	B
A	(α, 2-α)	(0, 0)
B	(0, 0)	(2-α, α)

Prior to playing the game, however, the players can send messages to each other. For simplicity, we will suppose that the players can communicate using a restricted message space consisting of exactly two messages, $m \in \{A, B\}$. Following He, Offerman and van de Ven (2019) and other scholars (consider Farrell (1987, 1988), Rabin (1994), and Farrell and Rabin (1996)), we assume that these messages are endowed with intuitive meaning (and this is common knowledge between the players): message $m \in \{A, B\}$ corresponds to recommending the $a = (m, m)$ action profile. Finally, there is a third "message" that either player can send whenever it is their turn to send a message. We denote this message by $m = \varphi$, which corresponds to the player in question unilaterally terminating the communication stage and moving the players from the pre-play communication stage into the coordination game.

While the messaging protocol is cheap talk, communication is potentially costly.[44] Time is assumed to be discrete, across periods $t \in \{1, 2, \ldots, T\}$, where T is exogenous, common knowledge, and $T = \infty$ is possible. In each period t, exactly one player will be the sender in any given time period and the identity of the message sender in each period t is common knowledge at the outset of pre-play communication. Each message sent (other than $m = \varphi$) costs both players $\gamma \geq 0$. Thus, if communication takes n periods, the players final payoffs are as given in Figure C.4. A (possibly empty) ordered list of messages, $(m_1, m_2, \ldots, m_n)$ is a **conversation**. If the list contains only one element, $m_1 \in \{A, B\}$ or if $m_n = m_{n-1}$, then the conversation reached an **agreement**. If agreement is not reached, then the players are assumed to play the **focal** equilibrium, which in this case is the unique mixed strategy equilibrium of the game displayed in Figure 1 (see Assumption 1 in He, Offerman and van de Ven (2019)).

	A	B
A	$(\alpha - n \cdot \gamma, 2 - \alpha - n \cdot \gamma)$	$(-n \cdot \gamma, -n \cdot \gamma)$
B	$(-n \cdot \gamma, -n \cdot \gamma)$	$(2 - \alpha - n \cdot \gamma, \alpha - n \cdot \gamma)$

Figure C.4: Communication Game Payoffs, Given $n \in \{0, 1, \ldots\}$ Periods of Communication

Following He, Offerman and van de Ven (2019),[45] define the following thresholds:

$$\begin{aligned} \gamma_1 &= \frac{\alpha^2}{2}, \\ \gamma_2 &= \frac{(2-\alpha)^2}{2}, \text{ and} \\ \gamma_3 &= \min\left\{\frac{\alpha^2}{4}, \frac{(2-\alpha)^2}{6}, 2-\alpha\right\}. \end{aligned}$$

[44]In game theoretic terms, a messaging/signaling protocol is "cheap talk" if the cost of sending any given message is identical for all messages and independent of any other payoff relevant factors, even if the cost is positive.

[45]To make the comparison as clear as possible, note that the notation in He, Offerman and van de Ven (2019) reduce to the following within the framing presented in Figure 1:

	A	B
A	(b, a)	$(0, 0)$
B	$(0, 0)$	(a, b)

Notice that

$$\gamma_3 = \begin{cases} \frac{(2-\alpha)^2}{6} & \text{if } \alpha > 2 \cdot \sqrt{6} - 4 \approx 0.9, \\ \frac{\alpha^2}{4} & \text{if } \alpha \in (0, 2 \cdot \sqrt{6} - 4), \end{cases}$$

and, because $\alpha \in (0, 1]$,

$$\gamma_3 < \gamma_1 < \gamma_2.$$

"Pure Communication" Equilibria. We first consider SPNE in which players use deterministic ("pure") communication strategies. The only outcomes of the communication game that can be supported in a SPNE are as follows:[46]

1. *Immediate Concession (IC)*: Player 1 sends $m_1 = A$ and Player 2 ends the conversation ($m_2 = \varphi$), after which the players play (A, A). This equilibrium exists if and only if $\gamma \leq \gamma_1$.

2. *Immediate Demand (ID)*: Player 1 sends $m_1 = B$ and Player 2 ends the conversation ($m_2 = \varphi$), after which the players play (B, B). This equilibrium exists if and only if $\gamma \leq \gamma_2$.

3. *Delayed Demands (DD)*: Player 1 sends either message $m_1 \in \{A, B\}$, Player 2 sends $m_2 = B$, Player 1 responds with $m_3 = B$, Player 2 ends the conversation ($m_4 = \varphi$), after which the players play (B, B). This equilibrium exists if and only if $\gamma \leq \gamma_3$.

4. *Immediate Termination (IT)*: Player 1 immediately ends the conversation ($m_1 = \varphi$), after which the players play the mixed strategy equilibrium. This equilibrium — the only SPNE in which communication "fails" with positive probability — exists if and only if $\gamma \geq \gamma_1$.

Note that, because $\gamma_2 > \gamma_1 > \gamma_3$, the DD conversation is supportable in SPNE only if the IC and ID conversations are also each supportable in SPNE. Thus, when communication is sufficiently cheap ($\gamma \leq \gamma_1$), there are multiple SPNE that achieve policy coordination with certainty. If $\gamma > 0$, the DD equilibrium is inefficient, because it requires 3 rounds of communication, while the IC and ID equilibria each require only one round of communication. If $\alpha < 1$, Player 1 strictly prefers the ID equilibrium to the IC equilibrium. In spite of the fact that Player 1 moves first and strictly prefers ID to IC, the IC conversation is nonetheless an SPNE because Player 2's responses to Player 1 obviously play a role in whether Player 1 can "select" his or her preferred SPNE: this is because communication is two-sided. Accordingly, the equilibrium multiplicity problem is not set aside even if we accept the notion that the two-sided communication is exogenously structured.

Furthermore, if $\gamma \leq \gamma_1$, there is a "noisy communication" equilibrium in which the players essentially engage in a sort of war of attrition, probabilistically sending "demand" messages until one of the two players sends a conceding message. We now describe this equilibrium.

[46] This is simply a restatement of Proposition 1 in He, Offerman and van de Ven (2019).

"Noisy Communication" Equilibria. Define the following values:

$$\begin{aligned} q_1(\alpha,\gamma) &= \frac{1-\alpha}{1-\alpha+\gamma}, \\ q_2(\alpha,\gamma) &= \frac{2(1-\alpha-\gamma)}{2(1-\alpha)+\gamma}, \\ q(\alpha,\gamma) &= \frac{2(1-\alpha)-\gamma}{2(1-\alpha)+\gamma}, \text{ and} \\ T(\alpha,\gamma) &= \frac{\alpha^2-\alpha(\gamma+2)+\gamma^2+\gamma+1}{\gamma(\gamma-\alpha+1)}. \end{aligned}$$

If $\gamma \leq \gamma_1$, there exists an SPNE in which the players use a non-degenerate mixed strategy in the pre-play communication stage. In the first two rounds of communication of such an SPNE, the players mix between the demanding message ($m = B$ for Player 1, $m = A$ for Player 2) and the conceding message ($m = A$ for Player 1, $m = B$ for Player 2), placing probability $q_1(\alpha,\gamma)$ on their own demanding message. In the third period, Player 1 sends the demand message ($m_3 = B$) with probability $q_2(\alpha,\gamma)$. From the fourth period on, each player sends their demanding message with probability $q(\alpha,\gamma)$. The first player to send his or her conceding message will end the conversation with an agreement, and that player's less-preferred coordination outcome is then played with certainty by both players. The expected length of the conversation is $T(\alpha,\gamma)$ messages.[47]

Fact 1 *The expected delay in equilibrium, $T(\alpha,\gamma)$, is decreasing in both*

1. *the cost of communication, γ, and*
2. *the alignment of the agencies' interests, $\alpha \in [0,1]$.*

In this equilibrium, coordination is achieved (*i.e.*, an agreement is always reached) with probability 1, it is nonetheless an inefficient SPNE relative to the "immediate concession" and "immediate demand" pure communication equilibria described above, because coordination generally requires more rounds of communication. The probability that the noisy communication SPNE is efficient is the probability that Player 1 concedes in the first message, which occurs in this SPNE with probability $1 - q_1 = \frac{\gamma}{1-\alpha+\gamma}$. The immediate demand SPNE exists if and only if $\gamma \leq \gamma_2$.

When is Successful Coordination Associated with a Unique SPNE? Putting the details above together, there is a unique SPNE in which coordination occurs with probability 1 if and only if

$$\gamma_1 < \gamma \leq \gamma_2,$$

[47] He, Offerman and van de Ven (2019), Proposition 2.

or, equivalently,

$$\alpha < \sqrt{2 \cdot \gamma} \leq 2 - \alpha.$$

In these cases, the unique SPNE that guarantees successful coordination is the ID equilibrium, and Player 1 receives his or her most-preferred outcome in this equilibrium. Note that the range of communication costs γ for which there is a unique successful SPNE is decreasing in $\alpha \in (0, 1)$. However, note that Player 1's payoff in this region is

$$2 - \alpha - \gamma,$$

which is decreasing in α. Accordingly, if there is a unique SPNE in which coordination occurs with certainty, Player 1 has *preferences for misalignment* in this region, with his or her equilibrium payoff being maximized by

$$\alpha^*(\gamma) = 2 - \sqrt{2 \cdot \gamma},$$

which is, of course, decreasing in γ. This implies that the favored agency (*i.e.*, Agency 1) prefers greater misalignment as communication becomes *less* costly. On the other hand, Agency 2 has a preference for *greater* alignment in this SPNE.

Fact 2 *In equilibrium, the agencies' have opposed induced preferences over the alignment, α.*

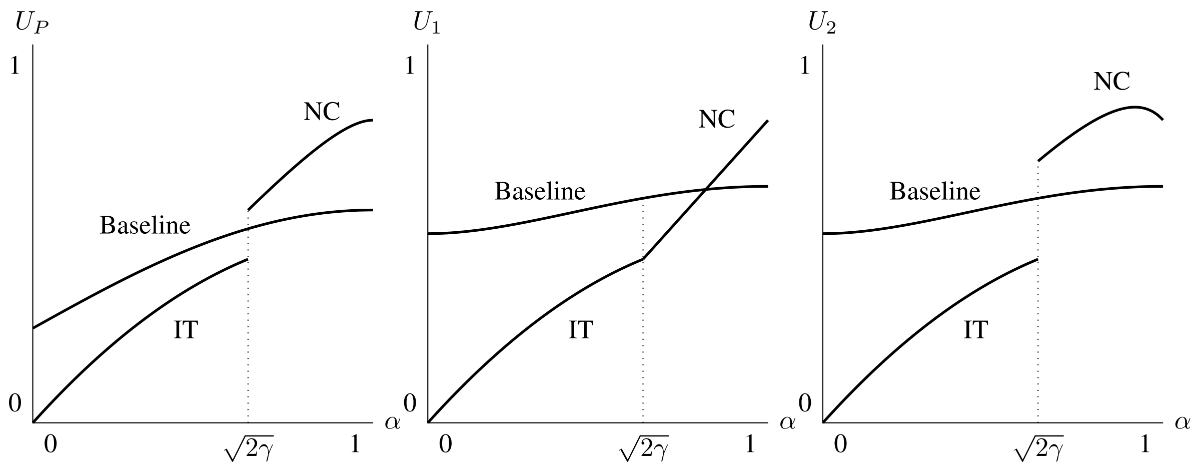
Comparing Coordination Approaches. Figure C.5 illustrates the president and the players' equilibrium payoffs in the baseline model and in the pre-play communication extension. First, we can clearly see that equilibrium multiplicity only disappears under pre-play communication when $\gamma > \gamma_2$. Further note that in this region, both the president and the players always prefer to play the baseline game over the pre-play communication game (blue line is always above the *Immediate Termination* line). This implies that pre-play communication does not solve the equilibrium multiplicity problem when the cost of delay is sufficiently small ($\gamma < \gamma_2$), and when it does solve it, both the principal and the players prefers to play the baseline game instead.

Agency 1's payoff in the Noisy Communication equilibrium is

$$(1 - q_1)\alpha + q_1(1 - q_1)(2 - \alpha) + q_1^2(1 - q_2)\alpha + q_1^2 q_2(1 - q)\left(\frac{2 - \alpha}{1 - q^2} + \frac{q\alpha}{1 - q^2}\right) - T\gamma,$$

which simplifies to

$$\alpha - \gamma.$$



(a) Principal

(b) Agency 1

(c) Agency 2

Figure C.5: Comparison of Payoffs ($\gamma = 0.2$)

Similarly, Agency 2's payoff in the Noisy Communication equilibrium is

$$(1-q_1)(2-\alpha)+q_1(1-q_1)\alpha+q_1^2(1-q_2)(2-\alpha)+q_1^2q_2(1-q)\left(\frac{\alpha}{1-q^2}+\frac{q(2-\alpha)}{1-q^2}\right)-T\gamma,$$

which simplifies to

$$\frac{(\alpha-1)\alpha+(\gamma-1)\gamma}{\alpha-\gamma-1},$$

and the Principal's payoff in the Noisy Communication equilibrium is

$$1-T\gamma.$$