Policymaking with Multiple Agencies*

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Abstract

Authority over related policy issues is often dispersed amongst multiple government agencies. In this paper, I study when Congress should delegate to multiple agencies, and how shared regulatory space complicates agency decision making. To do so, I develop a formal model of decentralized policymaking with two agencies that incorporates information acquisition and information sharing, delineating situations where legislators should and should not prefer multiple agencies. Greater divergence between the agencies' ideal points distorts information sharing and policy choices, but may increase the amount of information acquisition. Congress achieves better policy outcomes by delegating authority to both agencies if the agencies have strong policy disagreements. If the agencies have similar policy preferences, however, then Congress may want to consolidate authority within one agency because this approach mitigates free-riding and takes advantage of returns to scale.

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Introduction

Lawmakers have limited time and resources to devote developing expertise within each topic on which they legislate. Due to these constraints, delegating important policymaking duties to the bureaucracy is often a necessity (Wilson (1887)). Ideally, legislators should design institutions that motivate effective use of expertise within bureaucratic agencies. In practice, however, legislators have a limited number of mechanisms to control agencies. One that is often available to lawmakers is to split authority across multiple agencies.

Government agencies frequently share regulatory space with one another. Many have argued that this is a defining feature of the American bureaucracy,[1] with Justice Kennedy, citing Gersen (2006), commenting that "...statutes that parcel out authority to multiple agencies which 'may be the norm, rather than an exception'".[2] For example, the authority to determine whether a merger is anticompetitive, or not, is split between the Department of Justice (DOJ) and Federal Trade Commission (FTC).

Congress can intentionally delegate authority over similar policy issues to multiple agencies, even within the same piece of legislation. The Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) allocates significant rulemaking authority across four agencies and requires the involvement of over a dozen regulatory agencies. This dispersion results in fragmented or overlapping delegations, e.g., under Dodd-Frank both the Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) regulate financial products. More broadly, Farhang and Yaver (2015) analyze fragmented policy implementation and find that, on average, federal statutes delegate regulatory power to nearly 3 agencies and create almost 2.5 overlapping functions. This issue has become increasingly important, as the yearly averages of these measures have been increasing since the late 1990s.[3]

Despite the prevalence of shared regulatory space, most existing theories focus on policymaking by a single agency. While this literature has produced a number of fundamental insights, these results cannot account for the myriad new challenges that arise when agencies share regulatory space (Freeman and Rossi (2012)). As a step in this direction, I study when it is optimal for Congress to delegate authority to multiple agencies. Furthermore, I look at the impact of shared regulatory space on bureaucratic policymaking. Specifically, I develop a formal model of policy formation that incorporates information acquisition, policy preferences, and information sharing. The model suggests that Congress should split author-

[1] See, Gersen (2006), Biber (2011), Marisam (2011), and Freeman and Rossi (2012).

[2] See *City of Arlington, Tex. v. FCC* 133 S. Ct. 1863, 1878 (2013) (Kennedy, J, dissenting).

[3] To assess fragmented policy implementation, Farhang and Yaver (2015) study the content of significant laws passed by Congress between 1947 and 2008.

ity between multiple agencies when the available agencies have diverse policy preferences. Congress should consolidate authority within one agency, however, if the agencies have similar policy preferences, under certain conditions. I also show that increasingly divergent policy preferences between agencies can lead to more informed policymaking.

In the baseline model, decision-making is decentralized. There are two agencies, each with authority over a separate policy decision. The outcome of each agency's policy choice, however, is affected by some initially unknown information, or underlying state of the world, that is common to both policies. Thus, the policy issues are related, but each agency has its own jurisdiction. This jurisdiction could be substantive, as the FTC regulates security-based swaps while the CFTC covers all other swaps, or geographic, as would be the case with two state-level environmental agencies. Before choosing policy, each agency performs an experiment to try to obtain relevant information and then chooses whether to share information with the other agency. Accordingly, I adopt the view that agencies act as laboratories which produce new information (Katyal (2006)) and that this process is crucial for effective bureaucratic policymaking (Stephenson (2010)).

As mentioned, shared regulatory space can manifest in a number of ways. This model primarily studies a type of shared space described by Freeman and Rossi (2012) as *related jurisdictional assignments*. Multiple agencies have authority over different issues, in this case, but each issue is closely related to the others. The model also provides insight into *overlapping agency functions*, in which multiple agencies performs almost identical functions. Mostly outside the purview of this model, however, are instances of *interacting jurisdictional assignments* and *delegations requiring concurrence*. The former describes delegations in which the final outcome is highly dependent on every agency's decision and interagency coordination, while in the latter type, each agency has veto power over the final outcome. Gersen (2006) provides an alternative typology of delegated agency authority. In Gersen's framework, this paper best applies to delegations in which agencies have *exclusive* jurisdiction, as the agencies in the model have authority over separate policy choices.[4] Of course, actual delegations do not necessarily fit neatly into just one category, and the model touches on many different aspects of shared regulatory space. These typologies, however, provide a useful guideline for understanding the scope of the model.

The model provides several insights into policymaking under shared regulatory space. As overlapping delegations can arise for a number of reasons, the results of the baseline model have important implications beyond understanding Congressional incentives to split

[4] Gersen (2006) also characterizes multiple agency delegations by *completeness*. The model is agnostic on this issue. The analysis here does not depend on whether the two policy choices in the model represent the entirety of the relevant policy space or there exist other (unmodeled) dimensions on which no actor is actively making policy.

authority between multiple agencies.[5] I assume that shared information is verifiable and conceptualize the state of the world as technical information, with the agencies having the expertise to effectively scrutinize it. In equilibrium, agencies attempt to influence each other's policy choices by strategically choosing whether to reveal information. Neither agency conceals any information if the agencies have the same policy preferences. Increasing the divergence in policy preferences, however, leads agencies to conceal states of the world from each other.

Additionally, I find that ideological disagreement affects the incentives for agencies to expend effort and resources acquiring information in the first place. If agencies are far apart ideologically, then incentives to conceal information strongly distort policy choices. Agencies greatly increase their effort to avoid making overly extreme policy choices on their respective issues, which can arise from extreme inferences when uninformed. If ideological conflict increases between agencies with initially similar policy preferences this effect also exists. Even more importantly, however, in this case agencies are not able to easily free-ride on each other's information, which also encourages higher information acquisition.

I next use the baseline model to help parse Congressional incentives in delegating shared regulatory space. Specifically, I study two issues of institutional design: whether Congress should delegate authority to multiple agencies, and whether it should mandate that agencies share information with other agencies.

I first look at whether Congress should split authority over similar issues between the two agencies, or place full authority within one of the agencies. Under a single agency regime, only one agency gathers information and makes both policy choices. I show that the optimal arrangement is conditional on agency ideology. Authority should be consolidated within one agency when the agencies have similar ideologies and consolidation improves agency effectiveness. In this case, incentives to conceal information are diminished when agencies have similar policy preferences, which creates a strong free-riding problem if authority is split. On the other hand, it is optimal for Congress to delegate authority to multiple agencies, if the agencies have sufficiently different ideologies, because substantial information acquisition occurs in this case.

I also derive empirical implications on the impact of policy complexity and budget constraints on multiple delegation. In the model, I use greater uncertainty about the state of the world to capture policy complexity and use greater concern for resource expenditures to represent tighter budget constraints. If ideological conflict between the agencies is high, then

[5] For example, it may be hard to remove authority from an existing agency due to entrenched Congressional or outside interests. Additionally, inconsistent delegations by the legislature over time may create overlapping or unclear jurisdictions by accident (Freeman and Rossi (2012)).

increasing policy complexity encourages Congress to delegate to multiple agencies. If the agencies have similar policy preferences, however, greater complexity decreases Congress' incentive to delegate to multiple agencies. These results suggest that empirical research should take seriously the interaction between policy preferences and complexity on delegation. Finally, in the model, tighter Congressional budgetary constraints lead to fewer overlapping delegations regardless of whether agencies have similar or divergent policy preferences.

Congress may also be concerned that the president will interfere with agency preferences and goals after it delegates authority. In this vein, previous scholars have argued that Congress might use overlapping delegations to mitigate presidential influence (Freeman and Rossi (2012), Marisam (2011)). This effect should be especially pronounced under divided government, which is supported by Farhang and Yaver (2015), who find that divided government is correlated with increased fragmentation. To address this issue, I extend the model to allow for presidential influence and party affiliations. Depending on the agencies' initial preferences, I show that either divided government leads to split authority and unified government leads to consolidation or the delegation decision is independent of divided government. By explicitly modeling how Congress can split authority to circumvent the president, the model identifies conditions under which this effect should be strongest. Additionally, I study how overlapping delegations interact with more generic Congressional tools for insulating agencies from the president. In some instances, Congressional delegation is much different when it has both tools at its disposal. These results taken together predict that, under divided government, low insulation should produce high fragmentation and high agency insulation should lead to high consolidation.

Finally, I consider whether Congress should force agencies to share acquired information with each other. The analysis demonstrates that requiring information to be shared between agencies is clearly beneficial for Congress at the disclosure stage, but that it may backfire by causing the agencies to expend less effort gathering information in the first place. In particular, when information is public, effort by one agency discourages the other agency from expending effort as well, i.e., efforts are strategic substitutes. Provided that agencies have similar ideal points, Congress should require information sharing as it leads to similar policy outcomes while conserving resources. Congress should leave information sharing to the agencies' discretion, however, when agencies have very different policy preferences.

While I focus on the interaction between federal agencies and the design of these interactions, this paper also relates to more general issues of decentralized decision-making. To this end, the model can also be interpreted as a within agency or firm decision to assign policy issues or tasks to different bureaucrats or divisions. At the national level, if players are interpreted as different districts, these results may have implications for the design of a federalist system. Finally, the baseline model may apply to international relations, specifically the incentives of different nations to share policy knowledge with each other.

The paper proceeds as follows. The remainder of the introduction reviews the related theoretical literature. The subsequent section describes the set-up of the model and discusses the model in terms of the DOJ and FTC. Section characterizes how information is shared across agencies, and analyzes the agencies' incentives to expend effort acquiring information. Section studies when Congress should delegate to multiple agencies. Section investigates when Congress should mandate information sharing between the agencies. The policy implications of the model are discussed in section . Finally, section concludes. Proofs not included in the main text can be found in the appendix. Additionally, the appendix considers how changes to the model may affect the main results.

Related Literature

This paper features a principal who allocates authority over two policy issues to one or two agents. In terms of agency jurisdictions, Ting (2002) studies a model in which agency policy choices alter the probability that a task is successfully completed. When the principal can write contracts, Ting finds that agency preferences over outcomes affect the decision to separate jurisdiction over multiple policy issues. This paper, however, focuses on information sharing and acquisition, spatial policy outcomes, and does not allow the principal to write contracts. Substantively, these differences result in the two models applying to different aspects of shared jurisdiction. Gailmard and Patty (Forthcoming) develop a theory of decentralized policymaking by multiple bureaucratic agencies as well. They analyze a vertical relationship between the agencies, and abstract from information acquisition.

Horizontal decision-making between agents also appears outside of the bureaucracy literature. Callander and Harstad (2015) study a model of federalism, where districts select policies before performing an experiment to improve their quality. Ashworth and Bueno de Mesquita (2017) examine a model of elections in which tasks can be assigned to one politician or divided across two politicians. Issues of decentralized decision-making and communication have been further analyzed in the context of divisions within a firm (Stein (2002), Dessein and Matouschek (2008)).

Persuasion (Milgrom (1981)), and costly acquisition of verifiable information (Shavell (1994), Hughes and Pae (2004), Shin (2008), Sharif and Swank (2012)) play a key role in the results. This literature has also noted the potentially detrimental effects of mandatory disclosure on information acquisition. The modeling approach here most relates to Che and Kartik (2009), which has a similar information acquisition technology and verifiable communication, but with one expert and one decision-maker. Che and Kartik also find that increasing the difference between the expert's and decision-maker's policy preferences distorts information sharing, causing the expert to expend more effort, and term this the *prejudicial effect*. The main point of departure in my baseline model is that the there are two agencies, each of which has partial decision-making authority over policy outcomes, and this impacts their incentives to acquire information. Further, given the existence of two agents in my model, I focus on different aspects of institutional design than Che and Kartik (2009).

Other work has emphasized issues of redundancy in multiple agency delegations (Bendor (1985), Ting (2003)). In this literature, a policy outcome is either a success or failure, and free-riding incentives are a central aspect of the analysis. While some of these incentives arise in my model as well, I analyze a different set of issues. Furthermore, I show that free-riding effects are often not the primary consideration when incentives are driven by spatial preferences and information.

The allocation of jurisdiction also relates to the problem of a principal choosing to delegate to an agent or retain authority. In general, a lack of direct control over decisions, or loss of formal authority, is thought to demotivate agents (Aghion and Tirole (1997), Dessein (2002)). To reframe my setting in the parlance of this literature, under shared regulatory space agencies have both formal authority and real authority, i.e., they both choose their own policy and influence the other agency's decision. Thus, authority is partial. If agency functions are consolidated, however, then one agency is responsible for information acquisition and makes both decisions. Thus, this agency has full formal authority and the other agency has no authority. In this paper, the principal never has formal authority over decisions, and is only able to influence outcomes through its choice of shared versus consolidated authority.

Competition between agents with different preferences is often seen as potentially beneficial for a decision-maker. Herrera, Reuben and Ting (2016) considers turf wars between government agencies and how prizes affect these agencies' incentives. I abstract from turf considerations, and do not consider how effort and policy choices may affect non-policy or effort motives of the agencies. The effect of policy differences between multiple advisors on competition has been studied in terms of information revelation (Milgrom and Roberts (1986), Battaglini (2002), Gailmard and Patty (2013), Gentzkow and Kamenica (2016)), information acquisition (Dewatripont and Tirole (1999), Kartik, Lee and Suen (2017)), and policy quality (Hirsch and Shotts (2015)). Importantly, this literature looks at a unified policy choice being made by the decision-maker after the agents move. In contrast to these models, in this paper the principal has no ex-post control over the policy choices. Yet differences in policy preferences still leads agents to expend high effort when there are overlapping delegations.

Baseline Model

There are two agencies, $i \in \{1, 2\}$, and a policy space $\mathbb{R}^2$. Each agency has authority over one dimension of the policy space and makes a *policy choice* $x_i \in \mathbb{R}$. The *policy outcome* of each decision, however, depends on both the policy choice and the state of the world, $\omega \in \mathbb{R}$. Specifically, I assume the standard additive shocks model, where the policy outcome is $x + \omega$. The state of the world is unknown to the agencies ahead of time and is assumed to be normally distributed, with mean zero and variance σ^2. Let $f(\omega)$ and $F(\omega)$ be the PDF and CDF of the normal distribution, respectively. In the appendix I show that similar results continue to hold if there is a different shock on each dimension and the two shocks are drawn from a bivariate normal distribution with positive correlation. For ease of exposition I present the case with one state of the world, i.e. the shocks are perfectly correlated.

The game begins with each agency i simultaneously expending an *unobservable* effort $e_i \in [0, 1]$ to perform an experiment on ω. If agency i chooses effort e_i, then with probability e_i the experiment is a success and ω is revealed to agency i; with probability $1 - e_i$ the experiment fails and the agency acquires no information. Thus, higher effort increases the probability that the agency's experiment successfully uncovers the state of the world.[6] The outcome of the experiment is private information to agency i. Agencies incur costs from expending effort, according to the function $c(e_i)$, which is smooth and satisfies $c' > 0$, $c'' > 0$, $c'(0) = 0$, and $\lim_{e_i \to 1} c'(e_i) = \infty$. Costly effort reflects that the agency must devote resources, time, and labor into the experiment.

After the information acquisition stage, agencies can choose to share information with each other. If agency i's experiment was successful, it can reveal ω to agency j, and this information is verifiable. That is, the agency cannot report $\tilde{\omega} \neq \omega$ if it learns that the state is ω. The agency may, however, choose not to send a report even if it successfully observes the state. Thus, a successful agency sends a report ω or a report ϕ, where ϕ denotes reporting no information. If an agency's experiment was unsuccessful then it must send the uninformed report ϕ. This type of communication is common in a broader literature on "hard" or "verifiable" information (Ijiri (1975)). As the agencies are experts on these issues, and the information is technical, it may be easy for the agency to verify the accuracy of the other agency's report. Additionally, the costs to a government agency for purposefully manipulating reports to another agency may be particularly severe.

Finally, each agency i simultaneously makes its policy choice, $x_i \in \mathbb{R}$. After these choices, policy outcomes are realized and the game ends. Each agency has quadratic utility over each

[6] For further discussion of this type of success enhancing information acquisition technology, see Green and Stokey (1980).

policy outcome. As in the motivating examples, two separate policies are chosen, and the policy choice of one agency does not affect the policy outcome of the other agency.

Throughout the paper, assume $i \neq j$. In general agency i's ideal policy is given by $(a_i^i, a_i^j) \in \mathbb{R}^2$, however, to clarify the primary tradeoffs of interest I assume that $a_i^i = a_i^j$ and define $a_i \equiv a_i^i$. Define $u_i(x, \omega) = -(x - \omega - a_i)^2$. Agency i's final utility for policy choices and effort is given by the sum of utility for each policy outcome minus costs of effort,

$$u_i(x_i, \omega) + u_i(x_j, \omega) - c(e_i).$$

Assume that $a_1 < a_2$, and let the level of preference divergence between the agencies be defined as $\Delta = a_2 - a_1$.

To recap the timing of the game:

1. nature draws ω from distribution F, where ω is initially unobserved by the agencies,
2. each agency $i \in \{1, 2\}$ expends effort e_i and privately learns ω with probability e_i,
3. if agency i learns ω, it chooses whether or not to disclose this to agency j,
4. each agency i chooses a policy $x_i \in \mathbb{R}$,
5. policy outcomes $x_i + \omega$ are realized and utilities obtained.

The agencies in the model share regulatory space through three mechanisms. First, due to ω, the same information is relevant for informed policymaking on both issues. Second, the difference in the agencies' policy preferences can be summarized by one parameter Δ. Therefore, ideological disagreement on one issue implies disagreement on the other issue as well. Third, because agencies have policy preferences, I assume that agencies care about both policy outcomes. In practice, it is possible that an agency cares less about the other agency's policy issue. As long as agencies place positive weight on each policy outcome, however, qualitatively my results continue to hold. The important strategic consideration is that the agency cares that its decisions influence the policy choice of the other agency, and vice versa.

Application to Antitrust Enforcement

To better illustrate the strategic setting of policymaking with two agencies, consider the example of overlap between the DOJ and FTC on antitrust regulation. Although each has authority over antitrust issues, the agencies have divided authority over antitrust issues based on the industry under consideration. For example, the DOJ typically regulates mergers in the financial services industry, while the FTC handles the pharmaceutical industry. In this example, the agencies make separate policy choices this can be interpreted as their respective approaches or philosophies towards regulating cases that fall within their jurisdiction. For example, the agency's standards when deciding whether to prosecute a proposed merger for being anticompetitive may be more or less stringent. Similar to agency choices in the model, the FTC's choice does not affect the outcomes of cases regulated by the DOJ, but there may be information relevant to how both agencies enforce antitrust law.

In this scenario, the unknown information could be the effect of mergers on price increases and market power in previous cases.[7] This type of information would be useful to both the DOJ and FTC in understanding how different approaches to pursuing antitrust violations lead to different economic and political outcomes. Furthermore, this information will help the agencies better assess the merits of future cases. Here, an experiment could represent the DOJ devoting resources to conducting an empirical study to uncover the effect, or bureaucrats in the agency understanding and incorporating outside research on the topic, e.g., analysis from Farrell and Shapiro (1990) or Kim and Singal (1993). As this knowledge about how mergers have impacted prices and competition is also useful to the FTC, the DOJ's decision whether to share this information can affect the FTC's approach to antitrust enforcement.

In the model, differences in ideology lead to different policy choices, even if both agencies learn the underlying state of the world, whether through independent studies or information sharing. In fact, the FTC and DOJ have had substantial differences in their merger standards. During the administration of President George W. Bush, antitrust regulation was often characterized by strong disagreements between the agencies. The DOJ placed more weight on the benefits of deregulation, costs of overenforcement, and deterrents to investment, while the FTC worried more about the costs of underenforcement and monopoly power (Everett (2009)).[8] Under the Bush presidency, the DOJ pursued no cases against dominant firms for anticompetitive behaviour and a 2006 DOJ describing its policies for investigating anticompetitive behavior drew harsh criticism from the sitting FTC commissioners (Goulet (2008)). There was no disagreement over the available information, in this example, as the agencies held joint hearings. Yet, fundamental policy disagreements still led the DOJ and FTC to adopt significantly different policies. Furthermore, consistent with the theory, despite the division of authority the agencies cared about the policy choices of the

[7] The importance of this type of information is specifically listed in the DOJ and FTC Horizontal Merger Guidelines.

[8] One reason for policy differences between the agencies is that the the DOJ is an executive agency, whereas the FTC is an independent agency and may be more insulated from the preferences of the President.

other agency.

Results

The solution concept is perfect Bayesian equilibrium. An equilibrium is characterized by, for each agency, an optimal policy choice given its belief about the state, a reporting strategy as a function of its information about the state, and an effort decision. Beliefs at the policymaking stage are updated using Bayes' rule and must be consistent with the effort and reporting strategies.[9]

Given the importance of policy choices and information sharing for understanding the results on information acquisition and institutional design, I begin by analyzing these incentives. There is an extensive literature on optimal disclosure with verifiable information, but much of it features players with monotonic preferences over outcomes, e.g., the seller of a good always wants a higher price.[10] Although the policymaking and disclosure stages are not technically a subgame of the effort stage, as effort is unobservable, it will be convenient to "work backwards" and break the remaining analysis into multiple stages.

When choosing a policy, each agency has an updated belief over the state, ω. The agency's belief depends on (i) whether its own experiment was a success, (ii) how much effort it believes the other agency expended, and (iii) the information sharing strategy of the other agency. Throughout the paper, let $\hat{e}_j$ be agency i's conjecture about the amount of effort expended by agency j. With quadratic utility the agency's optimal policy choice is given by its ideal point plus its updated expectation over ω. If agency i observes ω, due to its own experiment or the other agency disclosing the state, then it is optimal to choose $a_i + \omega$. Denote this choice as $x_i(\omega)$, which is agency i's ideal policy outcome. If agency i does not observe ω, then its optimal policy choice is $a_i + E_i[\omega|\phi, \hat{e}_j]$, where E_i is agency i's expectation over ω conditional on being uninformed. Let agency i's uninformed policy choice be defined as $x_i(\phi)$.

Information Sharing

I start by characterizing whether or not an agency reveals information when informed.[11] As each agency also weights the other agency's policy outcome, agency i discloses information

[9]Note, usual difficulties specifying off-path-beliefs do not arise in this model as the message $\tilde{\omega}$ can only be sent by the $\tilde{\omega}$ type.

[10]An exception is Che and Kartik (2009) which has a similar characterization for information sharing.

[11]Other than the case where $e = 1$ there is some probability that the agency is uninformed. Therefore, the unraveling theorem of Milgrom (1981) does not hold and agencies can conceal information in equilibrium.

strategically in order to move agency j's policy outcome towards its own ideal policy. If agency i's own experiment is unsuccessful, then it must send the uninformed report, ϕ.

Characterizing agencies' optimal disclosure requires finding the set of states $\Omega_i \subset \mathbb{R}$ for which agency i does not disclose ω following a successful experiment. Consider agency 2's decision to reveal a state ω or not, fixing agency 1's uninformed policy choice, $x_1(\phi)$. If agency 2's experiment is successful, then it always gets its ideal outcome on its own policy choice, regardless of whether it reveals ω. If agency 1's experiment is successful then agency 2 revealing information or not has no effect on agency 1's choice. Thus, agency 2's decision to reveal information depends on how it will influence agency 1's choice if agency 1's experiment is unsuccessful. If agency 2 reveals ω, then its utility from agency 1's policy choice is $\hat{e}_1 u_s(x_1(\omega), \omega) + (1 - \hat{e}_1)u_2(x_1(\omega), \omega)$. As agency 1 always uses this information to secure its ideal policy outcome, this is simply agency 2's utility from agency 1's ideal point. On the other hand, if agency 2 does not disclose ω_2, its expected utility for agency 1's policy choice is $\hat{e}_1 u_2(x_1(\omega), \omega) + (1 - \hat{e}_1)u_2(x_1(\phi), \omega)$.

Figure 1 demonstrates agency 2's payoffs for each realization of ω on agency 1's policy issue from disclosure and non-disclosure given $x_1(\phi)$. This comparison reveals that the non-disclosure set of agency 2 is given by an interval $\Omega_2 = [\underline{\omega}_2, \overline{\omega}_2]$.

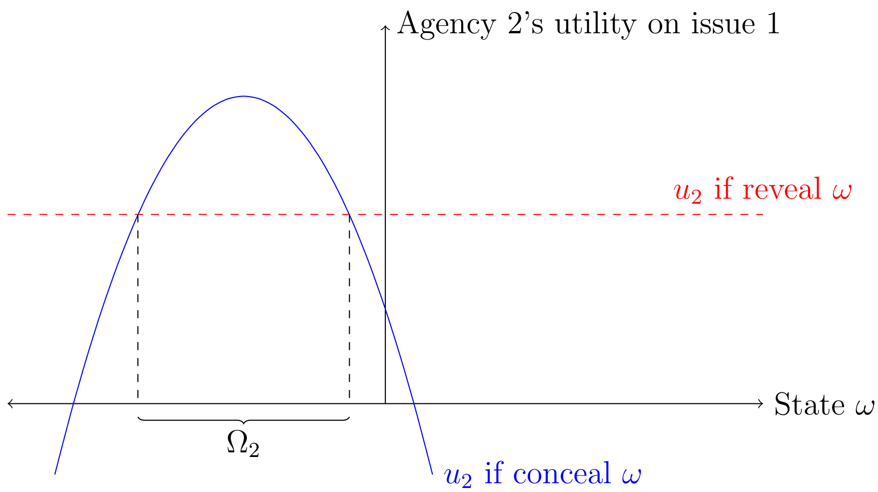

Figure 1: Agency 2's utilities for revealing and not revealing information, as a function of the state of the world.

This leads to the following result characterizing equilibrium policy choices and non-disclosure sets.

Proposition 1. *Given expected effort levels $\hat{e}_1$ and $\hat{e}_2$, there exist unique optimal non-disclosure intervals $\Omega_1^*(\hat{e}_1) = [\underline{\omega}_1^*(\hat{e}_1), \overline{\omega}_1^*(\hat{e}_1)]$ and $\Omega_2^*(\hat{e}_2) = [\underline{\omega}_2^*(\hat{e}_2), \overline{\omega}_2^*(\hat{e}_2)]$, and unique optimal policy choices $x_1^*(\phi, \hat{e}_2)$ and $x_2^*(\phi, \hat{e}_1)$.*

1. *Agency 1's lower endpoint is equal to agency 2's updated expectation over the state ω, when uninformed, $\underline{\omega}_1^*(\hat{e}_1) = E_2^*[\omega|\phi, \hat{e}_1]$,*

2. *Agency 1's upper endpoint is equal to the lower endpoint shifted by the divergence in policy preferences, $\overline{\omega}_1^*(\hat{e}_1) = \underline{\omega}_1^*(\hat{e}_1) + 2\Delta$.*

3. *Agency 1's uninformed policy choice is equal to its ideal point plus its expectation over the state when uninformed, $x_1^*(\phi, \hat{e}_2) = a_1 + E_1^*[\omega|\phi, \hat{e}_2]$.*

Agency 2's actions are characterized symmetrically.

In equilibrium, $\overline{\omega}_2^* \leq 0 \leq \underline{\omega}_1^*$. Agency 2 conceals negative states, while agency 1 conceals positive states.

This demonstrates that both the decision to share information and the optimal policy choice depend directly on the conjectured efforts. Consider agency 1's policy choice if its experiment fails and it receives an uninformative report from agency 2. Higher conjectured effort by agency 2 causes agency 1 to place greater weight on agency 2 being informed and, thus, having purposefully concealed information. Believing agency 2 to be concealing information, agency 1 adjusts its uninformed policy. In turn, agency 2 must conceal states further to the right, i.e. that are more extreme, in equilibrium.

To better understand agency incentives to share information, the next proposition examines the effect of ideological divergence on policies and disclosure, holding the conjectured efforts constant.

Proposition 2. *If the agencies have identical ideological preferences, then agencies disclose for all states of the world, and $\overline{\omega}^* = \underline{\omega}^* = 0$ for both agencies. Given conjectures about effort, $\hat{e}_1$ and $\hat{e}_2$, increasing the divergence between agency ideal points decreases $\overline{\omega}_2^*(\hat{e}_2)$ and increases $\underline{\omega}_1^*(\hat{e}_1)$.*

Ideological divergence shifts the set of states that are not revealed away from 0. To see why, examine $\underline{\omega}_2(\hat{e}_2)$. Greater ideological divergence has the direct effect of decreasing $\underline{\omega}_2(\hat{e}_2)$, but in equilibrium agency 1 adjusts its policy choice to compensate. This change now further decreases $\overline{\omega}_2(\hat{e}_2)$. When ideological divergence disappears, however, there is no conflict between the agencies over the final policy outcome and therefore there are no incentives to conceal information.

Information Acquisition

To complete the baseline analysis, I study how much effort agencies want to expend trying to acquire information. Specifically, I discuss how ideological divergence between the agencies affects equilibrium effort. Importantly, decentralized decision making authority causes an agency's incentive to expend effort to be affected by the expected impact on *both* policy outcomes.

The expected utility to agency i from expending effort e_i, given that it expects agency j to expend effort $\hat{e}_j$ and agency j expects i to expend effort $\hat{e}_i$, can be written as

$$\begin{aligned} U_i(e_i;\hat{e}_i,\hat{e}_j) = e_i\Big(&\Gamma_i^i(\hat{e}_j)+\Gamma_i^j(\hat{e}_i,\hat{e}_j)\Big) \\ &+\hat{e}_j\Big(E_\omega[u_i(x_j(\omega),\omega)-u_i(x_j(\phi),\omega)]-E_{\omega\notin\Omega_j^*}[u_i(x_i(\phi),\omega)]\Big) \\ &+E_\omega[u_i(x_i(\phi),\omega)+u_i(x_j(\phi),\omega)]-c(e_i), \end{aligned}$$

where E_ω refers to i's expectation over the entire state space, and $E_{\omega\notin\Omega_j^*}$ is i's expectation over ω, given that $\omega\notin\Omega_j^*$. This form of agency i's expected utility clarifies agency's incentives. Most importantly, the first line gives the agency's expected gain on both policy issues when its experiment is a success.

Given conjectures $\hat{e}_1$ and $\hat{e}_2$, the best response of agency i is characterized by the first order condition

$$\Gamma_i^i(\hat{e}_j)+\Gamma_i^j(\hat{e}_i,\hat{e}_j)=c'(e_i).$$

The term $\Gamma_i^i(\hat{e}_j)$ represents the expected gain to agency i *on its own policy issue* for successfully discovering the state itself, and is given by

$$\Gamma_i^i(\hat{e}_j)=-\hat{e}_jE_{\omega\in\Omega_j(\hat{e}_j)}[u_i(x_i(\phi,\hat{e}_j),\omega)]-(1-\hat{e}_j)E_\omega[u_i(x_i(\phi,\hat{e}_j),\omega)].$$

Agency i is able to choose the policy that leads to its ideal outcome with certainty in this case. Agency i benefits from a successful experiment in two scenarios. The first, given by the first term, occurs when agency j is successful but the state of the world lies within its non-disclosure set. Because agency i would otherwise be uninformed, it benefits from discovering the state. Outside the non-disclosure set, if agency j's experiment is a success it will reveal the state to i anyway. Thus, agency i does not benefit from learning information on its own. The second scenario, reflected by the last term, is agency i's benefit if agency j's experiment fails. Agency i always benefits from learning the state in this case, as otherwise it will have to make policy uninformed.

On the other hand, $\Gamma_i^j(\hat{e}_i,\hat{e}_j)$ represents the gain to agency i *on agency j's policy issue* from discovering the state of the world when its experiment succeeds, and is given by

$$\Gamma_i^j(\hat{e}_i, \hat{e}_j) = (1 - \hat{e}_j)E_{\omega \notin \Omega_i}[u_i(x_j(\omega), \omega) - u_i(x_j(\phi, \hat{e}_i), \omega)].$$

In this case, agency i benefits from discovering the state only if agency j's experiment is unsuccessful. Otherwise, if agency j is successful it will always be able to make its policy outcome match its ideal point, and thus agency i cannot influence agency j's policy choice. When the other agency is uninformed, however, agency i gains by being able to influence agency j's decision. By sharing information, agency i can avoid agency j choosing an uninformed policy that leads to an outcome that, from agency i's viewpoint, is even more extreme than agency j's ideal outcome.

In equilibrium, the agencies' conjectures about each other's efforts must be correct. This yields the following result.

Proposition 3. *Pure strategy equilibria are characterized by efforts (e_1^*, e_2^*) that solve*

$$\Gamma_1^1(e_2^*) + \Gamma_1^2(e_1^*, e_2^*) = c'(e_1^*),$$
$$\Gamma_2^2(e_1^*) + \Gamma_2^1(e_1^*, e_2^*) = c'(e_2^*).$$

In particular, there always exists a symmetric equilibrium in which the agencies exert the same effort, $e_1^* = e_2^* = e^*$. Furthermore, if $\Delta = 0$ there is a unique symmetric equilibrium and as $\Delta \to \infty$ all symmetric equilibria converge.

Moving forward, the results focus on symmetric equilibria.[12] Next, I look at how ideological divergence between the agencies, Δ, affects effort. Specifically, the effect of Δ on information acquisition when the agencies have either very similar or very different ideal policies.

Proposition 4. *In a symmetric equilibrium, changing agencies' policy preferences affects information acquisition as follows:*

1. *As the divergence in policy preferences becomes arbitrarily large, agency efforts go to 1.*

2. *If the agencies have the same ideal point, then increasing the difference between ideal points increases agency effort.*

For very large differences in policy preferences, agency i's incentive to expend a high level of effort arises because each updates that the other is attempting to conceal more extreme

[12] Appendix C discusses asymmetric equilibria.

signals. Consequently, each is choosing ever more extreme policies when uninformed. In response, the agencies expend high effort to discover the state. This incentive is termed the prejudicial effect in Che and Kartik (2009). By discovering the state in this paper, however, the agency is able to avoid overly extreme uninformed policy choices by *both* agencies.

When there is no ideological disagreement between the agencies, increasing disagreement improves information acquisition by both reducing free-riding and through the prejudicial effect. At $\Delta = 0$, no information is concealed, but increasing policy divergence causes agencies to withhold information in equilibrium. Consequently, agency i is no longer able to always use agency j's discovery. This feature encourages agency i to increase its effort to avoid having to make an uninformed policy choice.

Unlike the main model in Che and Kartik (2009), in the model here increasing policy differences may not always lead to more information acquisition. This is because each agency is acquiring information and making a policy choice. Specifically, for some levels of Δ an increase in disagreement may result in more free-riding because even though the interval of concealed states has grown larger, the probability that the state falls in that interval decreases. For intermediate values of Δ, this increased incentive to shirk from free-riding may dominate the incentive to expend more effort due to the prejudicial effect.

Overlapping Delegations

In this section I study whether or not Congress should delegate overlapping functions to multiple agencies in the first place. To address this issue, I include Congress and allow it to decide whether to delegate authority to both agencies or consolidate authority within one of the agencies. Let Congress' ideal policy outcome be at 0. Additionally, assume Congress weights the costs of effort by $\beta \geq 0$, reflecting that it has budget constraints and therefore cares about the resources spent by the agencies. Thus, the final utility to Congress from policy choices and efforts is

$$u_0(x_1, \omega) + u_0(x_2, \omega) - \beta\big(c(e_1) + c(e_2)\big).$$

If Congress delegates to both agencies, then the game proceeds as previously described and analyzed. On the other hand, if Congress consolidates authority within one agency, then that agency chooses both policies x_1 and x_2 and is the sole producer of information.

Assume that if Congress consolidates authority within one agency, that agency produces effort at a cost $C(e)$, satisfying $C' > 0$, $C'(0) < 2\sigma^2$, $\lim_{e \to 1} C'(e) > 2\sigma^2$, and $C'' > 0$, where σ^2 is the variance of the distribution of ω. Thus, with consolidated authority, the agency could be more or less effective at generating information than it is when authority is dispersed. In general, the results focus on the case where there are returns to scale from consolidating authority and resources within one of the agencies. It could be, however, that the agency does not become more effective, or even that it is less effective due to increased intra-agency free-riding.

Under consolidated authority, the agency will choose $x_1 = x_2 = x$. Thus, if it successfully discovers ω it chooses $x = a_2 + \omega$. Unlike the case with two agencies, where the agency updates its belief even when uninformed due to strategic information revelation by the other agency, here if it does not discover the state it simply retains its prior beliefs. Thus, it will choose $x = a_2$ when its experiment fails to discover the state. The consolidated agency expends effort $\tilde{e}$, where $\tilde{e}$ is the unique solution to

$$2\sigma^2 = C^{'}(e).$$

Therefore, if Congress delegates to one agency, then its equilibrium payoff is $2u_0(x, \omega) - \beta C(\tilde{e})$. Having characterized behavior under consolidated authority, the next proposition studies when Congress has a clear incentive to delegate to just one agency.

Proposition 5. *If one agency's ideal policy is sufficiently close to Congress, relative to the other agency, then Congress always consolidates authority within the closer agency.*

Proposition 5 recovers a version of the ally principle, because Congress always delegates to the ideologically closer agency. Even when there are gains from improved information acquisition under multiple agencies, if one agency is much closer to Congress these gains are not enough to mitigate the policy loss incurred by delegating one dimension to an agency that is ideologically distant.

For the remainder of this section I consider the most strategically interesting case, with both agencies roughly equidistant from Congress ideologically. Specifically, assume that agencies are symmetric, $a_1 = -a_2 = -\frac{\Delta}{2}$. The next proposition characterizes Congress' decision to split or consolidate authority.[13]

Proposition 6. ***(Overlapping delegations versus consolidation)***

1. *If the divergence in the agencies' policy preferences is sufficiently large and Congress places sufficiently low weight on resource expenditures, then Congress delegates authority to multiple agencies.*

[13] Note that, as both agencies' ideal points are equidistant from Congress' ideal policy of 0, if Congress decides to give authority to one agency then it is indifferent between delegating to agency 1 or agency 2. Thus, assume it delegates to agency 2 in this case.

2. *If the divergence in the agencies' policy preferences is sufficiently low and the consolidated agency is sufficiently effective at expending effort, then Congress consolidates authority within one agency.*

First, consider when agencies are far apart ideologically. Changing policy preferences does not affect effort under a single agency regime, however, from Proposition 4, under shared regulatory space equilibrium effort becomes large when agency ideal points diverge. Sharing authority between agencies drives them to increase effort as much as possible. This ensures that both will almost certainly be making informed policy choices. Even if the consolidated agency benefits from more effective production of effort, multiple agencies still acquire more information. Consequently, so long as Congress weighs policy concerns sufficiently more than budgetary concerns, it will prefer to delegate to multiple agencies. Conversely, if Congress places enough weight on budgetary concerns, it will not want to delegate to multiple agencies. This is because the cost of resource expenditures is greater under overlapping delegations and the cost to Congress from poorly made policy by one agency is bounded.[14]

Next, I study the case when the agencies have very similar ideal points. Consolidating authority in one agency allows Congress to remove both the free-riding problem and efficiency loss due to concealed information. Unfortunately, it also loses benefits from redundancy and incentives to increase effort from changes in policy divergence. To focus on understanding of the policy trade-offs to Congress when agencies have similar policy preferences the next propositions assumes $\beta = 0$.

To gain a deeper understanding of the *policy trade-offs* to Congress when agencies have similar policy preferences, set $\beta = 0$ and parameterize the cost of effort function as $c(e) = \frac{\theta e^2}{1-e}$. I will refer to θ as the *marginal cost coefficient* and assume $\theta > \underline{\theta} = 2\sigma^2$. Furthermore, if authority is consolidated within one agency, let the cost of effort be $C_\alpha(e) = c(\alpha e) + c((1-\alpha)e)$, for $\alpha \in [1/2, 1]$. In this case, conceptualize the consolidated agency as having the resources to divide effort between two internal divisions. The parameter α characterizes how effectively the single agency coordinates effort production. If $\alpha = 1/2$, then the single agency is maximally effective relative to split authority.[15] If $\alpha = 1$, however, then consolidating authority results in no gains in effectiveness, as $C_1(e) = c(e)$. Interior values of α yield

[14] In proposition 6, β need not be close to 0. In fact, $\beta = 1$ can be permissible if the variance of ω is high and so Congress weights costs the same as the agencies.

[15] To see that $\alpha = 1/2$ maximizes effectiveness, consider an agency that wants to expend effort e. An efficient agency divides effort across its two divisions to solve the problem

$$\min_{\overline{e} \in [0,e]} c(e) + c(e - \overline{e}).$$

By convexity of c, the agency divides effort evenly between the divisions, $\overline{e} = \frac{e}{2}$, which is obtained by setting $\alpha = 1/2$.

intermediate levels of effectiveness.

Proposition 7. *Assume the agencies have identical ideal points and Congress only cares about policy outcomes.*

1. *If the consolidated agency is sufficiently effective and the marginal cost coefficient is sufficiently low, then Congress consolidates authority.*

2. *If the consolidated agency is sufficiently ineffective or the marginal cost coefficient is sufficiently high, then Congress splits authority.*

When the single agency is more effective, it produces more effort, which improves the payoff to Congress from consolidating authority. For Congress to consolidate authority, however, θ must also be sufficiently low. Although high θ dampens the incentive to expend effort under both consolidated or split authority, the effect is stronger on the consolidated agency. Moreover, Congress always prefers to split authority if the single agency is too ineffective, regardless of the marginal cost coefficient. Figure summarizes the decision to consolidate authority.

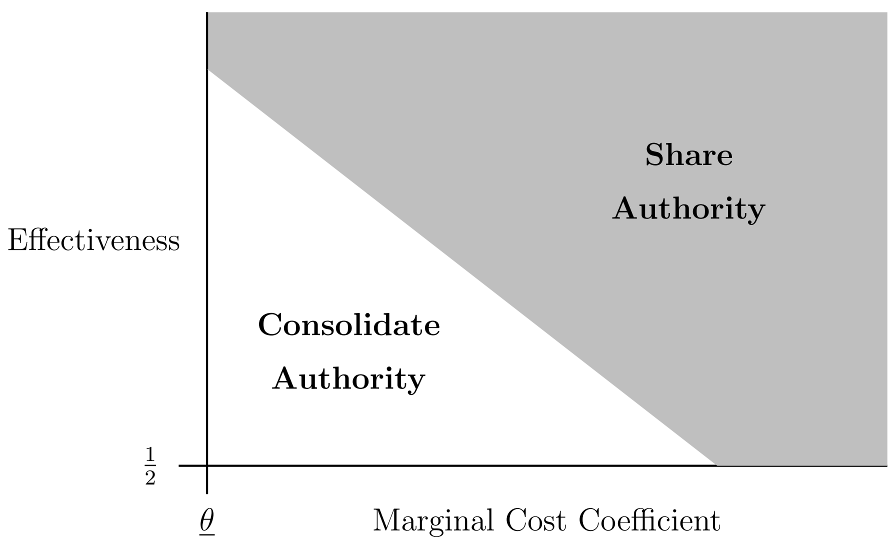

Figure 2: For $\Delta = 0$, Figure depicts the regions for which Congress consolidates authority within one agency versus divide authority between two agencies.

Next, I study how complexity of the policymaking environment affects the decision to delegate to multiple agencies. I use σ^2 as a measure of complexity in the model, thus, interpreting policy complexity as greater uncertainty over how policy choices lead to policy outcomes. Additionally, for the remainder of this section assume $C_\alpha(e)$ is maximally efficient, so let $\alpha = 1/2$.[16]

[16] Comparative statics on σ^2 may be ambiguous under more general assumptions about the cost functions.

Proposition 8. *Assume Congress only cares about policy outcomes.*

1. *When the divergence in agency policy preferences is arbitrarily large, increasing policy complexity increases Congress' gains from splitting authority.*

2. *When there is no ideological conflict between the agencies, increasing policy complexity decreases the Congress' gains from split authority.*

Increasing policy complexity has the direct effect of decreasing Congressional welfare because uninformed policy choices become worse. The consolidated agency, however, responds to greater complexity by increasing its effort. When the difference in agency ideal points is large, then the two agencies expend effort close to 1 to mitigate the direct loss from higher complexity. Further, the higher effort from the single agency is not enough to make up for the losses from higher uncertainty. Congress therefore enjoys greater policy gains from splitting authority. On the other hand, consolidation is more attractive to Congress when agencies have the same policy preferences because the increase in effort from the consolidated agency outweighs the increase in effort from the two agencies.

I end this section commenting on the impact of budgetary concerns, β, on Congress' decision. Maintaining the functional form assumptions, the cost of resource expenditures is always higher under shared authority, whether there is no divergence or large divergence in agency policy preferences. Therefore, higher β decreases the incentive for Congress to delegate to multiple agencies.

Presidential Influence

In this section, I extend the model to incorporate the president's influence over bureaucratic policy preferences. In particular, this extension highlights the impact of divided government on overlapping delegations. Furthermore, I study how the decision to delegate to multiple agencies depends on whether Congress can use other methods to insulate agencies.

Let there be two parties with ideal policy outcomes at D and R, with $D < 0 < R$ and $D << R$.[17] Thus, parties are significantly polarized. Assume that the president has an ideal policy at R and only cares about the distance of each agency's ideal point from his own. Congress and the two agencies have ideal points in $\{D, R\}$. If Congress has an ideal point at D there is divided government, otherwise, if Congress has an ideal point at R then there is unified government. Again, in order to focus on policy tradeoffs, assume $\beta = 0$.

[17] Here, I use $<<$ to indicate that the ideal policy outcomes are sufficiently far from one another, specifically in terms of propositions 5 and 6.

Further, alter the model so that after Congress decides to split or consolidate authority, but before the agencies begin acquiring information, the president is able to change one agency's ideal point. This presents the most strategically interesting case. Otherwise, either the agencies' ideal points never change or both agencies are moved to the president's ideal point. Additionally, it is reasonable to assume that the president is not able to effectively alter the ideology of every agency due to the time, effort, and political capital required to find and nominate appointees. While this set-up simplifies the president's motivations and his interaction with Congress, it makes the analysis tractable, focuses the analysis on the role of overlapping delegations in interbranch interactions, and captures that presidents often try to appoint ideologically friendly agents to administrative agencies (Clinton et al. (2012)).

After Congress delegates, the president will choose the active agency with the furthest ideal point and move it to match his own. This leads to the next proposition, characterizing Congress' decision.

Proposition 9. ***(Unified versus divided government)***

1. *If neither agency shares the president's ideology then Congress consolidates authority under unified government. On the other hand, if there is divided government then it splits authority.*

2. *If at least one agency shares the president's ideology then the decision to delegate to multiple agencies is independent of which party controls Congress and can be characterized by Proposition 7.*

If neither agency shares an ideal point with the president, then the agencies have different ideal points even after the president acts. If there is unified government then Congress consolidates authority, as this yields ideologically favorable outcomes on both policy choices after the president acts. If there is divided government, Congress ensures that one of the policy outcomes does not become ideologically distant by splitting authority. Although Congress' choice is driven by ideological polarization, this results in increased information acquisition under divided relative to unified government.

If either agency has an ideal point at R, then the president moves the non-allied agency to his ideal point. Therefore, the agencies will have the same ideal points, regardless of how Congress delegates. In this case, presidential influence washes out any ideological component of Congress' decision. Thus, its decision only depends on what is optimal in terms of information. This choice can be characterized by Proposition 7 and depends on the marginal cost coefficient and gains from consolidation.

Beyond creating overlapping delegations, Congress may also write laws in such a way that it constrains the president's ability to influence the bureaucracy in the first place (Moe

(1990), Epstein and O'halloran (1999), Huber and Shipan (2002)). Moreover, overlapping delegations do not necessarily constrain the president in the same way as other forms of insulation. To gain a better understanding of how the two interact, now alter the model so that Congress can prevent the president from changing the agencies' ideal points and choose how many agencies have authority. As before, if Congress does not insulate the agencies, the president will move the furthest agency to his ideal point.

Proposition 10. ***(Insulation and overlapping delegations)***

1. *Congress weakly prefers to insulate the agencies under divided government. If one agency is more ideologically aligned, then Congress consolidates authority within that agency. If both agencies have the same ideal policy, then Congress' decision to split authority is characterized by Proposition 7.*

2. *Congress weakly prefers to never insulates the agencies under unified government. If neither agency shares the president's ideal point, then Congress consolidates authority. Otherwise, its decision to consolidate authority is characterized by Proposition 9.*

The ability to insulate agencies from presidential influence using other tools can result in a sharp change in behavior. Furthermore, whether or not Congress insulates the bureaucracy does not necessarily imply that it will or will not delegate to multiple agencies. Thus, the two tools act in different ways to constrain the president.

In line with previous work, Congress is incentivized to insulate the bureaucracy under divided government, whereas it has no reason to do so under unified government. If there is unified government, the ability to insulate agencies does not alter Congress' decision to consolidate. If there is divided government, however, Congress uses insulation and consolidation in conjuncture with one another. In fact, it now consolidates in cases where it would have split authority. Thus, if Congress is able to effectively insulate an agency, then under divided government it should also consolidate. On the other hand, if it is unable to effectively insulate the agency from presidential control, then it should split authority. Introducing other insulating technologies creates a sharper division between unified and divided government, as now Congress' choices are almost entirely driven by ideological proximity rather than information acquisition—the only exception occurs when *both* agencies already share the president's ideal point at the outset.

Mandatory Information Sharing

Information sharing is discretionary in the baseline model. This section looks at whether Congress should require the agencies to share information. Specifically, Congress can allow the agencies to play the baseline game or it can alter the game so that the outcome of each agency's experiment is public information.

If the outcomes of the experiments are always public information, if either agency successfully discovers ω then each agency i chooses $x_i(\omega) = a_i + \omega$. If neither discovers ω, then each agency i retains its prior belief about the state and chooses $x_i(\phi) = a_i + E[\omega] = a_i$ because there is no strategic concealment of information,.

Agency i's expected utility for expending effort simplifies to $-\Delta^2 - (1-e_i)(1-\hat{e}_j)2\sigma^2 - c(e_i)$. Free-riding motives are exacerbated under public information, as an agency always benefits from the other agency's success and efforts are strategic substitutes. In this model, there exists a symmetric Nash equilibrium of the mandatory information sharing game where each agency expends effort e^M to solve

$$(1 - e^M)2\sigma^2 = c(e^M).$$

Unlike in the baseline model, however, the agencies' effort does not depend on the ideological divergence when information is public. This is because neither agency is able to adjust its strategy in such a way that it affects the other agency's optimal policy choice. Thus, with mandatory information the agencies' ideal points only impact Congress through the direct effect on policy preferences. Ideological divergence still has interesting implications for whether Congress should mandate information sharing in the first place, however, as divergence does affect effort under voluntary information sharing.

Proposition 11. ***(Information sharing)***

1. *If the divergence in agency ideal points is sufficiently large and the Congress places sufficiently low weight on resource expenditures, then Congress does not require information sharing.*

2. *If the divergence in agency policy preferences is sufficiently low, then Congress always mandates that the agencies share information.*

When ideological conflict is sufficiently large, the high effort spent acquiring information under discretionary sharing outweighs any potential gains from mandatory sharing, provided Congress does not place too much weight on costs. If agency ideal points are similar, then Congress makes information sharing mandatory. At $\Delta = 0$ the payoff to Congress under both voluntary and mandatory sharing rules is the same, because the agencies do not conceal any information under either rule. Under discretionary sharing, increasing conflict over policy outcomes increases the amount of information acquired, making multiple agencies more efficient. Agencies conceal more information, however, making outcomes less efficient.

In fact, starting from no policy disagreement, if Δ increases then the gains from effort and losses from concealment exactly cancel out. Consequently, Congress does equally well under mandatory and discretionary sharing in terms of policy outcomes. Thus, Congress is better off forcing agencies to share information because otherwise the agencies expend more resources to get the same outcome.

Policy Implications

The literature recognizes a number of potential costs (e.g., wasted resources) and benefits (e.g., interagency competition) to overlapping agency delegations. This paper provides insight into these trade-offs for Congress when it contemplates delegating to multiple agencies. The model directly considers how ideological conflict between the agencies interacts with informational uncertainty to affect bureaucratic policymaking under shared regulatory space.

Overlapping Delegations The model suggests that Congress can improve policy outcomes by splitting authority when agencies have very divergent policy preferences. This is due to a form of agency competition different from those that the literature has focused on previously. Competition, leading to productive effort, is usually seen as happening because the agencies are trying to increase their share of a limited resource or jurisdiction (Downs (1967)). Instead, when policy preferences diverge, in this paper the ability for agencies to influence each other's policy choices through information sharing leads to more effort.

As an illustration, recall that the FTC and DOJ have conflicted over antitrust regulation in the past. Looking at ideal point estimates for these agencies (Richardson, Clinton and Lewis (2016)) further suggests that there is substantial policy disagreement between the two agencies. Thus, split authority here is consistent with Proposition 6, and this result suggests that the agencies should continue to share authority on antitrust issues.

Consolidation The model recommends consolidating authority over the issues within one of the agencies if there are efficiency gains from consolidating resources and little difference in agency ideologies. This might characterize the choices made in the aftermath of the September 11th terrorist attacks. Decision-makers recognized a number of weaknesses in the split authority over homeland security and created the Department of Homeland Security (DHS). This was one of the largest government reorganizations in U.S. history, consolidating 22 agencies under one roof. Given the scope of the reorganization, there were a number of different issues and aspects of shared authority at stake. It is reasonable to see the agencies as having similar goals, especially in the aftermath of 9/11, which the model presented here would lead us to recommend consolidation. For example, border security enforcement was split between the U.S. Border Control and U.S Customs before reorganization, but this has now been consolidated within the DHS.

Admittedly, not all instances when we would expect to see consolidation have a single agency. For example, shared authority over financial regulation persists despite frequent calls for the CFTC to be merged into the SEC and the agencies seemingly having overall similar goals in terms of regulating financial products.[18] However, not surprisingly given the model, there have been calls for merging the agencies. In 2009 the Obama administration tried to include a merger provision as part of Dodd-Frank, and in 2012 the House Financial Services Committee again introduced a bill to merge the two agencies. Thus far, a merger has been politically unfeasible due to conflicts and entrenched interests within Congress. Even putting aside any cost saving benefits, the model suggests that consolidating regulatory authority within one of the agencies would lead to better informed policy outcomes.

Policy Complexity The model also gives a theoretical foundation for understanding the relationship between policy complexity and multiple delegations. Farhang and Yaver (2015) find either a positive or no relationship between fragmentation and policy complexity, depending on which measure of complexity they use. The model implies that a positive relationship should hold when ideological disagreement between the available agencies is high. When ideological disagreement between the agencies is small, however, the relationship is reversed. Thus, empirical research should be cognizant that the relationship may depend on interaction effects with relative agency ideology.

Budget Constraints As mentioned, the weight that Congress places on resource expenditures in the model can be interpreted as reflecting budget constraints. Confirming the intuition that overlapping delegations lead to wasted resources, the model expects fewer overlapping delegations with tighter budget constraints. In fact, when agencies have the same policy preferences, delegating to multiple agencies can lead to costlier resource expenditures and worse policy outcomes compared to consolidating authority in one agency.

Insulation Propositions 9 and 10 make several empirical predictions about divided government, agency insulation, and overlapping delegations when parties are polarized. First, if overlapping delegations are studied separately from insulation then, consistent with Farhang and Yaver (2015), the model predicts more fragmentation under divided government. Second, the model suggests that insulation should be higher under divided government than under unified government, a finding consistent with Lewis (2004). Taken together, however, the propositions predict that these two variables should interact with each other, as

[18] Ideal point estimates from both Clinton and Lewis (2008) and Richardson, Clinton and Lewis (2016) indicate that these agencies have similar ideologies. Additionally, general agreement between the agencies on financial regulation can be found in the joint report on harmonization issued by the SEC and CFTC in 2009.

well as divided government. Specifically, policy authority should be less fragmented under divided government if insulation is high. Finally, Farhang and Yaver (2015) demonstrate that insulation and fragmented authority do not exhibit similar trends over time. Again, this is roughly consistent with these results, which suggest that any correlations depend on interaction effects and, in many cases, the two decisions are independent of each other.

Information Sharing One way that Congress can coordinate agency behavior is by mandating that agencies share information. The model suggests that Congress should not force information sharing when agencies have strong policy disagreements. This implies that Congress should not interfere with the DOJ and FTC's own determinations of what information to share with each other. When agencies have similar policy preferences, however, information sharing results in fewer wasted resources and no loss in terms of policy consequences. Improved information sharing between agencies and departments was a key component for Congress when creating the DHS, and this focus seems well placed in the context of this paper.

Additionally, Dodd-Frank states that the CFTC must provide the SEC information related to security-based swap agreement transactions. In fact, several portions of Dodd-Frank require agencies, such as the SEC, CFTC, and Federal Energy Regulatory Commission to coordinate on information sharing. Based on the model, while this may not be an improvement over full consolidation, this is better than not requiring information sharing, given the similarity in the preferences of the SEC and CFTC.

Conclusion

In this paper I examine a model in which Congress can delegate authority over similar policy issues to multiple agencies, or consolidate authority within one agency. I show that splitting authority leads to better policy outcomes when agencies have strong policy disagreements. This is because agencies with very divergent policy preferences work harder to produce policy-relevant information. Additionally, the model suggests that empirical work studying multiple agency delegations should carefully consider all of the relevant agencies that exist and the ideologies of these agencies. Finally, the model suggests that the relationship between overlapping delegations and divided government is conditional on Congress' ability to insulate agencies using other tools.

Shared regulatory space has become increasingly common. Furthermore, it can arise in a number of complex ways. In light of this, continued theoretical work on the topic will be crucial for understanding the policymaking incentives in these situations. Beyond this model, it would be interesting to investigate the effectiveness of coordinating institutions, such as OIRA, by analyzing a setting in which multiple agencies acquire information and communicate to a centralized decisionmaker. Additionally, studying overlapping agency delegations in which agency policy choices interact with each other seems like a promising avenue for future work.

A Proofs for Baseline Model

A.1 Information Sharing

Proof of Proposition 1. We begin by proving that for any conjectured effort $\hat{e}_2$ there exists $\overline{\omega}_2$ that solves

$$\overline{\omega}_2 = \frac{\hat{e}_2}{\hat{e}_2 \int_{\Omega_2} f(\omega) d\omega + (1-\hat{e}_2)} \int_{\Omega_2} \omega dF(\omega), \tag{1}$$

where $\Omega_2 = [\overline{\omega}_2 - 2\Delta, \overline{\omega}_2]$. To see that a solution exists, first let $\overline{\omega}_2$ go to $-\infty$. In this case, the LHS of 1 goes to $-\infty$. Since $\overline{\omega}_2 \to -\infty$ we also have $\underline{\omega}_2 \to -\infty$. Thus, in the limit Ω_2 has measure zero and the RHS of 1 goes to 0. Second, if $\overline{\omega}_2$ goes to 0 then the LHS goes to 0 and the RHS goes to

$$\frac{\hat{e}_2}{\hat{e}_2[F(0) - F(-2\Delta)] + (1-\hat{e}_2)} \int_{-2\Delta}^{0} \omega dF(\omega) < 0.$$

As both sides of (1) are continuous in $\overline{\omega}_2$, the intermediate value theorem implies there exists some $\overline{\omega}_2 < 0$ that solves (1).

Next we want to show that (1) has a unique solution. Manipulating (1) we get that $\overline{\omega}_2$ solves

$$\overline{\omega}_2[\hat{e}_2(F(\overline{\omega}_2) - F(\underline{\omega}_2)) + (1-\hat{e}_2)] = \hat{e}_2 \int_{\Omega_2(\hat{e}_2)} \omega dF(\omega) \tag{2}$$

We show that both sides of (2) are strictly increasing in $\overline{\omega}_2$, but that the LHS is always increasing faster than the RHS. Differentiating the LHS of (2) with respect to $\overline{\omega}_2$ yields

$$\hat{e}_2[F(\overline{\omega}_2) - F(\underline{\omega}_2)] + (1-\hat{e}_2) + \overline{\omega}_2 \hat{e}_2 (f(\overline{\omega}_2) - f(\underline{\omega}_2)), \tag{3}$$

and differentiating the RHS yields

$$\hat{e}_2[\overline{\omega}_2 f(\overline{\omega}_2) - \underline{\omega}_2 f(\underline{\omega}_2)]. \tag{4}$$

For the statement to hold we need that (3) is strictly greater than the (4). Comparing and rearranging yields

$$\hat{e}_2(F(\overline{\omega}_2) - F(\underline{\omega}_2)) + (1-\hat{e}_2) > \hat{e}_2 f(\underline{\omega}_2)(\overline{\omega}_2 - \underline{\omega}_2).$$

As the distribution of ω is symmetric about 0, $f(\omega)$ is strictly increasing in ω for $\omega < 0$, and we have

$$\hat{e}_2 f(\underline{\omega}_2)(\overline{\omega}_2 - \underline{\omega}_2) \leq \hat{e}_2 \int_{\underline{\omega}_2}^{\overline{\omega}_2} f(\omega) d\omega < \hat{e}_2[F(\overline{\omega}_2) - F(\underline{\omega}_2)] + (1 - \hat{e}_2),$$

as required. Thus, the solution to the equation for $\overline{\omega}_2$ is unique. A similar analysis yields the result for $\Omega_1(\hat{e}_1) = [\underline{\omega}_1, \overline{\omega}_1]$.

Changes in conjectured effort. We next show that increasing $\hat{e}_2$ leads to a decrease in $\overline{\omega}_2^*$ and $\underline{\omega}_2^*$. Specifically, we prove the following lemma.

Lemma 1. *We have*

$$\frac{\partial \underline{\omega}_2^*}{\partial \hat{e}_2}, \frac{\partial \overline{\omega}_2^*}{\partial \hat{e}_2} < 0.$$

First, note $\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} = \frac{\partial \underline{\omega}_2}{\partial \hat{e}_2}$, since $\underline{\omega}_2$ is equivalent to $\overline{\omega}_2$ modulo a constant. Thus, showing the result for $\overline{\omega}_2$ suffices. Manipulating equation (1) we have that $\overline{\omega}_2$ solves

$$\overline{\omega}_2[\hat{e}_2(F(\overline{\omega}_2) - F(\underline{\omega}_2)) + (1 - \hat{e}_2)] = \hat{e}_2 \int_{\underline{\omega}_2}^{\overline{\omega}_2} \omega dF(\omega). \tag{5}$$

To obtain the result requires further manipulation, yielding the following chain of expressions

$$\overline{\omega}_2[\hat{e}_2(F(\overline{\omega}_2) - F(\underline{\omega}_2)) + (1 - \hat{e}_2)] = \hat{e}_2[\overline{\omega}_2 F(\overline{\omega}_2) - \underline{\omega}_2 F(\underline{\omega}_2) - \int_{\underline{\omega}_2}^{\overline{\omega}_2} F(\omega) d\omega] \tag{6}$$

$$\overline{\omega}_2 \frac{1 - \hat{e}_2}{\hat{e}_2} = (\overline{\omega}_2 - \underline{\omega}_2) F(\underline{\omega}_2) - \int_{\underline{\omega}_2}^{\overline{\omega}_2} F(\omega) d\omega \tag{7}$$

$$\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} \frac{1 - \hat{e}_2}{\hat{e}_2} - \frac{\overline{\omega}_2}{\hat{e}_2^2} = (\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} - \frac{\partial \underline{\omega}_2}{\partial \hat{e}_2}) F(\underline{\omega}_2) + (\overline{\omega}_2 - \underline{\omega}_2) f(\underline{\omega}_2) \frac{\partial \underline{\omega}_2}{\partial \hat{e}_2} - \frac{\partial}{\partial \hat{e}_2} \left(\int_{\underline{\omega}_2}^{\overline{\omega}_2} F(\omega) d\omega \right) \tag{8}$$

$$\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} \frac{1 - \hat{e}_2}{\hat{e}_2} = \frac{\overline{\omega}_2}{\hat{e}_2^2} + (\overline{\omega}_2 - \underline{\omega}_2) f(\underline{\omega}_2) \frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} - \frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} \left(F(\overline{\omega}_2) F(\underline{\omega}_2) \right) \tag{9}$$

$$\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} \left(\frac{1 - \hat{e}_2}{\hat{e}_2} + (F(\overline{\omega}_2) - F(\underline{\omega}_2)) - (\overline{\omega}_2 - \underline{\omega}_2) f(\underline{\omega}_2) \right) = \frac{\overline{\omega}_2}{\hat{e}_2^2}. \tag{10}$$

Where integration by parts yields (6). Rearranging (6) gives (7). Equation (8) follows from differentiating each side of (7). Equation (9) follows using $\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} = \frac{\partial \underline{\omega}_2}{\hat{e}_2}$ and applying Leibniz rule. Finally, rearranging once more gives (10). Since $\overline{\omega}_2 < 0$ the RHS of (10) is negative. Thus, the proposition will be true if $\frac{1 - \hat{e}_2}{\hat{e}_2} \geq 0$ and $(F(\overline{\omega}_2) - F(\underline{\omega}_2)) - (\overline{\omega}_2 - \underline{\omega}_2) f(\underline{\omega}_2) \geq 0$. The first part is immediate as $\hat{e}_2 \in [0, 1]$. To see that the second part is true we can rewrite this expression as

$$\int_{\underline{\omega}_2}^{\overline{\omega}_2} f(\omega)d\omega - (\overline{\omega}_2 - \underline{\omega}_2)f(\underline{\omega}_2) \geq 0.$$

Because $f(\omega)$ is symmetric about 0 we have that $f(\omega)$ is strictly increasing for $\omega < 0$. As $\overline{\omega}_2 < 0$ we have that $f(\omega)$ is minimized on $[\underline{\omega}_2, \overline{\omega}_2]$ at $\omega = \underline{\omega}_2$. Therefore, $\int_{\underline{\omega}_2}^{\overline{\omega}_2} f(\omega)d\omega \geq (\overline{\omega}_2 - \underline{\omega}_2)f(\underline{\omega}_2)$ and we can conclude that $\frac{\partial \overline{\omega}_2}{\partial \hat{e}_2} < 0$. A similar argument proves the corresponding result for $\underline{\omega}_1$.

Proof of Proposition 2. It is immediate that if $\Delta = 0$ then neither agency has an incentive to conceal information and inspecting (1) that $\overline{\omega}_i = \underline{\omega}_i = 0$. Next, assume that Δ increases. If agency 1 does not adjust its action $x_1(\phi)$ then $\overline{\omega}_2$ will not change, however, $\underline{\omega}_2$ would shift further left. This decreases agency 1's expectation over ω, when uninformed, causing $x_1(\phi)$ to shift downward. Thus, $\overline{\omega}_2$ must also shift downward and, in equilibrium, agency 2 must now conceal more extreme states of the world.

A.2 Information Acquisition

The expected utility to agency 2 from expending effort e_2 is

$$\begin{aligned} & e_2\Bigg(E_{\omega\notin\Omega_2}\Big[u_2(x_1(\omega),\omega)\Big] + E_{\omega\in\Omega_2}\Big[\hat{e}_1 u_2(x_1(\omega),\omega) + (1-\hat{e}_1)\theta u_2(x_1(\phi),\omega)\Big]\Bigg) \\ & + (1-e_2)\Bigg(E_{\omega\notin\Omega_1}\Big[\hat{e}_1\theta u_2(x_1(\omega),\omega) + (1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega) + u_2(x_1(\phi),\omega)\Big)\Big] \\ & + E_{\omega\in\Omega_1}\Big[\hat{e}_1(u_2(x_2(\phi),\omega) + u_2(x_1(\omega),\omega)) + (1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega) + u_2(x_1(\phi),\omega)\Big)\Big]\Bigg) - c(e_2), \end{aligned}$$

where $E_{\omega\in X}[u_2(\bullet)] = \int_X u_2(\bullet)f(\omega)d\omega$. We begin by rearranging the agency's expected utility to show that it has the form given in the paper. First, we group terms by those multiplied by e_2, split a term weighting by $\hat{e}_1$ and $1-\hat{e}_1$, and pull out θ, yielding

$$e_2\Bigg(E_{\omega\notin\Omega_2}\Big[\hat{e}_1 u_2(x_1(\omega),\omega)+(1-\hat{e}_1)u_2(x_1(\omega),\omega)\Big]+E_{\omega\in\Omega_2}\Big[\hat{e}_1 u_2(x_1(\omega),\omega)+(1-\hat{e}_1)u_2(x_1(\phi),\omega)\Big]$$

$$-E_{\omega\notin\Omega_1}\Big[\hat{e}_1 u_2(x_1(\omega),\omega)+(1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big)\Big]$$

$$-E_{\omega\in\Omega_1}\Big[\hat{e}_1(u_2(x_2(\phi),\omega)+u_2(x_1(\omega),\omega))+(1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big)\Big]\Bigg)$$

$$+\Bigg(E_{\omega\notin\Omega_1}\Big[\hat{e}_1 u_2(x_1(\omega),\omega)+(1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big)\Big]$$

$$+E_{\omega\in\Omega_1}\Big[\hat{e}_1(u_2(x_2(\phi),\omega)+u_2(x_1(\omega),\omega))+(1-\hat{e}_1)\Big(u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big)\Big]\Bigg)-c(e_2).$$

Next, looking at the terms multiplied by e_2 we split into two groups multiplied by $\hat{e}_1$ and $1-\hat{e}_1$. Those not multiplied by e_2 we group based on those multiplied by $\hat{e}_1$.

$$e_2\Bigg[\hat{e}_1\Bigg(-E_{\omega\in\Omega_1}\Big[(u_2(x_2(\phi),\omega)\Big]+E_{\omega\notin\Omega_2}\Big[u_2(x_1(\omega),\omega)\Big]+E_{\omega\in\Omega_2}\Big[u_2(x_1(\omega),\omega)\Big]$$

$$-E_{\omega\notin\Omega_1}\Big[u_2(x_1(\omega),\omega)\Big]-E_{\omega\in\Omega_1}\Big[u_2(x_1(\omega),\omega))\Big]\Bigg)$$

$$+(1-\hat{e}_1)\Bigg(\theta E_{\omega\notin\Omega_2}\Big[u_2(x_1(\omega),\omega)\Big]+E_{\omega\in\Omega_2}\Big[u_2(x_1(\phi),\omega)\Big]-E_{\omega\notin\Omega_1}\Big[u_2(x_2(\phi),\omega)\Big]$$

$$-E_{\omega\notin\Omega_1}\Big[u_2(x_1(\phi),\omega)\Big]-E_{\omega\in\Omega_1}\Big[u_2(x_2(\phi),\omega)\Big]-E_{\omega\in\Omega_1}\Big[u_2(x_1(\phi),\omega)\Big]\Bigg)\Bigg]$$

$$+\hat{e}_1\Bigg(E_{\omega\notin\Omega_1}\Big[u_2(x_1(\omega),\omega)-u_2(x_2(\phi),\omega)-u_2(x_1(\phi),\omega)\Big]$$

$$+E_{\omega\in\Omega_1}\Big[u_2(x_2(\phi),\omega)+u_2(x_1(\omega),\omega)-u_2(x_2(\phi),\omega)-u_2(x_1(\phi),\omega)\Big]\Bigg)$$

$$+E_{\omega\notin\Omega_1}\Big[u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big]+E_{\omega\in\Omega_1}\Big[u_2(x_2(\phi),\omega)+u_2(x_1(\phi),\omega)\Big]-c(e_2)$$

Finally, combining expectations and eliminating like terms gives

$$\begin{aligned}
& e_2\Bigg(- \hat{e}_1 E_{\omega\in\Omega_1}\Big[u_2(x_2(\phi),\omega)\Big] - (1-\hat{e}_2) E_{\omega}\Big[u_2(x_2(\phi),\omega)\Big] \\
& + (1-\hat{e}_2) E_{\omega\notin\Omega_2}\Big[u_2(x_1(\omega),\omega) - u_2(x_1(\phi),\omega)\Big]\Bigg) \\
& + \hat{e}_1\Bigg(- E_{\omega\notin\Omega_1}\Big[u_2(x_2(\phi),\omega)\Big] + E_{\omega}\Big[u_2(x_1(\omega),\omega) - u_2(x_1(\phi),\omega)\Big]\Bigg) \\
& + E_{\omega}\Big[u_2(x_2(\phi),\omega) + u_2(x_1(\phi),\omega)\Big] - c(e_2),
\end{aligned}$$

which, given the definitions of Γ_2^1 and Γ_2^2, yields the expression in the paper.

Proof of Proposition 3. Concavity in own effort and the conditions on c yield that first order conditions are sufficient to characterize pure strategy equilibria. From the model assumptions, it is clear that the Debreu-Fan-Glicksberg theorem holds, thus, there exists a pure strategy Nash equilibrium. If e^* is a symmetric pure strategy equilibrium it solves

$$\begin{aligned}
& e^* \int_{\underline{\omega}_1^*(e^*,\Delta)}^{\overline{\omega}_1^*(e^*,\Delta)} (\underline{\omega}_1^*(e^*,\Delta)-\omega)^2 f(\omega)d\omega + (1-e^*)\int(\underline{\omega}_1^*(e^*,\Delta)-\omega)^2 f(\omega)d\omega \\
& \qquad +(1-e^*)\int_{\{\omega:\omega\notin\Omega_2^*(e^*,\Delta)\}} [(\overline{\omega}_2^*(e^*,\Delta)-\omega-\Delta)^2-(\Delta)^2] f(\omega)d\omega = c'(e^*).
\end{aligned} \tag{11}$$

Letting $e^* \to 1$ the LHS of (11) goes to 0 while the RHS goes to ∞. On the other hand, if $e^* = 0$ then the LHS is positive while the RHS of (11) goes to 0. Thus, by the intermediate value theorem, a solution to (11) exists and so a symmetric Nash equilibrium exists.

Next, we show uniqueness at $\Delta = 0$. Assume $\Delta = 0$. From our analysis of the cut-points $\underline{\omega}_i^*$ and $\overline{\omega}_i^*$ we get that equation (11) reduces to

$$2(1-e)\sigma^2 = c'(e). \tag{12}$$

As the LHS of (12) is strictly decreasing in e and the RHS of (12) is strictly increasing a unique solution to (11) exists at $\Delta = 0$. That all symmetric equilibria converge as $\Delta \to \infty$ is a by-product of the following proof.

Proof of Proposition 4 Part 1. We now show that in the multiple agency policymaking game if $\Delta \to \infty$ then any symmetric equilibrium e^* must go to 1.

We prove the result by contradiction. Specifically, let Δ go to infinity but assume e^* does not go to 1. From $c(e)$ we have that the RHS of (11) is finite, thus, in equilibrium it must be that the LHS is also finite. Since $e^* \int_{\underline{\omega}_1^*(e^*,\Delta)}^{\overline{\omega}_1^*(e^*,\Delta)} (\underline{\omega}_1^*(e^*,\Delta)-\omega)^2 f(\omega)d\omega + (1-e^*)\int(\underline{\omega}_1^*(e^*,\Delta)-$

$\omega)^2 f(\omega)d\omega \geq 0$ we have that the LHS of 11 is greater than $(1-e^*)\int_{\{\omega:\omega\notin\Omega_2^*(e^*,\Delta)\}}[(\overline{\omega}_2^*(e^*,\Delta)-\omega-\Delta)^2-(\Delta)^2]f(\omega)d\omega$. Expanding this we get $\int_{\{\omega:\omega\notin\Omega_2^*(e^*,\Delta)\}}[(\overline{\omega}_2^*-\omega)^2-2\Delta\overline{\omega}_2^*+2\Delta\omega]f(\omega)d\omega$. The first term in the integrand is positive. Additionally, the last term is positive as well, since agency 2 conceals $\omega \leq 0$ the expectation of ω given $\omega \notin \Omega_2^*$ is positive. Thus, the LHS of (11) is bounded below by

$$U^* = -(1-e^*)Pr(\omega \notin \Omega_2^*)\overline{\omega}_2^*\Delta.$$

From the information sharing section, we know that agency 2 never conceals positive states of the world. Therefore, since the distribution of states has full support on $\mathbb{R}$, it must be that $Pr(\omega \notin \Omega_2^*) > 0$. Additionally, agency 2 always revealing positive states means $-\overline{\omega}_2^* \geq 0$. In fact, by proposition 2, this inequality must hold strictly. As $-Pr(\omega \notin \Omega_2^*)\overline{\omega}_2^* > 0$ and $\Delta \to \infty$, for it to be possible for U^* to not go to infinity it must be that $1-e^*$ goes to zero as Δ goes to infinity. However, $1-e^*$ going to zero contradicts the assumption that e^* does not go to 1 as Δ goes to infinity. Consequently, it must be that $\lim_{\Delta\to\infty} U^* = \infty$, and, since the LHS of (11) is bounded below by U^*, if $\Delta \to \infty$ then the LHS of (11) goes to infinity as well. However, $c(e^*)$ is finite, therefore assuming e^* does not go to 1 as $\Delta \to \infty$ contradicts that e^* is an equilibrium.

Proof of Proposition 4 Part 2. We want to show that at $\Delta = 0$ increasing Δ increases equilibrium effort e^*. To do so, we show that e^* has a minimum at $\Delta = 0$. Specifically, that $\frac{\partial e^*}{\partial \Delta}|_{\Delta=0} = 0$ and $\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} > 0$. Note, when setting $\Delta = 0$ we frequently use that if $\Delta = 0$ then $\overline{\omega}_i^* = \underline{\omega}_i^* = 0$ and so Ω_i^* has measure zero, yielding $\int_{\Omega_i^*} \omega f(\omega)d\omega = 0$.

Define $G = \Gamma_i^i(\hat{e}^*) + \Gamma_i^j(\hat{e}^*, \hat{e}^*) - c'(e^*)$. Applying the implicit function theorem we have that

$$\frac{\partial e^*}{\partial \Delta} = -\frac{\partial G/\partial \Delta}{\partial G/\partial e^*}.$$

Differentiating yields

$$\begin{aligned}\frac{\partial G}{\partial e^*} &= \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} (\underline{\omega}_1^* - \omega)^2 f(\omega)d\omega + e^*\Big(\frac{\partial \overline{\omega}_1^*}{\partial e^*}(\underline{\omega}_1^* - \overline{\omega}_1^*)^2 f(\overline{\omega}_1^*) + \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} 2\frac{\partial \underline{\omega}_1^*}{\partial e^*}(\underline{\omega}_1^* - \omega)f(\omega)d\omega\Big) \\ &\quad -\Big(\int (\underline{\omega}_1^* - \omega)^2 f(\omega)d\omega + \int_{\omega\notin\Omega_2^*}[(\overline{\omega}_2^* - \omega - \Delta)^2 - \Delta^2]f(\omega)d\omega\Big) \\ &\quad + (1-e^*)\Big(\int 2\frac{\partial \underline{\omega}_1^*}{\partial e^*}(\underline{\omega}_1^* - \omega)f(\omega)d\omega + \int 2\frac{\partial \overline{\omega}_2^*}{\partial e^*}(\overline{\omega}_2^* - \omega - \Delta)f(\omega)d\omega \\ &\quad - \int_{\underline{\omega}_2^*}^{\overline{\omega}_2^*} 2\frac{\partial \overline{\omega}_2^*}{\partial e^*}(\overline{\omega}_2^* - \omega - \Delta)f(\omega)d\omega\Big) - c''(e^*)\end{aligned}$$

Setting Δ equal to zero, we get $\frac{\partial G}{\partial e^*}|_{\Delta=0} = -2\sigma^2 - c''(e^*)$. Next, we differentiate to get

$$\begin{aligned}\frac{\partial G}{\partial \Delta} =& e^*\Big(\frac{\partial \overline{\omega}_1^*}{\partial \Delta}(\underline{\omega}_1^* - \overline{\omega}_1^*)^2 f(\overline{\omega}_1^*) + \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} 2\frac{\partial \underline{\omega}_1^*}{\partial \Delta}(\underline{\omega}_1^* - \omega) f(\omega) d\omega\Big) \\ &+ (1-e^*)\Big(\int 2\frac{\partial \underline{\omega}_1^*}{\partial \Delta}(\underline{\omega}_1^* - \omega) f(\omega) d\omega + \int 2(\frac{\partial \overline{\omega}_2^*}{\partial \Delta} - 1)[(\overline{\omega}_2^* - \omega - \Delta) - 2\Delta] f(\omega) d\omega \\ &- \int_{\underline{\omega}_2^*}^{\overline{\omega}_2^*} 2(\frac{\partial \overline{\omega}_2^*}{\partial \Delta} - 1)[(\overline{\omega}_2^* - \omega - \Delta) - 2\Delta] f(\omega) d\omega\Big)\end{aligned}$$

Setting Δ equal to zero, we get $\frac{\partial G}{\partial \Delta}|_{\Delta=0} = 0$. Thus, $\frac{\partial e^*}{\partial \Delta}|_{\Delta=0} = 0$. Next, we want to show that $\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} > 0$. We can write this as

$$\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} = \lim_{\Delta \to 0} \frac{\frac{\partial e^*}{\partial \Delta} - \frac{\partial e^*}{\partial \Delta}|_{\Delta=0}}{\Delta},$$

using that $\frac{\partial e^*}{\partial \Delta}|_{\Delta=0} = 0$ and the implicit function theorem we can rewrite this as

$$\lim_{\Delta \to 0} -\frac{\partial G/\partial \Delta}{\Delta(\partial G/\partial e)}.$$

Applying L'Hopital's rule we get

$$\lim_{\Delta \to 0} -\frac{\partial^2 G/\partial \Delta^2}{\Delta(\partial^2 G/\partial e^2) + \partial G/\partial e}.$$

Differentiating, we get

$$\begin{aligned}\frac{\partial^2 G}{\partial \Delta^2} =& e^*\Big(\frac{\partial^2 \overline{\omega}_1^*}{\partial \Delta^2} 4\Delta^2 f(\overline{\omega}_1^*) + 8\Delta \frac{\partial \overline{\omega}_1^*}{\partial \Delta} f(\overline{\omega}_1^*) + 2(\underline{\omega}_1^* - \overline{\omega}_1^*)\frac{\partial \underline{\omega}_1^*}{\partial \Delta} f(\overline{\omega}_1^*)\frac{\partial \overline{\omega}_1^*}{\partial \Delta} \\ &+ \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} 2[\frac{\partial^2 \underline{\omega}_1^*}{\partial \Delta^2}(\underline{\omega}_1^* - \overline{\omega}_1^*) + (\frac{\partial \underline{\omega}_1^*}{\partial \Delta})^2] f(\omega) d\omega\Big) + (1-e^*)\Big(\int 2[\frac{\partial^2 \underline{\omega}_1^*}{\partial \Delta^2}(\underline{\omega}_1^* - \overline{\omega}_1^*) + (\frac{\partial \underline{\omega}_1^*}{\partial \Delta})^2] f(\omega) d\omega \\ &+ \int 2[\frac{\partial^2 \overline{\omega}_2^*}{\partial \Delta}(\overline{\omega}_2^* - \omega - \Delta) + (\frac{\partial \overline{\omega}_2^*}{\partial \Delta} - 1) - 1] f(\omega) d\omega \\ &- [(2(\frac{\partial \overline{\omega}_2^*}{\partial \Delta} - 1)(\overline{\omega}_2^* - \omega - \Delta) - 2\Delta) - (2(\frac{\partial \underline{\omega}_2^*}{\partial \Delta} - 1)(\overline{\omega}_2^* - \underline{\omega}_2^* - \Delta) - 2\Delta) \\ &+ \int_{\underline{\omega}_2^*}^{\overline{\omega}_2^*} 2[\frac{\partial^2 \overline{\omega}_2^*}{\partial \Delta^2}(\overline{\omega}_2^* - \omega - \Delta) + (\frac{\partial \overline{\omega}_2^*}{\partial \Delta} - 1)^2 - 1] f(\omega) d\omega]\Big)\end{aligned}$$

Finally, letting Δ go to 0, we get $\frac{\partial^2 G}{\partial \Delta^2}|_{\Delta=0} = 2(1-e)((\frac{\partial \underline{\omega}_1^*}{\partial \Delta})^2 - \frac{\partial \underline{\omega}_2^*}{\partial \Delta}) > 0$ as $\frac{\partial \omega_2}{\partial \Delta} < 0$.

Consequently,

$$\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} = \frac{2(1-e)((\frac{\partial \underline{\omega}_2^*}{\partial \Delta})^2 - 2\frac{\partial \underline{\omega}_2^*}{\partial \Delta})}{2\sigma^2 + c''(e)} > 0,$$

as required.

B Proofs for Congressional Models

B.1 Overlapping Delegations

The expected utility to Congress from the multiple agency policymaking game is

$$\begin{aligned}
V_C^2 =& e_1^* e_2^* (E_\omega[u_p(x_1(\omega),\omega)] + E_\omega[u_c(x_2(\omega),\omega)]) + \\
& e_1^*(1-e_2^*)\Big(E_\omega[u_p(x_1(\omega),\omega)] + E_{\omega\notin\Omega_1}[u_p(x_2(\omega),\omega)] + E_{\omega\in\Omega_1}[u_p(x_2(\phi),\omega)]\Big) \\
& + (1-e_1^*)e_2^*\Big(E_\omega[u_p(x_2(\omega),\omega)] + E_{\omega\notin\Omega_2}[u_p(x_1(\omega),\omega)] + E_{\omega\in\Omega_1}[u_p(x_1(\phi),\omega)]\Big) \\
& + (1-e_1^*)(1-e_2^*)E_\omega[u_p(x_1(\phi),\omega) + u_p(x_2(\phi),\omega)] - \beta\Big(c(e_1^*) + c(e_2^*)\Big).
\end{aligned}$$

On the other hand, its utility from delegating to a single agency is

$$V_C^1 = -2(a_i)^2 - (1-\tilde{e})2\sigma^2 - \beta C(\tilde{e}).$$

Define $\overline{V}_c = V_C^2 - V_C^1$. Because we study symmetric equilibrium set $e_1^* = e_2^* = e^*$. We decompose $\overline{V}_C$ as a function of Δ into the payoff from the policy outcome and the costs from resource expenditures. Specifically, $\overline{V}_C = P(\Delta) - \beta K(\Delta)$, where

$$\begin{aligned}
P(\Delta) &= (1-\tilde{e})2\sigma^2 - 2(1-e^*)\Big(e^* \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} \pi(\Delta,\omega) f(\omega) d\omega + (1-e^*) \int \pi(\Delta,\omega) f(\omega) d\omega\Big) \\
K(\Delta) &= 2c(e^*) - C(\tilde{e}),
\end{aligned}$$

where we define $\pi(\Delta,\omega)$ as

$$\pi(\Delta,\omega) = \Delta(\underline{\omega}_1^* - \omega) + (\underline{\omega}_1^* - \omega)^2.$$

Proof of Proposition 5. Assume agency 1 is closer to Congress than agency 2, $|a_1| < |a_2|$. Congress' utility for delegation to agency 1 is $V_C^1(a_1) = -2(a_1)^2 - (1-\tilde{e})2\sigma^2 - \beta C(\tilde{e}) > V_C^1(a_2)$. So it is clear that if Congress delegates to one agency it consolidates in agency 1.

On the other hand, if Congress splits authority between both its utility V_C^2 is bounded above by $-a_1^2 - a_2^2$. Thus, for $|a_2|$ sufficiently large $V_C^2 < V_C^1$ as required.

Proof of Proposition 6 At $e^* = 1$ both agencies always discover the state for certain and so taking the limit of $P(\Delta)$ as $\Delta \to \infty$ from proposition 4 and continuity in e Congress' payoff must be converging to its payoff from the model in which both agencies expend effort at 1. As such, we get that $\lim_{\Delta\to\infty} P(\Delta) = (1-\tilde{e})2\sigma^2 > 0$. By continuity of P in Δ, there exists $\overline{\Delta}$ such that for all $\Delta' \in [\overline{\Delta}, \infty)$ we have $P(\Delta') > 0$. Further, for any $\Delta' \in [\overline{\Delta}, \infty)$ we have $K(\Delta') < \infty$. Since $P(\Delta') > 0$ we can choose β sufficiently small, as a function of Δ', to get $P(\Delta') - \beta K(\Delta') > 0$ and so Congress will choose to delegate to multiple agencies.

Next, we want to analyze what happens when $\Delta = 0$. In this case we have $\overline{V}_c(0) = P(0) - \beta K(0)$, where

$$\begin{aligned} P(0) &= (1-\tilde{e})2\sigma^2 - (1-e^*)^2 2\sigma^2 \\ K(0) &= 2c(e_0^*) - C(\tilde{e}). \end{aligned}$$

First, we find conditions under which the policy payoff to Congress for consolidating is greater. We have that $P(0) < 0$ holds if

$$e_0^*(2 - e_0^*) < \tilde{e}. \tag{13}$$

Since $e_0^* < 1$ the LHS (13) is strictly less than 1. From the single agency's first order condition we can choose $C(e)$ such that (13) holds. For example, if $C(e) = \theta c(e)$ for $\theta > 0$, then there is some $\theta' > 0$ such that for all $\theta < \theta'$ (13) holds. Similarly, $\tilde{e} < 1$ and so for any $\tilde{e}$ we can always find a θ'' such that $2c(e^*(0)) - C(\tilde{e}) > 0$. Choosing $\theta \in (0, \min\{\theta', \theta''\}]$, we get a sufficiently efficient cost function such that it will be optimal to consolidate. In this case, $\overline{V}_c(0) > 0$ and continuity yields that for Δ sufficiently small Congress will prefer to consolidate.

Proof of Proposition 7. Let $c(e) = \frac{\theta e^2}{1-e}$ and $C(e) = c(\alpha e) + c((1-\alpha)e)$ for $\alpha \in [1/2, 1]$, with $\theta > 2\sigma^2$, and set $\beta = 0$. We have that e_0^* solves

$$(1-e_0^*)2\sigma^2 = \theta\Big(\frac{1}{(1-e_0^*)^2} - 1\Big). \tag{14}$$

The consolidated agency expends effort $\tilde{e}_\alpha$, which solves

$$2\sigma^2 = \theta\Big(\frac{\alpha}{(1-\alpha e)^2} + \frac{1-\alpha}{(1-(1-\alpha)e)^2} - 1\Big). \tag{15}$$

First, note that

$$\frac{\partial \tilde{e}_\alpha}{\partial \alpha} = -\frac{c'(\alpha\tilde{e}_\alpha) - c'((1-\alpha)\tilde{e}_\alpha) + \tilde{e}_\alpha\Big(\alpha c''(\alpha\tilde{e}_\alpha) - (1-\alpha)c''((1-\alpha)\tilde{e}_\alpha)\Big)}{\alpha^2 c''(\alpha\tilde{e}_\alpha) + (1-\alpha)^2 c''((1-\alpha)\tilde{e}_\alpha)} < 0$$

thus, $\tilde{e}$ is decreasing in α. Further, since changes in α do not affect e_0^* and $P(0)$ is clearly decreasing as $\tilde{e}_\alpha$ increases, this implies that $P(0)$ is increasing in α, i.e., as the consolidated agency becomes less efficient it becomes more attractive to delegate to multiple agencies.

At $\alpha = 1$ we have

$$\tilde{e}_1 = 1 - \frac{\theta}{\sqrt{\theta(2\sigma + \theta)}}.$$

Substituting e_0^* and $\tilde{e}_1$ into (13) and solving, we get that at $\alpha = 1$ the inequality (13) never holds, thus $P(0) > 0$.

Next, if $\alpha = 1/2$ then $\tilde{e}_{\frac{1}{2}} = 2\tilde{e}_1$. Substituting into (13) and computing we have that there exists $\theta^*(\frac{1}{2}) > 0$ such that if $\theta < \theta^*(\frac{1}{2})$ then $P(0) < 0$ and if $\theta > \theta^*(\frac{1}{2})$ then $P(0) > 0$. Finally, since $\overline{V}_c$ is decreasing in α it must be there is $\theta^*(\alpha)$ decreasing in α, such that for $\theta \leq \theta^*(\alpha)$ it is optimal to consolidate and split authority otherwise, completing the characterization.

B.2 Policy Complexity & Budget Constraints

The model is parameterized by the distribution of the state, $\omega \sim \mathcal{N}(0, \sigma^2)$, and the weight Congress places on effort costs, β. In this section we consider how changing the variance σ^2 or the weight β affects delegation.

First, we want to show that at $\Delta = 0$ an increase in σ^2 causes $\theta^*(\frac{1}{2})$ to increase. We have that $\theta^*(\frac{1}{2})$ solves

$$\tilde{e}_{1/2} = e_0^*(2 - e_0^*)$$

Using Mathematica to take the partial of $\theta^*(\frac{1}{2})$ with respect to σ^2 yields $\frac{\partial\theta^*(\frac{1}{2})}{\partial\sigma^2} > 0$ as desired. Next, again using Mathematica, we immediately get that $2c(e_0^*) - C(\tilde{e}) > 0$, and so, higher β makes delegating to multiple agencies less attractive.

We now turn to high policy divergence. In particular, in the limit, $\Delta \to \infty$, Congress' utility for splitting authority over consolidating is $\overline{V}_c = 2\sigma^2(1 - \tilde{e}_{1/2})$. The derivative with respect to σ^2 is

$$2\Big(\frac{((\sigma^2)^2+2\theta)\sqrt{\theta((\sigma^2)^2+\theta)}}{(\sigma^2+\theta)^2}-1\Big).$$

We want to show that this is positive. Manipulating, we have the following sequence of expressions:

$$\begin{aligned}
\frac{\partial \overline{V}_c}{\partial \sigma^2} &> 0,\\
\frac{(\sigma^2+2\theta)\sqrt{\theta(\sigma^2+\theta)}}{(\sigma^2+\theta)^2} &> 1,\\
\theta((\sigma^2)^2+\theta)((\sigma^2)^2+2\theta)^2 &> (\sigma^2+\theta)^4,\\
3\theta^4+4\sigma^2\theta^3 &> (\sigma^2)^4+3(\sigma^2)^3\theta+(\sigma^2)^2\theta^2.
\end{aligned}$$

To show that the final line holds we just need that the following expressions hold

$$3\theta^4 > (\sigma^2)^4+(\sigma^2)^2\theta^2 \tag{16}$$

$$4\sigma^2\theta^3 > 3(\sigma^2)^3\theta, \tag{17}$$

both of which follow from $\theta > 2\sigma^2$. Thus, the gain to Congress for delegating to multiple agencies is increasing in σ^2.

Finally, clearly $\lim_{e^*\to 1} 2c(e^*) - c(\frac{1}{2}\tilde{e}) > 0$, and so, higher β makes delegating to multiple agencies less attractive when Δ is large.

B.3 Presidential Influence

If authority is consolidated in one agency the president, if possible, moves that agency to share his ideal point. On the other hand, if authority is split between two agencies the president moves the furthest agency.

Proof of Proposition 9. First, assume neither agency shares an ideal point with the president. If Congress also has an ideal point at R by the assumptions on D and R proposition 5 implies that it consolidates authority in one agency. Next, if Congress has an ideal point at D we want to show that it splits authority. If it consolidates then its expected utility is $-2(D-R)^2-(1-\tilde{e})2\sigma^2$. On the other hand, as $R-D\to\infty$, if it splits authority its expected utility is $-(D-R)^2$. Thus, for sufficiently high polarization Congress splits authority.

Second, assume that one agency shares an ideal point with the president. In this case, if authority is consolidated or split any active agencies have an ideal point at R. Thus, for any Congress its decision only depends on its optimal choice at $\Delta = 0$.

Proof of Proposition 10. Assume there is divided government. If both agencies have ideal policies at R then insulating the agencies does not affect agency ideal policies. As such, Congress weakly prefers to insulate and makes its choice based on the characterization at $\Delta = 0$. If one agency has an ideal point at R and the other at D first assume that Congress insulates the agencies. In this case, by proposition 5, it prefers to consolidate authority with the agency at D and has expected utility $-(1-\tilde{e})2\sigma^2$. On the other hand, if it does not insulate and consolidates authority in one agency it gets $-2(R-D)^2 - (1-\tilde{e})2\sigma^2$ which is clearly dominated by insulating and consolidating. If it does not insulate and instead splits authority then its expected payoff is $-2(R-D)^2 - (1-e_0^*)^2 2\sigma^2$ which, for $R-D$ sufficiently large, results in strictly worse variance and policy payoffs compared to insulating and splitting authority and thus, is strictly worse than insulating and consolidating. Finally, assume both agencies have ideal policies at D. By proposition 5 splitting authority and not insulating is worse for Congress than consolidating authority and insulating. Additionally, consolidating authority and not insulating results in the same level of information acquisition as consolidating and insulating, but yields strictly worse policy payoffs. Thus, Congress always insulates in this case and its decision depends on its choice at $\Delta = 0$. Similar arguments yield part 2 of the proposition characterizing Congress' decision under unified government.

B.4 Mandatory Information Sharing

Define V_c^M as Congress' payoff under mandatory information sharing, $V_c^M = -\frac{\Delta^2}{2} - (1-e^M)^2 2\sigma^2$. Let the difference between V_c^2 and V_c^M be V_c^*. Thus,

$$V_c^* = (1-e^M)^2 2\sigma^2 - 2(1-e^*)\Big(e^* \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*} \pi(\Delta) f(\omega) d\omega + (1-e^*) \int \pi(\Delta) f(\omega) d\omega\Big)$$
$$-2\beta\Big(c(e^*) - c(e^M)\Big)$$

For Δ and β sufficiently small large $e^* \to 1$ implies optimality of non-disclosure, similar to the case of consolidated versus split authority. For Δ small we will show that at $\Delta = 0$ we have $V_c^2 = V_c^M$ but that V_c^2 has a maximum at $\Delta = 0$ while V_c^M is unchanging in Δ, implying there exists $\underline{\Delta}^* > 0$ such that for all $\Delta \in [0, \underline{\Delta}^*]$ we have $V_c^* \le 0$, with this holding strictly for $\Delta \neq 0$. Thus, Congress prefers mandatory information sharing for sufficiently small Δ. We want to show that $\frac{\partial V_c^*}{\partial \Delta}|_{\Delta=0} = 0$ and $\frac{\partial^2 V_c^*}{\partial \Delta^2}|_{\Delta=0} < 0$. First, differentiating yields

$$\begin{aligned}\frac{\partial V_c^*}{\partial \Delta} =& 2\frac{\partial e^*}{\partial \Delta}\Big[e^*\int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi(\Delta)f(\omega)d\omega + (1-e^*)\int\pi(\Delta)f(\omega)d\omega\Big] \\ & - 2(1-e^*)\Big[\frac{\partial e^*}{\partial \Delta}\int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi(\Delta)f(\omega)d\omega + e^*\Big(\frac{\partial \overline{\omega}_1^*}{\partial \Delta}\pi(\Delta,\overline{\omega}_1^*) + \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi'(\Delta)f(\omega)d\omega\Big) \\ & - \frac{\partial e^*}{\partial \Delta}\int\pi(\Delta)f(\omega)d\omega + (1-e^*)\int\pi'(\Delta)f(\omega)d\omega\Big] - 2\beta c'(e)\frac{\partial e^*}{\partial \Delta},\end{aligned}$$

where π' is the derivative with respect to Δ and we have

$$\pi'(\Delta) = (\underline{\omega}_1^* - \omega) + \Delta\frac{\partial \underline{\omega}_1^*}{\partial \Delta} + 2\frac{\partial \underline{\omega}_1^*}{\partial \Delta}(\underline{\omega}_1^* - \omega).$$

Furthermore, $\frac{\partial \underline{\omega}_1^*}{\partial \Delta} = \frac{d\underline{\omega}_1^*}{d\Delta}\frac{\partial e^*}{\partial \Delta}$, and so $\frac{\partial \underline{\omega}_1^*}{\partial \Delta}|_{\Delta=0} = 0$. We will also use $\pi''(\Delta)$ as the second derivative of π with respect to Δ, differentiating yields

$$\pi''(\Delta) = 2\frac{\partial \underline{\omega}_1^*}{\partial \Delta} + \Delta\frac{\partial^2 \underline{\omega}_1^*}{\partial \Delta^2}(\underline{\omega}_1^* - \omega) + 2(\frac{\partial \underline{\omega}_1^*}{\partial \Delta})^2.$$

We have $\pi'(0) = -\omega$ and $\pi''(0) = 0$. Setting $\Delta = 0$ we get $\frac{\partial V_c^*}{\partial \Delta}|_{\Delta=0} = 0$. Next, we find that

$$\begin{aligned}\frac{\partial^2 V_c^*}{\partial \Delta^2} =& 2\frac{\partial^2 e^*}{\partial \Delta^2}\Big[e^*\int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi(\Delta)f(\omega)d\omega + (1-e^*)\int\pi(\Delta)f(\omega)d\omega\Big] \\ & + 2\frac{\partial e^*}{\partial \Delta}\Big[\frac{\partial e^*}{\partial \Delta}\int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi(\Delta)f(\omega)d\omega + e^*\Big(\frac{\partial \overline{\omega}_1^*}{\partial \Delta}\pi(\Delta,\overline{\omega}_1^*) + \int_{\underline{\omega}_1^*}^{\overline{\omega}_1^*}\pi'(\Delta)f(\omega)d\omega\Big) \\ & - \frac{\partial e^*}{\partial \Delta}\int\pi(\Delta)f(\omega)d\omega + (1-e^*)\int\pi'(\Delta)f(\omega)d\omega\Big] \\ & - 2(1-e^*)\Big(\frac{\partial^2 e^*}{\partial \Delta^2}\int_{\Omega_1^*}\pi(\Delta)f(\omega)d\omega + 2\frac{\partial e^*}{\partial \Delta}\frac{\partial \overline{\omega}_1^*}{\partial \Delta}\pi(\Delta,\overline{\omega}_1^*) + \frac{\partial e^*}{\partial \Delta}\int_{\Omega_1^*}\pi'(\Delta)f(\omega)d\omega \\ & + e^*\Big[\frac{\partial^2 \overline{\omega}_1^*}{\partial \Delta^2}\pi(\Delta,\overline{\omega}_1^*) + \frac{\partial \overline{\omega}_1^*}{\partial \Delta}\Big((\underline{\omega}_1^* - \overline{\omega}_1^*) + \Delta(\frac{\partial \underline{\omega}_1^*}{\partial \Delta} - \frac{\partial \overline{\omega}_1^*}{\partial \Delta}) + 2(\frac{\partial \underline{\omega}_1^*}{\partial \Delta} - \frac{\partial \overline{\omega}_1^*}{\partial \Delta})(\underline{\omega}_1^* - \overline{\omega}_1^*)\Big) \\ & \frac{\partial \overline{\omega}_1^*}{\partial \Delta}f(\overline{\omega}_1^*)\Big((\underline{\omega}_1^* - \overline{\omega}_1^*) + \Delta\frac{\partial \underline{\omega}_1^*}{\partial \Delta} + 2\frac{\partial \underline{\omega}_1^*}{\partial \Delta}(\underline{\omega}_1^* - \overline{\omega}_1^*)\Big) - \Delta(\frac{\partial \underline{\omega}_1^*}{\partial \Delta})^2 + \int_{\Omega_1^*}\pi''(\Delta)f(\omega)d\omega\Big] \\ & - \frac{\partial^2 e^*}{\partial \Delta^2}\int\pi(\Delta)f(\omega)d\omega - 2\frac{\partial e^*}{\partial \Delta}\int\pi''(\Delta)f(\omega)d\omega\Big) \\ & - 2\beta(c''(e^*)(\frac{\partial e^*}{\partial \Delta})^2 + c'(e^*)\frac{\partial^2 e^*}{\partial \Delta^2})\end{aligned}$$

Setting $\Delta = 0$ we get

$$\frac{\partial^2 V_c^*}{\partial \Delta^2}|_{\Delta=0} = -2\beta c'(e^*)\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} < 0,$$

as required. Note, $\frac{\partial^2 e^*}{\partial \Delta^2}|_{\Delta=0} > 0$ is a by-product of the proof of proposition 4 part 2.

C Robustness

I now discuss the robustness of these results. I consider asymmetric equilibria of the model, and a number of possible extensions. In particular, I scrutinize the finding in Proposition 6 that divergent agency policy preferences should lead Congress to delegate to multiple agencies.

C.1 Asymmetric Equilibria

It is possible equilibria exist in which the agencies expend asymmetric efforts. Even if selecting an asymmetric equilibrium, however, it will remain optimal for Congress to delegate to multiple agencies when Δ is sufficiently high. In any asymmetric equilibrium, as Δ becomes arbitrarily large, one agency's effort is going to 1 and the other agency's effort is going to 0. Thus, unlike in the symmetric equilibrium, for sufficiently high Δ, one agency is actually decreasing its effort. Policy outcomes, however, will remain unaltered. As, in the limit, one agency learns ω for certain, at the information sharing stage that agency will be unable to actually conceal information in equilibrium. Hence, as in the symmetric case, both agencies will end up learning the state and be able to choose policy to get their ideal outcome.

Therefore, in the limit, the policy utility to Congress for delegating to multiple agencies is the same, regardless if the ensuing equilibrium is symmetric or asymmetric. In fact, asymmetric equilibria are an improvement for Congress, as fewer resources are spent to achieve the same policy outcome.

Recall that equilibrium efforts (e_1^*, e_2^*) solve

$$\Gamma_1^1(e_2^*) + \Gamma_1^2(e_1^*, e_2^*) = c'(e_1^*),$$
$$\Gamma_2^2(e_1^*) + \Gamma_2^1(e_1^*, e_2^*) = c'(e_2^*).$$

Assume there exists an equilibrium with efforts such that $e_1^* \neq e_2^*$ and let $e_1^* > e_2^*$. Thus,

(e_1^*, e_2^*) solves

$$e_2^* \int_{\underline{\omega}_2^*(e_2^*,\Delta)}^{\overline{\omega}_2^*(e_2^*,\Delta)} (\underline{\omega}_2^*(e_2^*,\Delta) - \omega)^2 f(\omega) d\omega + (1-e_2^*) \int (\underline{\omega}_2^*(e_2^*,\Delta) - \omega)^2 f(\omega) d\omega$$
$$+ (1-e_2^*) \int_{\{\omega : \omega \notin \Omega_1^*(e_1^*,\Delta)\}} [(\overline{\omega}_1^*(e_1^*,\Delta) - \omega - \Delta)^2 - (\Delta)^2] f(\omega) d\omega = c'(e_1^*) \tag{18}$$

$$e_1^* \int_{\underline{\omega}_1^*(e_1^*,\Delta)}^{\overline{\omega}_1^*(e_1^*,\Delta)} (\underline{\omega}_1^*(e_1^*,\Delta) - \omega)^2 f(\omega) d\omega + (1-e_1^*) \int (\underline{\omega}_1^*(e_1^*,\Delta) - \omega)^2 f(\omega) d\omega$$
$$+ (1-e_1^*) \int_{\{\omega : \omega \notin \Omega_2^*(e_2^*,\Delta)\}} [(\overline{\omega}_2^*(e_2^*,\Delta) - \omega - \Delta)^2 - (\Delta)^2] f(\omega) d\omega = c'(e_2^*). \tag{19}$$

Let $\Delta \to \infty$ we want to show that $(e_1^*, e_2^*) \to (1,0)$. First, assume e_1^* does not go to 1. Using similar arguments as before, we get that the LHS of at least one of the equations must go to infinity, and so at least one agency expends effort going to 1. However, if $e_2^* \to 1$ and e_1^* does not go to 1 this contradicts $e_1^* > e_2^*$. Thus, $e_1^* \to 1$ and inspecting (19) it must be that $e_2^* \to 0$.

C.2 Partially Correlated States

The baseline model assumes that the exact same underlying state of the world impacts each agency's policy issue. While this is may be a reasonable approximation for some applications, it is an overly strong assumption for others. Instead, here assume there is a different state of the world that impacts each issue, but that the states are correlated. Therefore, the issues are still related, as learning one of the states is informative about the other, but the information does not have to be perfectly informative.

Specifically, alter the model in the following ways: First, assume that the state of the world is $(\omega_1, \omega_2) \in \mathbb{R}^2$ and that (ω_1, ω_2) is drawn from a bivariate normal distribution with mean (0,0), variance (σ^2, σ^2), and correlation $\rho \in (0,1]$. Thus, ρ represents the similarity of the policy issues or jurisdictions, and setting it to 1 recovers the original model. Each issue is affected by one of the states, so the final payoff to agency i is

$$u_i(x_i, \omega_i) + u_i(x_j, \omega_j) - c(e_i).$$

After expending effort agency i learns ω_i with probability e_i, i.e., it experiments only on its own policy issue. Finally, assume that when authority is given to one agency it expends effort e to learn (ω_1, ω_2) with probability e.

Let ** refer to equilibrium variables of the correlated model, while * continues to refer to those of the original model. As the states are distributed bivariate normal we have $E[\omega_i|\omega_j] = \rho\omega_j$. Using this, we get

$$\underline{\omega}_1^{**}(\hat{e}_1) = \frac{\underline{\omega}_1^{*}(\hat{e}_1)}{\rho} \qquad \overline{\omega}_1^{**}(\hat{e}_1) = \frac{\underline{\omega}_1^{*}(\hat{e}_1)}{\rho} + 2\Delta \qquad x_2^{**}(\phi) = a_2 + \frac{\underline{\omega}_1^{*}(\hat{e}_1)}{\rho},$$

with similar transformations for agency 2's non-disclosure set and agency 1's policy choice. A pure strategy symmetric equilibrium continues to exist and we get that e^{**} solves

$$\begin{aligned} & e^{**}\int_{\underline{\omega}_1^{**}(e^{**},\Delta)}^{\overline{\omega}_1^{**}(e^{**},\Delta)} (\underline{\omega}_1^{**}(e^{**},\Delta)-\omega)^2 f(\omega)d\omega + (1-e^{**})\int (\underline{\omega}_1^{**}(e^{**},\Delta)-\omega)^2 f(\omega)d\omega \\ & +(1-e^{**})\int_{\{\omega:\omega\notin\Omega_2^{**}(e^{**},\Delta)\}} [(\overline{\omega}_2^{**}(e^{**},\Delta)-\omega-\Delta)^2-(\Delta)^2]f(\omega)d\omega = c'(e^{**}), \end{aligned} \tag{20}$$

and using the transformations given above, analogous arguments apply as in the proofs for the main model.

C.3 Other Extensions

Coordination In many applications, Congress may care about the level of coordination between the policy choices. To address this, include a loss function in the payoff to Congress that is increasing in the difference between the agencies' policy choices. If the disutility from large differences in policy choices is not too great, then it will still be optimal to delegate to multiple agencies when Δ is high. This extension, however, does not capture the many other intricate ways in which agency policy choices may interact. The assumption that Congress's utility over policy choices is additively separable may be particularly strong in some instances. Given the importance of situations in which policy choices interact, this represents an interesting avenue for future work that studies shared regulatory space.

Judicial Review Bureaucratic agencies are also subject to judicial review. The agency may face negative consequences if a court finds that the agency made policy without strong supporting evidence, i.e., it was uninformed. To account for this possibility, the model could incorporate a cost to the agency if it does not discover the state. As this cost does not impact information sharing or interact with other incentives for information acquisition, qualitatively, the results continue to hold under this set-up. Beyond this alteration, future work could build upon the model here and consider the effect of review by a strategic veto player.

Asymmetric Costs It may be that the agencies have different cost for expending effort.

This could represent that one agency has better expertise on the issue, or one agency is better organized than the other. Changing the model so each agency has its own cost function, c_i, it is not clear that the results based on the symmetric equilibria still hold. From the analysis of asymmetric equilibria, however, it will still hold that as Δ gets large one agency's effort is going to 1 and the other's effort going to 0. Thus, for large Δ it remains optimal to delegate to multiple agencies, even if one is much more efficient than the other.

Jurisdiction Finally, it may be unclear ahead of time which agency will have jurisdiction over an issue. To capture this possibility alter the model so that there is only one policy choice being made. After agencies acquire and share information, there is some probability of either agency having jurisdiction to choose the policy. If the agencies do not have the same probability of being chosen, the model again becomes asymmetric. The comments about asymmetric equilibria, however, still hold. In particular, for high Δ, Congress should continue to delegate authority to multiple agencies.

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