Bureaucratic Capacity and Legislative Performance

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Introduction

Ironically, most studies of the macro performance of Congress are rather micro in their orientation. Existing work focuses almost exclusively on how the distribution of political preferences across parties and branches affects the output of "significant" legislation. It has not focused on longer-term institutional changes that increase or decrease the capacity or willingness of Congress to perform its legislative functions.

If one seeks only to explain the post-World War II times series of legislative enactments, a focus on divided government (Mayhew 1991; Adler, Howell, Riemann and Cameron 2000), the gridlock interval (Krehbiel 1999), or bicameral polarization (Binder 1999) may be appropriate. However, it is doubtful that party and/or preference-based approaches can go very far in explaining longer national term trends in legislative productivity.[1] In the language of time series econometrics, divided government, gridlock intervals, and bicameral preference differences are roughly stationary while the amount of legislative activity experienced explosive growth during the first part of the 20th century (Heitshusen and Young, this volume; Lapinski 2000). It is clear that explaining such a dramatic increase in activity requires a theory of legislative decision making that incorporates variables that plausibly move in tandem with the series on legislative productivity.

The dominant theoretical approach also seems ill-equipped to explain other important aspects of legislative productivity in American politics. There are vast differences across the American states, for example, in the activism of legislatures. There are even differences at a given point in time in which federal departments or agencies are more or less likely to be affected by new laws.

[1] Even in the short post-war series, Adler et al find statistically significant time trends after controlling for shifts in partisan control and other control variables.

This chapter develops a model of legislative productivity that we hope can address some of these limitations in the literature. Our goal is to incorporate insights from existing theories of legislative-executive preference conflict into a model that looks explicitly at important non-legislative aspects of the policymaking process. With the exception of Huber and Shipan (2002), to the extent that existing models of law production analyze non-legislative actors in the law production process, they typically examine only legislative functions of such actors (such as a presidential veto or the striking down of a law by courts). Non-legislative policymaking, however, is a central feature of politics. Courts, presidential rule-making, legislative oversight, and, perhaps most importantly, bureaucrats have considerable impact on policy outcomes after laws are adopted. We argue that legislative actors will anticipate the impact of such non-legislative policymaking on policy outcomes, and will incorporate these expectations into their decisions to adopt any new laws.

Bureaucratic actors, of course, typically play the most significant role in turning laws into policy outcomes, and our analysis examines how the practical necessity of delegating implementation responsibilities to bureaucrats affects incentives to adopt new legislation in the first place. There has, of course, been considerable previous work on how legislation is designed to address problems of bureaucratic control, delegation, and implementation (e.g., Banks 1989, Bawn 1995, McNollgast, Huber and Shipan 2002, Epstein and O'Halloran 1999, and Volden 2002). This work, however, typically focuses on *how* to delegate authority, rather than whether to adopt a new item of legislation in the first place.

The model we develop examines several aspects of non-legislative policymaking and their impact on legislation, but the central focus is on "bureaucratic capacity." Most existing models assume that bureaucrats can choose effectively the outcomes they most prefer, subject to constraints in legislation or elsewhere in the political environment. We assume that bureaucratic capacity – which we define as the

likelihood that bureaucrats can take actions that yield their intended outcomes – varies. Our goal in making this assumption is to analyze a phenomenon that seems central in empirical accounts of bureaucratic politics in the U.S. Scholars often argue, for example, that the competence of bureaucrats varies over time in the U.S., with reforms such as the Civil Service Reform Act of 1883 and subsequent executive orders leading to increased professionalism in the bureaucracy. They also argue bureaucratic capacity can vary across departments at a given point in time (e.g., Carpenter 2001), and across the American states (e.g., Barrilleaux 1992). We want to understand how variation in bureaucratic capacity affects decisions to adopt new legislation.

Our model therefore examines a phenomenon that is emphasized by Carpenter (2001). His historical study of the Departments of Agriculture, Interior, and the Post Office pays a great deal of attention to how capacity within the bureaucracy affects policy change. But the connection he draws between bureaucratic capacity and policy change is largely non-legislative. He argues that agencies with reputations for competence have significantly more leeway to innovate and develop new programs *without* explicit legislative approval. By contrast, our analysis examines how bureaucratic capacity influences the *adoption of new legislation*, and we do so within a game theoretic model that treats institutional features of the non-legislative environments as variables that influence strategic interaction.

To explore the relationship between bureaucratic capacity and legislative output, we develop a game theoretic model of legislative delegation of policy making authority to an administrative agency with varying capacities to implement particular policies. Our model is related to Huber and Shipan (2002), which examines how the broad institutional context affects delegation, and it builds directly on Huber and McCarty (2001), which focuses on how bureaucratic capacity affects legislative strategy.

We emphasize two pathways by which bureaucratic capacity affects the adoption of new legislation. On one hand, there is a straightforward "efficiency loss." If bureaucrats are bad at what they

do, the value of adopting new programs will decline, increasing gridlock. On the other hand, there is a less obvious "compliance" effect. If bureaucratic capacity is relatively low, it will be more difficult for bureaucrats to comply with legislative statutes, decreasing their incentives to do so. This forces legislative actors to grant bureaucrats *more* autonomy in the laws that they adopt, decreasing the value of adopting new laws, and thereby increasing gridlock. Thus, as bureaucratic capacity declines, the legislature and executive will be less able to achieve mutually beneficial gains from adopting new legislation.

In what follows, we describe our game theoretic model. We then use this model to describe our argument about how bureaucratic capacity (and several other variables) can influence law production. While an empirical test of the model is beyond the scope of this chapter, we also develop a number of empirical implications for the study of the macro-politics of Congress, and American politics more generally.

The Model

There are three players in our model: a Legislature (with ideal point $x_L = 0$) who proposes legislation; a President (with ideal point $x_P \geq 0$) who can veto policy proposals; and a Bureaucrat (with ideal point $x_B \in \mathbb{R}^1$), who takes actions to implement policy. The players interact to determine a policy outcome in a single-dimensional policy space. Each of the players has quadratic utility functions over policy outcomes.

Of central interest in our analysis is the impact of bureaucratic capacity on the ability of the Legislature and President to agree on policy change. In our model, bureaucratic capacity is the ability of the Bureaucrat to execute the action he intends. Formally, if the Bureaucrat attempts action a, then the outcome of this action is $a - w$ where ω is a random variable with a probability density

function $f(w) = \frac{\Omega - |w|}{\Omega^2}$ on the interval $[-\Omega, \Omega]$. Therefore, ω is distributed symmetrically around a mean of 0 with a variance $s_w^2 = \frac{1}{6}\Omega^2$.[2] Since it is directly related to the variance of ω and therefore the Bureaucrat's ability to control the realized action, Ω represents bureaucratic *incapacity* in our model. When Ω is very small, the Bureaucrat's capacity is large (because the maximal errors in implementation are small). As Ω increases, so too does the possibility of large errors in implementation. Since we assume that all players have quadratic preferences, the utility from any action that is not overturned is $-(l-a)^2 - \frac{1}{6}\Omega^2$ for $l \in \{L, P, B\}$.[3]

Our assumption, then, is that bureaucrats take actions, but the result of these actions will often be other than what was intended. For some bureaucrats, this will be a bigger problem than for others. It may be the case, for example, that a bureaucrat charged with administering a pension system will attempt to establish a clear set of rules about eligibility and payments. But this bureaucrat may be unable to enforce adequately the application of these rules, as subordinates in the agency may favor particular individuals over others, may refuse pensions where they are deserved, may provide pensions to individuals who are ineligible, or may simply fail to show up for work. Similarly, a senior bureaucrat may attempt to limit imports of a particular product to a specific amount, but be unable to execute this limit because government agents at the docks allow too many, or too few, of a product to enter a country. In general, then, we think of large Ω as corresponding to situations where senior bureaucrats are unable to control subordinates, corruption is rampant, or bureaucrats are simply incompetent to carry out the tasks they have been assigned. In the context of American political development, it useful to think of Ω as varying

[2] For our results, only the unimodality of ω is crucial. The density of ω that of the sum or difference of two uniform random variables with 0 mean.
[3] The separability of the utilities of the mean and variance is a property of quadratic utility functions.

across states (in state level bureaucracies), across agencies in the federal government, and over time as general administrative capacities have waxed and waned.

The game begins when the Legislature decides whether to adopt a bill. If no bill is adopted, the final policy is the reversion policy Q which enforces the status quo outcome, Q. If the Legislature adopts a bill, the bill specifies the upper and lower bound on policies that the Bureaucrat can implement while remaining compliant with the law. Formally, this bill is $x = [\underline{x}, \overline{x}]$. If x is adopted, the President must decide whether to accept or veto the Legislation. If he exercises a veto, the status quo is in the outcome. Thus, policy change requires the consent of both the Legislature and the President.

If the President accepts x, the Bureaucrat adopts an action, a, to implement the legislation. The outcome of this action is $a + w$. The final policy outcome, however, depends not only on a and ω, but also on other institutional factors that can move policy to the ideal point of the Legislature or the President. In this respect, our model follows Huber and Shipan (2002), who argue that non-statutory factors such as the decisions of courts and presidential rule-making authority can influence policy outcomes, *independent* of the language of legislation. There are also factors that can influence whether legislatures can achieve their desired policy outcomes by means other than legislative statute. These would include favorable court decisions and effective oversight opportunities.

We treat these alternative influences on policy outcomes as variables in our model. For any x, we assume that there is an exogenous probability β that the outcome moves to the President's ideal point. This parameter, β, therefore captures variation in the powers of the president over time and across policy areas with a large β representing situations where presidents have greatest ability to influence policy directly. Similarly, we assume that γ is the probability that the outcome moves to the Legislature's idea point, where $\beta + \gamma < 1$. A large γ represents a situation where the Legislature can be reasonably

confident of obtaining desired policy outcomes independent of the language of statutes or the actions of bureaucrats.

We also assume that γ measures the probability the Bureaucrat will be caught if $a - w \notin [\underline{x}, \overline{x}]$. Our model does not assume, then, that Bureaucrats must comply with the law. They may try to do so, but fail because of a large error in their action. Or they may not even try to comply with a statute, taking instead an action that they know will be out of compliance with the statute. If, however, the Bureaucrat does not comply with the law ($a - w \notin [\underline{x}, \overline{x}]$), then with probability g the Bureaucrat is caught out of compliance, and must pay a cost δ of non-compliance. The parameters g and δ therefore capture the effectiveness of the Legislature at uncovering and punishing inappropriate actions by the Bureaucrat.[4]

It is useful to note in this regard that punishment is based on the outcome of the Bureaucrat's attempted action, $a - \omega$. We assume that politicians cannot observe a, the Bureaucrat's intended action. They can only observe the outcome from these actions. Thus, if the Bureaucrat "accidentally" complies with the statute (i.e., $a \notin [\underline{x}, \overline{x}]$ but $a - w \in [\underline{x}, \overline{x}]$) he cannot be punished, and if he tries to comply but fails (i.e., $a \in [\underline{x}, \overline{x}]$ but $a - w \notin [\underline{x}, \overline{x}]$) he can be punished

Our model, then, can be summarized as follows.

- The Legislature begins the game by deciding whether adopt new legislation, $x = [\underline{x}, \overline{x}]$, which establishes the domain of actions that the Bureaucrat can take while complying with the law. Failure to adopt a new statute enforces the status quo, Q.

[4] It would be straightforward to assume that b also affects the probability of non-compliance, and such an assumption would not change our results regarding bureaucratic capacity. We focus here on legislative oversight, which we feel is more important given that bureaucrats in American politics typically have preferences that are more aligned with the executive.

- If the Legislature adopts new legislation, the President either accepts or vetoes it. A veto enforces the status quo.
- If a new statute is proposed and accepted by the President, the Bureaucrat attempts an action to implement policy. The outcome of this action will diverge from what the Bureaucrat intended, and the variation in this divergence is a function of the Bureaucrat's (in)capacity, Ω.
- The final policy is the Legislature's preferred policy (with probability g), the President's preferred policy (with probability β), or the outcome of the Bureaucrat's action, $a-\omega$ (with probability $(1-\beta-\gamma)$.
- If the outcome of the Bureaucrat's action ($a-\omega$) does not comply with the law ($a-w \notin [\underline{x}, \overline{x}]$), then with probability g, the Bureaucrat pays the penalty for non-compliance, δ.

In the next section, we begin analyzing the solution to the model by focusing on the best strategy the Bureaucrat can adopt during policy implementation.

Bureaucratic capacity and inducible bureaucratic actions

Scholars have long recognized that policy change in presidential systems cannot occur unless policies exist that the legislature and president mutually prefer to the status quo. In this section, we describe how strategic incentives in the delegation process make the existence of "mutually preferred policies" necessary but not sufficient for policy change to occur. It may be that such mutually preferred policies exist but cannot be implemented. To understand what policies can actually be implemented, we have to consider the actions of bureaucrats. In Proposition 1, we describe how the strategy of the Bureaucrat in

our model influences the feasible set of alternatives that could be implemented following the adoption of a statute.

Proposition 1. Let $\theta = 2(1-\beta-\gamma)$ and $\pi = \gamma\delta$. There exists some statute $[\underline{x}, \overline{x}]$ that will induce any action in the interval

$$\mathbf{A} = \left[x_B - \min\left\{ \frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p+q\Omega^2}}, \frac{p}{q\Omega} \right\}, x_B + \min\left\{ \frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p+q\Omega^2}}, \frac{p}{q\Omega} \right\} \right].$$

No other action is inducible.

Proof. See Appendix.

To understand the intuition underlying Proposition 1, consider the Bureaucrat's best response to any statute, which is described in the proof of Proposition 1. Figure 1a depicts an example where w (the distance between the Bureaucrat's action and the outcome from this action) is distributed according to $f_1(w)$, with a maximum value of $\Omega = 1$. Consider two possible actions by the Bureaucrat. The first is when the Bureaucrat adopts the policy he most prefers from those action that always ensure compliance with the statute (for any realization of w). Given that $\Omega = 1$, if the upper-bound of the statute is at $\overline{x}$, the best "always compliant" action is at $\underset{\sim}{a} = \overline{x} - 1$. The distribution of consequences from this action are depicted by the dashed triangle with an apex above $\underset{\sim}{a}$. In this case, the Bureaucrat's action never results in non-compliance, but the policy outcome ($\underset{\sim}{a} + w$) is always relatively distant from his ideal policy, x_B.

Next consider what happens if the Bureaucrat takes an action to implement his most preferred policy, $\tilde{a} = x_B$. Following this action, with some probability (depicted by the shaded area under the dotted triangle and to the left of $\overline{x}$ in Figure 1a), the outcome from the Bureaucrat's action complies with

the statute. The rest of the time it will not. The expected cost of the non-compliant outcome for the Bureaucrat depends not only on the magnitude of this probability of non-compliance (the area under the dotted curve to the right of $\bar{x}$), *but also* on the probability non-compliant actions are detected (g) and the cost of being caught in non-compliance (d). As the expected cost of non-compliance grows, the Bureaucrat can be induced to move his action away from his ideal point.

The Bureaucrat's optimal action during policy implementation is thus determined by weighing the relative value of compliance and non-compliance. As the Bureaucrat moves his action from $\underset{\sim}{a}$ to $\tilde{a}$ in Figure 1a, the expected cost of non-compliance increases (because the probability of non-compliance increases) but the expected policy benefits (when non-compliance does not occur or is undetected) also increase. In equilibrium, the Bureaucrat will choose the action where the marginal expected policy benefits of moving his action toward his ideal point are exactly equal to the marginal expected costs of this movement. Given the location of $\bar{x}$, for example, for certain values of the other parameters in the model, the Bureaucrat's optimal action could be at a^*, which yields the distribution of outcomes depicted by the solid triangle. Note that in equilibrium, the Bureaucrat often takes an action that he knows will result in some non-compliant outcomes (i.e., outcomes under the solid triangle and to the right of $\bar{x}$).

Obviously, the Bureaucrat's action will be influenced by the location of $\bar{x}$. As $\bar{x}$ moves to the left, the Bureaucrat must move his action to the left to maintain the same expected probability of non-compliance, which reduces the Bureaucrat's policy utility. Proposition 1 shows that there is a limit as to how far the Bureaucrat is willing to move his action away from his ideal point. If the policy costs of achieving some level of compliance are sufficiently large (because $\bar{x}$ is sufficiently far to the left, for example), then the Bureaucrat will prefer adopting his most preferred action, $\tilde{a}$, to adopting any other action.

In the model, the specific range of outcomes that the Bureaucrat can be induced to take depends on the relationship between $\theta\Omega^2 = 2(1-\beta-\gamma)\Omega^2$ and $\pi=\gamma\delta$. Although this relationship affects the precise location of the boundary, it does not effect the intuition from the model (or the substantive results about the impact of bureaucratic capacity on gridlock, discussed below). Figure 1b depicts one example of the Bureaucrat's best response, a^*, to statutes adopted by the Legislature and President -- and thus the range of actions that the Legislator can induce for the case when the expected cost of non-compliance is relatively small (i.e. when $pd < q\Omega^2$). This ensures that the range of inducible actions is $\mathbf{A} = \left[x_B - \frac{p}{q\Omega}, x_B + \frac{p}{q\Omega} \right]$ as in Proposition 1.

One way that actions smaller than x_B can be induced is to set $\underline{x}$ very low (so that it does not affect the Bureaucrat's actions), leaving $\overline{x}$ as the only constraint on the Bureaucrat. The Bureaucrat's optimal action as a function of $\overline{x}$ is depicted by the solid line in the figure. If $\overline{x}$ is too low ($\overline{x} < x_B - \Omega$), the Bureaucrat's optimal action will be at his ideal point (case 10 in the proof of Proposition 1) . Similarly, for any $\overline{x}$ above $x_B + \Omega$ (and $\underline{x}$ very low) (case 4), the Bureaucrat will take the action at his ideal point (because this action never can result in non-compliance). For any $\overline{x}$ such that $x_B - \Omega \le \overline{x} \le x_B - \frac{\pi}{\theta\Omega}$, the Bureaucrat's best response is to adopt $a^* = \frac{\theta\Omega^2 x_B - \pi(\overline{x} + \Omega)}{\theta\Omega^2 - \pi}$ (case 9). Thus, the upper bound of the statute can be used to induce any action in the interval $\left[x_B - \frac{p}{q\Omega}, x_B \right]$.

Alternatively, if $x_B - \frac{\pi}{\theta\Omega} \le \overline{x} \le x_B + \Omega$, the Bureaucrat's best response is to adopt $a^* = \frac{\theta\Omega^2 x_B + \pi(\overline{x} - \Omega)}{\theta\Omega^2 + \pi}$ (case 3). Again, the statute can be set so as to induce any action in the interval $\left[x_B - \frac{p}{q\Omega}, x_B \right]$. Although

the Legislature and President will be indifferent between which of two possible statutes is used to induce a particular outcome, the Bureaucrat will not since more non-compliance as the statute's upper bound moves away from the Bureaucrat's ideal point.

By a similar logic, by setting $\overline{x}$ very high (so that it does not constrain the Bureaucrat), the Legislator can use the location of $\underline{x}$ to induce any action in the interval $\left[x_B, x_B + \frac{p}{q\Omega}\right]$. These actions are depicted by the dashed line in Figure 1b. As in the previous example, if the lower bound is sufficiently low ($\underline{x} < x_B - \Omega$), it will not constrain the Bureaucrat from adopting his ideal point (case 4), and if the lower bound is too high ($\underline{x} > x_B + \Omega$), the Bureaucrat will ignore it attempt to implement his ideal point (case 7). But using $\underline{x} \in [x_B - \Omega,\ x_B + \Omega]$, the statute can induce any action in the interval $\left[x_B, x_B + \frac{p}{q\Omega}\right]$. For example, if $\underline{x} \in \left[x_B - \Omega, x_B + \frac{p}{q\Omega}\right]$, then the conditions for case 2 in the proof of Proposition 1 are satisfied, implying, $a^* = \frac{\theta\Omega^2 x_B + \pi(\underline{x} + \Omega)}{\theta\Omega^2 + \pi}$, and the action can be anywhere in the interval $\left[x_B, x_B + \frac{p}{q\Omega}\right]$. Similarly, for $\underline{x} \in \left[x_B + \frac{p}{q\Omega},\ x_B + \Omega,\ \right]$, case 6 is satisfied and $a^* = \frac{\theta\Omega^2 x_B - \pi(\underline{x} - \Omega)}{\theta\Omega^2 - \pi}$. Again, $\underline{x}$ can be set to yield any action in the interval $\left[x_B, x_B + \frac{p}{q\Omega}\right]$.

Clearly, the set of actions that the Bureaucrat can be induced to take will have an impact on the incidence of gridlock. As the size of this set increases, there will be a greater possibility that the Legislator and President can find a statute that yields an expected outcome that each prefers to the status quo, *Q*. Importantly, the size of the set of inducible actions decreases as Ω increases.

Figure 1c illustrates the logic of the relationship between bureaucratic capacity (the magnitude of Ω) and the size of this set of inducible actions. As in Figure 1a, given $f_1(w)$ and $\bar{x}$, the Bureaucrat's optimal action is at a^*. But what if Bureaucratic capacity declined and was distributed according to $f_2(w)$, with the maximal shock now being $\Omega = 2$. This decrease in Bureaucratic capacity decreases the Bureaucrat's marginal cost (in terms of increased probability of getting caught in non-compliance) of moving his action toward his ideal policy. Consider, for example, a small adjustment in the Bureaucrat's action from a^* to $\hat{a}$. Given the relatively high level of bureaucratic capacity described by $f_1(w)$, the move to $\hat{a}$ has a substantial impact on the probability the Bureaucrat's action results in non-compliance (the area under the curve to the right of $\bar{x}$ has increased substantially). If $f_2(w)$ describes bureaucratic capacity, by contrast, the same move has a much smaller relative impact on the percentage of all realized outcomes that are non-compliant. Since the marginal policy benefit to the Bureaucrat of moving from a^* to $\hat{a}$ is the same under both distributions of w, and since the increase in the marginal cost of non-compliance is lower given $f_2(w)$ then given $f_1(w)$, the Bureaucrat's optimal action following the adoption of a statue will move closer to his ideal point as the Bureaucrat's capacity to achieve intended actions declines.

Legislative Gridlock

We now turn to the main object of analysis, the relationship between legislative gridlock and the variables in our model -- in particular, the level of bureaucratic capacity. We begin by characterizing the size of the "gridlock interval" for all possible parameter values in our model. This interval is the set of all status quo

points that cannot be changed through equilibrium behavior in the model. To characterize the interval, it is useful to consider its upper and lower bounds separately.[5]

As in standard models of gridlock, whenever the status quo lies between the ideal points of the Legislature and President, no policy change can occur.[6] In our model, however, the gridlock interval will always be larger than $[x_L, x_P]$. To see why, consider the example in Figure 2a, where we assume the parameters in the model yield a set of inducible policies in $\mathbf{A} = \left[x_B - \frac{\pi}{\theta\Omega}, x_B + \frac{\pi}{\theta\Omega} \right]$. In this example, $Q < x_L$ and $x_B - \frac{p}{q\Omega} < x_L < x_B + \frac{p}{q\Omega}$. Since the Legislature can induce any action in the interval $\mathbf{A}$, it can write a statute that induces the Bureaucrat to adopt the Legislature's ideal point. If the Legislature prefers this to Q, so will the President, so the veto does not constrain the Legislature. But if the Legislature adopts a statute that induces $a^* = x_L$, with some probability (g) the policy outcome will be the Legislature's ideal point with certainty, with some probability (b) the outcome will be the President's ideal point, and with some probability $(1 - b - g)$, the outcome will be the Legislature's ideal point plus the random shock due to bureaucratic incapacity. Thus, the Legislature's expected utility from adopting this new program (which induces the Bureaucrat to adopt the Legislature's most preferred policy) is given by

$$-b\,x_P^2 - (1 - b - g)\,s_w^2.$$

The expected utility of not adopting the new program is simply $-Q^2$. The Legislature therefore prefers adopting her optimal statute only if $Q < -\sqrt{b\,x_P^2 + (1 - b - g)\,s_w^2}$. Clearly, the right-hand side of this

[5] It is quite easy show that the set of unaltered status quos will always be a single interval.
[6] See, for example, Brady and Volden (1998) and Krehbiel (1998).

expression is less than 0 (the Legislature's ideal point) whenever there is any bureaucratic "incapacity" (i.e., whenever $\Omega > 0$). It is also interesting to note that even if $x_P = x_L = 0$ (so that there is no policy disagreement between the Legislature and President) there will be gridlock for status quos lying to the left of their ideal points.

How is the lower bound of the gridlock interval determined? First note that for $Q < x_L$, any statute that the Legislature prefers to the status quo is also preferred by the President (because $x_L \leq x_P$). Since policy change is constrained by the set of actions the Bureaucrat can be induced to take, we need only consider the three policies that might represent the Legislature most preferred inducible action, (which are determined in this example by the location of the set $\mathbf{A} = \left[x_B - \frac{\pi}{\theta\Omega}, x_B + \frac{\pi}{\theta\Omega} \right]$ relative to the Legislature's ideal point). The first possibility is the one we have just considered: $x_B - \frac{p}{q\Omega} < x_L < x_B + \frac{p}{q\Omega}$, which allows the Legislature to induce an action at her ideal point. Second, if $x_L < x_B - \frac{p}{q\Omega}$, then $x_B - \frac{p}{q\Omega}$ is the best action that can be elicited from the Bureaucrat. Finally, if $x_B < x_L$, then it is possible that $x_B + \frac{p}{q\Omega} < x_L$, which means that the Legislature's best inducible action is $x_B + \frac{p}{q\Omega}$. For each of these cases, the lower bound of the gridlock interval is determined by defining which status quo policies of those lower than x_L that the Legislature prefers to the best action the Bureaucrat can be induced to take.

The logic for identifying the upper bound of the gridlock interval is identical, only now we must consider the preferences of the President. Again, there are three cases to consider, which are determined

by the location of the set **A** relative to the President's ideal point. A full characterization of the gridlock interval is given in Proposition 2.

Proposition 2: The upper and lower bounds of the gridlock interval are given below.

1. If $0 < x_B - \frac{p}{q\Omega}$, $\underline{Q} = -\sqrt{\beta x_P^2 + (1-\beta-\gamma)\left[\left(x_B - \frac{\pi}{\theta\Omega}\right)^2 + \sigma_\omega^2\right]}$

2. If $x_B - \frac{p}{q\Omega} < 0 < x_B + \frac{p}{q\Omega}$, $\underline{Q} = -\sqrt{\beta x_P^2 + (1-\beta-\gamma)\sigma_\omega^2}$

3. If $x_B + \frac{p}{q\Omega} < 0$, $\underline{Q} = -\sqrt{\beta x_P^2 + (1-\beta-\gamma)\left[\left(x_B + \frac{\pi}{\theta\Omega}\right)^2 + \sigma_\omega^2\right]}$

4. If $x_B + \frac{p}{q\Omega} < x_P$, $\bar{Q} = x_P + \sqrt{\gamma x_P^2 + (1-\beta-\gamma)\left[\left(x_P - x_B - \frac{\pi}{\theta\Omega}\right)^2 + \sigma_\omega^2\right]}$

5. If $x_B - \frac{p}{q\Omega} < x_P < x_B + \frac{p}{q\Omega}$, $\bar{Q} = x_P + \sqrt{\gamma x_P^2 + (1-\beta-\gamma)\sigma_\omega^2}$

6. If $x_P < x_B - \frac{p}{q\Omega}$, $\bar{Q} = x_P + \sqrt{\gamma x_P^2 + (1-\beta-\gamma)\left[\left(x_B - \frac{\pi}{\theta\Omega} - x_P\right)^2 + \sigma_\omega^2\right]}$

Proof. See Appendix.

Having established the boundaries of the gridlock interval for all possible parameter values in the model, it is straightforward to explore how variables in our model affect the size of this interval. First note that in all possible cases, the gridlock interval will increase in size as bureaucratic capacity decreases. There are two reasons, both of which are alluded to above, for this relationship. The first and

most obvious is the "efficiency effect" -- lower levels of bureaucratic capacity produce greater errors in implementation, reducing the value of new legislation to all the actors in the model. As noted in the discussion of Figure 2a, for example, even if the Legislature can induce an action at her ideal point, she may prefer no action at all if there is considerable uncertainty about how close the actual outcome from the intended bureaucratic action is to the Legislature's ideal point. As bureaucratic capacity declines, the value of an action at the Legislature's ideal point will decline, which means that the status will have to become even more extreme before the Legislature will wish to undertake a new program. Consequently, low levels of bureaucratic capacity can force the Legislature and President to forgo the creation of new programs even when there exist programs that both prefer to the status quo. This dynamic corresponds almost directly with Carpenter's (2001) argument that a reputation for competence is necessary for a department to obtain greater policy authority.

However, the relationship between capacity and gridlock exists for an additional reason that is unrelated to the straightforward efficiency loss associated with low capacity bureaucrats. We call this the "compliance effect." As shown in Proposition 1, the set of inducible actions shrinks towards the Bureaucrat's preferred policy as bureaucratic capacity declines (because as capacity decreases, the policy costs to the Bureaucrat of ensuring a particular level of compliance with the statute will increase). Thus, for any location of the Bureaucrat's ideal point, as bureaucratic capacity declines, the best inducible action will move away from the Legislature, the President, or both actors. This makes it more difficult for the President and Legislature to design legislation inducing a bureaucratic action that both prefer to the status quo.

As an example, consider Figure 2b, where $x_P < Q$. The figure depicts two different upper bounds on the set **A**. If bureaucratic capacity is sufficiently high, this upper bound could be at $x_B + \frac{p}{q\Omega} = \overline{a}_1$.

Given the location of *Q*, it may well be the case that the President prefers a new program that induces an action at $\overline{a}_1$ to maintaining the status quo, and if the President prefers it, so too will the Legislature. But suppose that bureaucratic capacity were lower, moving the upper bound of the set **A** to $\overline{a}_2 < \overline{a}_1$. In this case, since the best action the Bureaucrat can be induced to take has moved away from the President's ideal point, the President may now prefer to maintain *Q* rather than adopting the new program. Thus, the low level of bureaucratic capacity has prevented the Legislature and the President from implementing a new program even though there are many outcomes that both actors prefer to the existing policy.

It is important to note that the compliance effect produces a relationship between gridlock and capacity even in the absence of the efficiency effect. To see this, suppose that rather than implementing a new program, the political actors were considering modifying an existing one, so that bureaucratic capacity affects both the implementation of new programs and the implementation of the status quo. In this model, the "efficiency effect" does not influence the choice between the status quo and the new program because the same variance in implementation errors occurs for either policy choice. But the "compliance effect" will still influence the size of gridlock interval. As bureaucratic capacity declines, the best inducible action will become less attractive to at least one political actor.

On this point, our argument diverges somewhat from Carpenter's. He stresses that reputations for competence increase bureaucratic autonomy, allowing agencies to take on more policy tasks without explicit legislative approval. In our model, as bureaucratic capacity increases, the Legislature and President have more opportunities to delegate authority to the Bureaucrat, but they are able to do so because they can adopt new policy statutes that ensure a sufficient level of influence over which action the Bureaucrat attempts to take. This legislative route to delegating authority becomes less attractive as bureaucratic capacity *diminishes*.

Other factors influencing gridlock. One factor that can help offset the negative impact of bureaucratic capacity on gridlock is the penalty of non-compliance (d). As this penalty increases, the set of inducible actions expands (because the Bureaucrat will be willing to take actions farther from his ideal point to avoid the penalty). Thus, whenever the set of inducible actions constrains the gridlock interval (e.g., $x_B + \frac{p}{q\Omega} < x_P$ or $x_B - \frac{p}{q\Omega} > x_L$), increases in d will decrease the size of the gridlock interval.

Another variable that receives considerable attention in studies of gridlock is policy conflict between the Legislature and President. As in most models, as x_P moves away from x_L in our model, there will be an increase in the size of the gridlock interval. Such an increase in conflict always diminishes the value to the Legislature and the President of adopting a new program (because with positive probabilities given by b and g, the outcome will be at the other political actor's ideal point). It also increases the range of policies between the ideal points of the two political actors that can never be changed, as in standard models of gridlock. The one interesting exception to this result occurs when both the status quo and the best inducible action are to the right of the President's ideal point. In this case, as x_P increases, the value of the best inducible action also improves for the President, which can expand the circumstances under which policy change is attractive to the President.

Finally, consider the effect of the Bureaucrat's policy preferences on gridlock. If the set of inducible actions does not constrain the gridlock interval (as in the example of Figure 1a), the Bureaucrat's preferences have no effect on its size. But if this set does determine a boundary, then the gridlock interval varies with changes in the Bureaucrat's ideal point. If the Bureaucrat's ideal point is "extreme" (e.g., $x_B + \frac{p}{q\Omega} < x_L$ or $x_B - \frac{p}{q\Omega} > x_P$), then as his ideal point moderates toward the political actors, the gridlock interval will diminish in size (because the best inducible action will improve for both

political actors). More interestingly (and counterintuitively), if a centrist Bureaucrat becomes more liberal, reforms in a liberal direction become more difficult.[7] Consider the case, for example, where the President's most preferred inducible action is lower than her ideal point and the status quo is rather conservative. If x_B moves to the left, so does the President's best obtainable action. This makes her less inclined to agree to allow liberal changes to conservative status quos, thereby expanding the gridlock set upward.[8]

These substantive results regarding the size of the gridlock interval are summarized in Proposition 3.

Proposition 3: The size of the gridlock interval

- Always increases as bureaucratic capacity declines.
- Decreases as the Bureaucrat's penalty for non-compliance increases, but only if the set **A** of inducible actions by the Bureaucrat defines a boundary of the gridlock interval (Cases 1,3,4 and 6 in Proposition 2).
- Increases as policy conflict between the Legislature and President increase, except when the lower boundary and the status quo are both to the right of the President's ideal point (in which case increased conflict can lead to decreased gridlock.
- Decreases as the ideal point of "extreme" Bureaucrats become more centrist and increase as the ideal point of "centrist" Bureaucrat's become more extreme.

[7] Because of symmetry, the same can be said for conservative policy changes when the bureaucrat becomes more conservative.

[8] The model of McCarty (1999) exploits a similar tradeoff. In that a model, a president might wish to use his appointment power to move an agency in the direction of the legislature to increase the legislature's willingness to fund the activities of the agency.

Proof. See Appendix

Conclusion

In this chapter, we have presented a model of several previously neglected features of legislative and bureaucratic institutions and their effect on legislative gridlock. We have focused in particular on bureaucratic capacity, a feature of bureaucracies that varies over time in the U.S. federal government, across federal agencies, and across the U.S. States. We argue that there is a strong positive relationship between increases in bureaucratic capacity and the adoption of new policy programs.

Our analysis focuses on two mechanisms by which bureaucratic capacity encourages new legislation. The "efficiency effect" is straightforward and unsurprising: as the competence with which agencies implement new programs increases, the payoff to all actors of adopting new programs also increases. This expands the possibility of executive-legislative agreement on new policies.

The second mechanism, the "compliance effect," is more subtle, and represents what we feel is the more interesting insight from our model. We do not assume that bureaucrats automatically comply with policy guidelines in statutes. They must choose to do so, and their capacity to realize the outcomes intended by their actions affects their willingness to try and do so. This link between bureaucratic capacity and compliance incentives influences the extent to which politicians can design statutes that yield desirable bureaucratic actions. Since declines in bureaucratic capacity make it more difficult for bureaucrats to comply with statutes, low-capacity bureaucrats are less willing to make the policy sacrifices that may be necessary to ensure compliance. Consequently, politicians delegating to low-capacity bureaucrats have to design statutes that allow these bureaucrats more latitude to pursue their own preferred policies rather than those of politicians. This decreases the incentives of politicians to adopt new programs.

Politicians, then, should always prefer high capacity bureaucrats. And when there is policy disagreement between the legislature and executive in American politics, this preference for high capacity bureaucrats exists independent of whether the bureaucrats share the preferences of any particular politician. A Democratic-controlled legislature, for example, would prefer high-capacity "Republican" bureaucrats to low capacity "Republican" bureaucrats because this capacity facilitates mutually beneficial policy bargains between Republicans and Democrats.

These observations about the compliance effect focus our attention on two empirical issues regarding the relationships between politicians, bureaucrats, and policy change. First, as noted in the Introduction, the vast majority of formal and quantitative empirical research on policy change focuses on how policy conflict between legislature and executive influences law production. Our analysis suggests the value of incorporating measures of bureaucratic capacity into such analyses. Conflict across the legislative branches, for example, could be high, but policy change could nonetheless occur if bureaucratic capacity is sufficiently high. Conversely, policy conflict across branches could be low, but policy change difficult if bureaucratic capacity is low. Thus, our empirical understanding of law production should improve if we interact measures of bureaucratic capacity with measures of preference divergence across political principals.

Second, our model suggests a correlation between bureaucratic capacity and the use of policy details in statutes that create new programs. When capacity is low, statutes must give bureaucrats more policy leeway so that bureaucrats will not be inclined to ignore the policy instructions all together. As capacity improves, politicians are better able to use policy details to micromanage bureaucratic behavior. Thus, not only the production of new legislation, but also the nature of new legislation should be influenced by bureaucratic capacity.

While a full scale empirical test of these hypotheses is beyond the scope of this chapter, Heitshusen and Young's (this volume) measure of legislative productivity in the late 19th and early 20th century may be useful in determining the extent to which enhanced bureaucratic capacity associated with civil service and progressive-era bureaucratic reforms contributed to increased legislation during this period. By counting changes to the United States Code, their measure reflects both the production of new laws and their scope and specificity, thus an ideal indicator for assessing our hypotheses.

While not establishing any causal link, changes in Heitshusen and Young's measure seem to readily track Johnson and Libecap's (1994) measure of the percentage of the federal workforce covered by the provisions of the Civil Service Reform Act of 1883. In the ten years prior to the Pendleton Act, the number of changes to the code ranged from 200 to 300 with an average of 240. In the decade following the Pendleton Act, the number of changes increase markedly to around 340 per biennial congress. However, there is reason to believe that the full effects of Civil Service Reform would not be felt immediately. Coverage as percentage of the federal workforce was low and numerous loopholes left open the possibility for patronage appointments.[9] Even 10 years after the act, only 20% of the federal workforce was covered by its provisions.[10] However, following numerous executive orders reclassifying positions and closing loopholes, coverage reached 80% by 1920 before leveling off. Over this same period the average number of code changes crept above 1300 until leveling off with very little change until the New Deal.

While these patterns certainly should not be mistaken for hard evidence of a causal link between bureaucratic capacity and legislative output, our hypotheses hold up at least as well as competing explanations for increased legislative activity over this time period. As Heitshusen and Young point out,

[9] See Skowronek (1982) and Johnson and Libecap (1994).
[10] Johnson and Libecap (1994) figure 3.2.

critical elections fail to provide a suitable explanation for increased legislative output. Indeed, changes to the code began trending upward in the early 1890s well before the Democrats were routed in 1896. The emergence of progressivism also provides an incomplete explanation. The upward trend began under the conservative presidencies of Grover Cleveland and William McKinley and accelerated dramatically prior to Progressivism's high watermark, the presidency of Woodrow Wilson.[11]

Finally, in concluding, we should also point out an important avenue for further development of the theoretical argument. Our model assumes that bureaucrats and politicians are equally informed about which policies will yield desired outcomes. By contrast, most existing theories of delegation quite reasonably assume that bureaucrats have an informational advantage – that is, bureaucrats are assumed to have greater policy expertise than legislators. In such models, the challenge for legislators is to exploit the bureaucrats' expertise by delegating in a way that encourages bureaucrats to use it on the politicians' behalf, rather than against the politicians. It seems reasonable to assume that in many instances, bureaucrats at the top of an agency do have an informational advantage, but that there nonetheless may also exist variation across agencies in their capacity to implement their intended actions. It would therefore be useful to explore how policy expertise and bureaucratic capacity interact to influence delegation and policymaking processes.

[11] We certainly do not completely discount the role of Progressivism. First of all, like all models of legislative productivity, our model associates increased productivity with changes in political preferences. Secondly, a major objective of Progressive reformers was implementing reforms to enhance bureaucratic capacity.

Bibliography

Barrilleaux, Charles. 1992. "Measuring and Comparing American States' Administrative Characteristics." *State and Local Government Review* 24: 12-18.

Banks, Jeffrey S. 1989. "Agency Budgets, Cost Information, and Auditing." *American Journal of Political Science* 33(3): 670-99.

Bawn, Kathleen. 1995. "Political Control Versus Expertise: Congressional Choice About Administrative Procedures." *American Political Science Review* 89(1): 62-73.

Binder, Sarah A. 1999. "The Dynamics of Legislative Gridlock." *American Political Science Review* 93(3): 519-533.

Brady, David W. and Craig Volden. 1998. *Revolving Gridlock: Politics and Policy from Carter to Clinton*. Boulder: Westview Press.

Carpenter, Daniel P. 2001. *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928*. Princeton: Princeton University Press.

Heitshusen, Valerie and Garry Young. nd. "Critical Elections, Divided Government, and Gridlock: Assessing Major Policy Change, 1874-1946," in Adler, E. Scott and John Lapinski, *The Macro-Politics of Congress.*

Epstein, David, and Sharyn O'Halloran. 1999. *Delegating Powers*. New York: Cambridge University Press.

Howell, William, Scott Adler, Charles Cameron, Charles Riemann. 2000. "Divided Government and the Legislative Productivity of Congress, 1945-94." *Legislative Studies Quarterly* 25(2): 285-312.

Huber, John D. and Nolan McCarty. 2001. "Legislative Organization, Bureaucratic Capacity and Delegation in Latin American Democracies." Typescript.

Huber, John D. and Charles Shipan. 2002. *Deliberate Discretion: Institutional Foundations of Bureaucratic Autonomy in Modern Democracies.* New York: Cambridge University Press.

Krehbiel, Keith. 1998. *Pivotal Politics: A Theory of U.S. Lawmaking*. Chicago: University of Chicago Press.

Johnson, Ronald N. and Gary Libecap. 1994. *The Federal Civil Service System and the Problem of Bureaucracy.* Chicago: University of Chicago Press.

Lapinski, John. 2000. Dissertation, Columbia University.

Mayhew, David R. 1991. *Divided We Govern: Party Control, Lawmaking, and Investigations, 1946-1990*. New Haven : Yale University Press.

McCarty, Nolan. 1999. "Bargaining Over Authority: The Case of Appointment and Removal Power." Typescript.

McCubbins, Mathew D., Roger G. Noll, and Barry R. Weingast. 1989. "Structure and Process, Politics and Policy: Administrative Arrangements and Political Control of Agencies." *Virginia Law Review* 75: 431-482.

McCubbins, Mathew D., Roger G. Noll, and Barry R. Weingast. 1987. "Administrative Procedures as Instruments of Political Control." *Journal of Law, Economics, and Organization* 3(2): 243-277.

Skowronek, Stephen. 1982. *Building a New American State: The Expansion of National Administrative Capacities* 1877-1920. New York: Cambridge University Press.

Volden, Craig. 2002. "A Formal Model of the Politics of Delegation in a Separation of Powers System." *American Journal of Political Science* 46(1): 111-133.

Appendix

Proof of Proposition 1. The bureaucrat's expected utility of attempting to implement the policy a is given by

$$
\begin{aligned}
&-\int_{a-\overline{x}}^{a-\underline{x}} \beta\left(x_P - x_B\right)^2 + \gamma\left(x_L - x_B\right)^2 + (1-\beta-\gamma)\left(a-\omega-x_B\right)^2 \, f(\omega)\, d\omega \\
&\qquad -\int_{-\Omega}^{a-\overline{x}} \left[(1-\beta-\gamma)\left(a-\omega-x_B\right)^2 + \beta\left(x_P - x_B\right)^2 + \gamma\left(x_L - x_B\right)^2 + \gamma\delta\right] f(\omega)\, d\omega \\
&\qquad -\int_{a-\underline{x}}^{\Omega} \left[(1-\beta-\gamma)\left(a-\omega-x_B\right)^2 + \beta\left(x_P - x_B\right)^2 + \gamma\left(x_L - x_B\right)^2 + \gamma\delta\right] f(\omega)\, d\omega
\end{aligned}
$$

Evaluating the integrals in Bureaucrat's expected utility yields

$$
EU_B\left(a \middle| \overline{x}\right) = -(1-b-g)\left(a-x_B\right)^2 - (1-b-g)\, s_w^2 - b\left(x_P - x_B\right)^2 - g\left(x_L - x_B\right)^2 - gd\left[1 - F\left(a-\underline{x}\right) + F\left(a-\overline{x}\right)\right]
$$

where $F(\bullet)$ is the cumulative distribution function for ω. The first order condition for a maximum is

$$
\frac{\partial EU_B(a)}{\partial a} = -2(1-\beta-\gamma)\left(a-x_B\right) - \gamma\delta\left[f\left(a-\overline{x}\right) - f\left(a-\underline{x}\right)\right] = 0 \qquad (0.1)
$$

Because of the $f\left(a-\overline{x}\right) - f\left(a-\underline{x}\right)$ term, this first order condition depends on the position of a relative to $\underline{x}$, $\overline{x}$, and Ω. For example, suppose (as in Case 1, below) that $a > \overline{x} - \Omega$ and $a < \underline{x} + \Omega$ so that $f\left(a-\overline{x}\right)$ and $f\left(a-\underline{x}\right)$ are positive. Then the first order condition is

$$
\frac{\partial EU_B(a)}{\partial a} = -2(1-\beta-\gamma)\left(a-x_B\right) - \gamma\delta\left[\frac{\Omega - \left|a-\overline{x}\right|}{\Omega^2} - \frac{\Omega - \left|a-\underline{x}\right|}{\Omega^2}\right] = 0
$$

or

$$
\frac{\partial EU_B(a)}{\partial a} = -2(1-\beta-\gamma)\left(a-x_B\right) - \gamma\delta\left[\frac{\left|a-\underline{x}\right| - \left|a-\overline{x}\right|}{\Omega^2}\right] = 0
$$

Because of the absolute value signs, this expression will depend on whether or not a lies between $\underline{x}$ and $\overline{x}$. If $\underline{x} < a < \overline{x}$, it reduces to

$$\frac{\partial EU_B(a)}{\partial a} = -2(1-\beta-\gamma)(a-x_B) + \gamma\delta\left[\frac{\overline{x}+\underline{x}-2a}{\Omega^2}\right] = 0$$

If $a > \overline{x}$, it is

$$\frac{\partial EU_B(a)}{\partial a} = -2(1-\beta-\gamma)(a-x_B) - \gamma\delta\left[\frac{\overline{x}-\underline{x}}{\Omega^2}\right] = 0$$

The first order condition would also be effected by $a < \overline{x} - \Omega$ and/or $a > \underline{x} + \Omega$ since one or both of the density functions would be zero.

In total, there are ten different possible expressions for (0.1) depending on conditions on a, $\underline{x}$, $\overline{x}$, and Ω. Each set of conditions is listed below along with optimal action a^* that satisfy (0.1). For example in case 1 below, a^* is a solution to (0.1) if and only if $\underline{x} < a^* < \overline{x}$, $a^* > \overline{x} - \Omega$, $a^* < \underline{x} + \Omega$, and $a^* = \dfrac{\theta\Omega^2 x_B + \pi[\overline{x}+\underline{x}]}{\theta\Omega^2 + 2\pi}$.

1. If $\underline{x} < a^* < \overline{x}$, $a^* > \overline{x} - \Omega$, $a^* < \underline{x} + \Omega$, $a^* = \dfrac{\theta\Omega^2 x_B + \pi[\overline{x}+\underline{x}]}{\theta\Omega^2 + 2\pi}$.

2. If $\underline{x} \le a^* < \overline{x}$, $a^* < \overline{x} - \Omega$, $a^* \le \underline{x} + \Omega$, $a^* = \dfrac{\theta\Omega^2 x_B + \pi(\underline{x}+\Omega)}{\theta\Omega^2 + \pi}$.

3. If $\underline{x} < a^* \le \overline{x}$, $a^* \ge \overline{x} - \Omega$, $a^* > \underline{x} + \Omega$, $a^* = \dfrac{\theta\Omega^2 x_B + \pi(\overline{x}-\Omega)}{\theta\Omega^2 + \pi}$

4. If $\underline{x} < a^* < \overline{x}$, $a^* < \overline{x} - \Omega$, $a^* > \underline{x} + \Omega$, $a^* = x_B$

5. If $a^* < \underline{x}$ and $a^* > \overline{x} - \Omega$, $a^* = x_B + \dfrac{\pi}{\theta\Omega^2}[\overline{x}-\underline{x}]$

6. If $a^* < \underline{x}$, $a^* < \overline{x} - \Omega$, $a^* > \underline{x} - \Omega$, $a^* = \dfrac{\theta\Omega^2 x_B - \pi(\underline{x} - \Omega)}{\theta\Omega^2 - \pi}$

7. If $a^* \leq \underline{x} - \Omega$, $a^* = x_B$

8. If $a^* > \overline{x}$ and $a^* < \underline{x} + \Omega$, $a^* = x_B - \dfrac{\pi}{\theta\Omega^2}[\overline{x} - \underline{x}]$

9. If $a^* > \overline{x}$ and $\overline{x} + \Omega > a^* > \underline{x} + \Omega$, $a^* = \dfrac{\theta\Omega^2 x_B - \pi(\overline{x} + \Omega)}{\theta\Omega^2 - \pi}$

10. If $a^* \geq \overline{x} + \Omega$, $a^* = x_B$

The second order conditions are $-1 - \dfrac{2\pi}{\theta\Omega^2}$ for case 1, $-1 - \dfrac{\pi}{\theta\Omega^2}$ for cases 2 and 3, $-1 + \dfrac{\pi}{\theta\Omega^2}$ for cases 6 and 9, and -1 for the remaining cases.

To solve for a^* we first must examine whether any of cases 1-10 can be satisfied simultaneously. It is straightforward to show that if $\pi < \theta\Omega^2$, then all cases are mutually exclusive. Therefore, given that the second order conditions are satisfied in all cases, a solution that satisfies any first order conditions and the corresponding case constraints represent a global maximum.

If $\pi > \theta\Omega^2$, the cases are no longer mutually exclusive. For example, case 6 requires that $a^* > \underline{x} - \Omega$ and $a^* = \dfrac{\theta\Omega^2 x_B - \pi(\underline{x} - \Omega)}{\theta\Omega^2 - \pi}$. These two conditions can only be satisfied simultaneously if $a^* \leq \underline{x} - \Omega$, which is the condition for case 7. Thus, whenever case 6 is satisfied, case 7 is satisfied as well. Similar analyses reveal that cases 9 and 10 are satisfied simultaneously, cases 2 and 7 are satisfied simultaneously, and cases 3 and 10 are satisfied simultaneously. To determine the optimal action by the Bureaucrat in these cases, first note that the second order conditions for a maximum are not satisfied in cases 6 and 9 when $\pi > \theta\Omega^2$. Thus, the optimum action is computed by comparing the solutions for each

remaining pair of cases directly. Comparing 2 and 7 reveals that the solution to case 2 is optimal if and only if

$$x_B + \Omega\left[\sqrt{2\left(\frac{q\Omega^2 + p}{q\Omega^2}\right)} - 1\right] \geq \underline{x} \tag{0.2}$$

Similarly, the solution to case 3 is optimal is

$$x_B - \Omega\left[\sqrt{2\left(\frac{\Omega^2 q + p}{\Omega^2 q}\right)} - 1\right] \leq \overline{x} \tag{0.3}$$

Given that the 10 cases plus equations (0.2) and (0.3) characterize the optimal bureaucratic action, we can turn computing the maximum and minimum actions that the bureaucrat can be induced to take. Note that in cases 4, 7, and 10, the maximum and minimum action is x_B. In the remaining cases, the optimal action is a linear function of either $\overline{x}$, $\underline{x}$, or both. Therefore, the largest and smallest a must come at a boundary point contained in the constraints on $\overline{x}$ and $\underline{x}$. However, in all of these cases except 2 and 3, the constraints on $\overline{x}$ and $\underline{x}$ are open intervals which do not contain their boundaries. Therefore, the maximum and minimum actions must either be x_B or lie on the extreme points of case 2 or 3.

First, consider $\pi < \theta\Omega^2$. The extreme values on case 2 occur when $a^* = \underline{x}$ or $a^* = \underline{x} + \Omega$ which lead to $a^* = x_B + \frac{p}{q\Omega}$ and $a^* = x_B$. Since a^* is linear in $\underline{x}$ for case 2, any action in $\left[x_B, x_B + \frac{p}{q\Omega}\right]$ can be induced. Similarly, in case 3, the extreme values occur at $a^* = \overline{x}$ and $a^* = \overline{x} - \Omega$ or $a^* = x_B - \frac{p}{q\Omega}$ and

$a^* = x_B$. The linearity of a^* in $\overline{x}$ suggests that $\left[x_B - \frac{p}{q\Omega}, x_B\right]$ is inducible. Combining case 2 and 3, the inducible set is $\left[x_B - \frac{p}{q\Omega}, x_B + \frac{p}{q\Omega}\right]$.

Now consider $\pi > \theta\Omega^2$. Given (0.2), the upper boundary of a for case 2 occurs when $\underline{x} = x_B + \Omega\left[\sqrt{2\left(\frac{q\Omega^2 + p}{q\Omega^2}\right)} - 1\right]$ so that $\left[x_B, x_B + \frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p + q\Omega^2}}\right]$ is inducible. Similarly, (0.3) implies that $\left[x_B - \frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p + q\Omega^2}}, x_B\right]$ is inducible from $\overline{x}$ satisfying case 3.

The fact that $\frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p + q\Omega^2}} > \frac{p}{q\Omega}$ if and only if $q\Omega^2 > p$ implies that we can write the inducible set as

$$\mathbf{A} = \left[x_B - \min\left\{\frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p + q\Omega^2}}, \frac{p}{q\Omega}\right\}, x_B + \min\left\{\frac{p}{q\Omega}\sqrt{\frac{2q\Omega^2}{p + q\Omega^2}}, \frac{p}{q\Omega}\right\}\right]$$

?

Proof of Proposition 2. Let $\hat{a}_j$ be the most preferred inducible policy for $j \in \{L, P\}$. Given Proposition 1 and the fact that preferences are single peaked, $\hat{a}_j \in \{\underline{a}, x_j, \overline{a}\}$. The set of status quo changes that each principal will veto are given by

$$-b\left(x_p - x_j\right)^2 - g\left(x_L - x_j\right)^2 - (1 - b - g)\left[\left(\hat{a}_j - x_j\right)^2 - s_w^2\right] \leq -\left(Q - x_j\right)^2 \qquad (1.1)$$

The set of status quos that satisfy (1.1) can be written as $\left[\underline{Q}_j, \overline{Q}_j\right]$ where

$$\underline{Q}_j = x_j - \sqrt{b\left(x_P - x_j\right)^2 + g\left(x_L - x_j\right)^2 + (1-b-g)\left[\left(\hat{a}_j - x_j\right)^2 + s_w^2\right]} \tag{1.2}$$

and

$$\overline{Q}_j = x_j + \sqrt{b\left(x_P - x_j\right)^2 + g\left(x_L - x_j\right)^2 + (1-b-g)\left[\left(\hat{a}_j - x_j\right)^2 + s_w^2\right]} \tag{1.3}$$

Since it can be shown that $\underline{Q}_L < \underline{Q}_P$ for all values of $\hat{a}_L$ and $\hat{a}_P$, $\underline{Q} = \underline{Q}_L$. Similarly, $\overline{Q} = \overline{Q}_R$. Cases 1-3 represent $\underline{Q}$ for all possible values of $\hat{a}_L$: $\underline{a}$, 0, and $\overline{a}$. Cases 4-6 represent $\overline{Q}$ for all values of $\hat{a}_P$?

Proof of Proposition 3. In addition to the conditions defining each of the cases, the following implications of Proposition 2 are useful in signing the derivatives for the various comparative statics:

1. $\underline{Q} < 0$
2. $\overline{Q} > x_P$
3. $\dfrac{\partial \underline{a}}{\partial \Omega} = -\dfrac{\partial \overline{a}}{\partial \Omega} = \left\{ \begin{array}{l} \dfrac{p}{q\Omega^2} \\ \dfrac{p}{q}\dfrac{4q\Omega}{\left(p+q\Omega^2\right)^2}\left(\dfrac{2q}{p+q\Omega^2}\right)^{-\frac{1}{2}} \end{array} \right\} > 0$
4. $\dfrac{\partial \underline{a}}{\partial d} = -\dfrac{\partial \overline{a}}{\partial d} = \left\{ \begin{array}{l} -\dfrac{g}{q\Omega} \\ -2g\left[\dfrac{2q}{q\Omega^2+p}\right]^{-\frac{1}{2}}\dfrac{q\Omega^2}{\left(q\Omega^2+p\right)^2} \end{array} \right\} < 0$
5. $\dfrac{\partial \underline{a}}{\partial x_B} = \dfrac{\partial \overline{a}}{\partial x_B} = 1$

Bureaucratic Capacity:

Case 1: $\frac{\partial \underline{Q}}{\partial \Omega} = \left[2\underline{a}\frac{\partial \underline{a}}{\partial \Omega} + \frac{\theta\Omega}{6} \right] \underline{Q}^{-1} < 0$

Case 2: $\frac{\partial \underline{Q}}{\partial \Omega} = \frac{\theta\Omega}{6}\underline{Q}^{-1} < 0$

Case 3: $\frac{\partial \underline{Q}}{\partial \Omega} = \left[-2\overline{a}\frac{\partial \overline{a}}{\partial \Omega} + \frac{\theta\Omega}{6} \right] \underline{Q}^{-1} < 0$

Case 4: $\frac{\partial \overline{Q}}{\partial \Omega} = \left[2\left(x_P - \underline{a} \right)\frac{\partial \underline{a}}{\partial \Omega} + \frac{\theta\Omega}{6} \right] \left[\overline{Q} - x_P \right]^{-1} > 0$

Case 5: $\frac{\partial \overline{Q}}{\partial \Omega} = \frac{\theta\Omega}{6}\left[\overline{Q} - x_P \right]^{-1} > 0$

Case 6: $\frac{\partial \overline{Q}}{\partial \Omega} = \left[2\left(\underline{a} - x_P \right)\frac{\partial \underline{a}}{\partial \Omega} + \frac{\theta\Omega}{6} \right] \left[\overline{Q} - x_P \right]^{-1} > 0$

Penalty: d

Case 1: $\frac{\partial \underline{Q}}{\partial \delta} = 2\underline{a}\frac{\partial \underline{a}}{\partial \delta}\underline{Q}^{-1} > 0$

Case 3: $\frac{\partial \underline{Q}}{\partial \delta} = 2\overline{a}\frac{\partial \overline{a}}{\partial \delta}\underline{Q}^{-1} > 0$

Case 4: $\frac{\partial \overline{Q}}{\partial \delta} = -\left(x_P - \overline{a} \right)\frac{\partial \overline{a}}{\partial \delta}\left[\overline{Q} - x_P \right]^{-1} < 0$

Case 6: $\frac{\partial \overline{Q}}{\partial \delta} = \left(\underline{a} - x_P \right)\frac{\partial \underline{a}}{\partial \delta}\left[\overline{Q} - x_P \right]^{-1} < 0$

President's ideal point:

Cases 1-3: $\frac{\partial \underline{\underline{Q}}}{\partial x_P} = -2\beta x_P \underline{Q}^{-1} < 0$

Case 4: $\frac{\partial \underline{\underline{Q}}}{\partial x_P} = 1 + 2\left[\gamma x_P + \left(x_P - \overline{a}\right)\right]\left[\overline{Q} - x_P\right]^{-1} > 0$

Case 5: $\frac{\partial \underline{\underline{Q}}}{\partial x_P} = 1 + 2\gamma x_P \left[\overline{Q} - x_P\right]^{-1} > 0$

Case 6: $\frac{\partial \underline{\underline{Q}}}{\partial x_P} = 1 + 2\left[\gamma x_P - \left(\underline{a} - x_P\right)\right]\left[\overline{Q} - x_P\right]^{-1} \begin{matrix} < \\ > \end{matrix} 0$

This last result is caused by the ambiguity of having x_P move both toward Q and $\underline{a}$.

Bureaucrat's Ideal Point:

Case 1: $\frac{\partial \underline{\underline{Q}}}{\partial x_B} = 2\underline{a}\underline{Q}^{-1} < 0$

Case 3: $\frac{\partial \underline{\underline{Q}}}{\partial x_B} = 2\overline{a}\underline{Q}^{-1} > 0$

Case 4: $\frac{\partial \overline{Q}}{\partial x_B} = -2\left(x_P - \overline{a}\right)\left[\overline{Q} - x_P\right]^{-1} < 0$

Case 6: $\frac{\partial \overline{Q}}{\partial x_B} = 2\left(\underline{a} - x_P\right)\left[\overline{Q} - x_P\right]^{-1} > 0$?

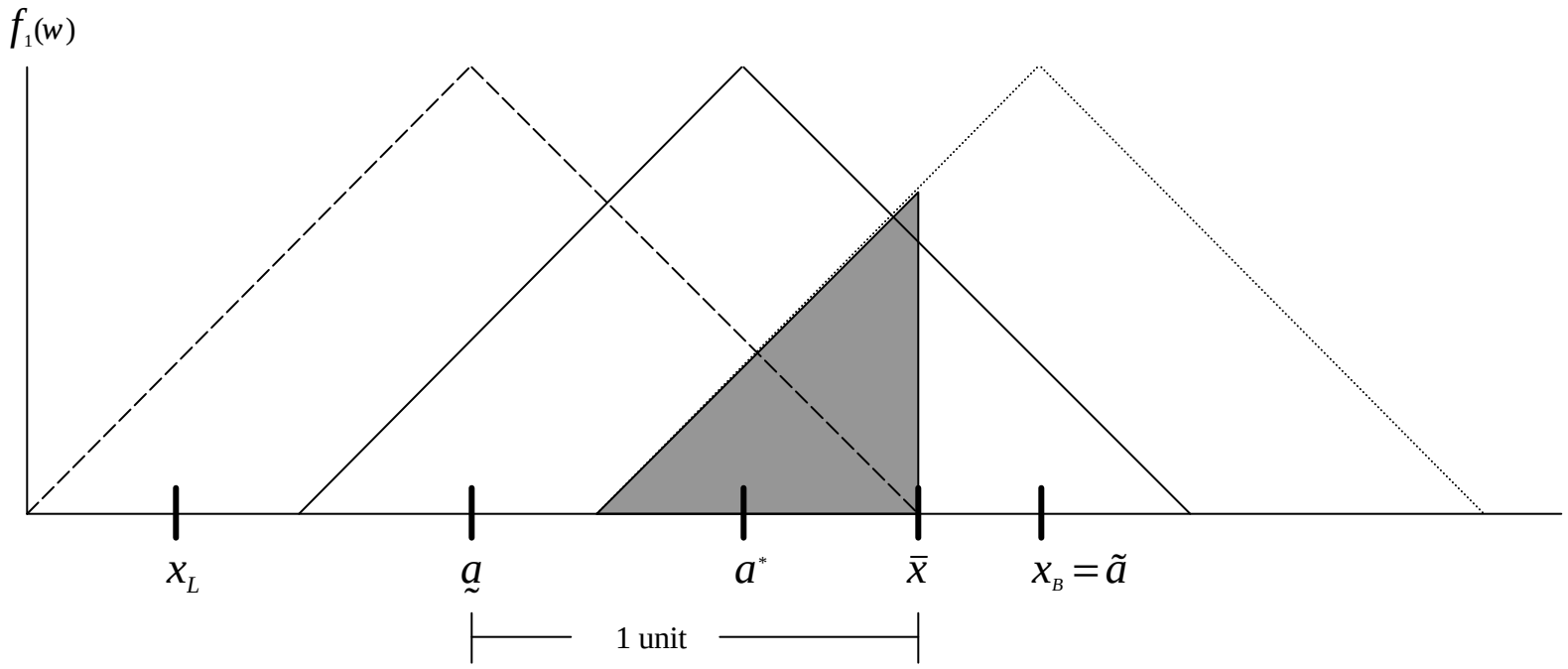

Figure 1A

Figure 1b

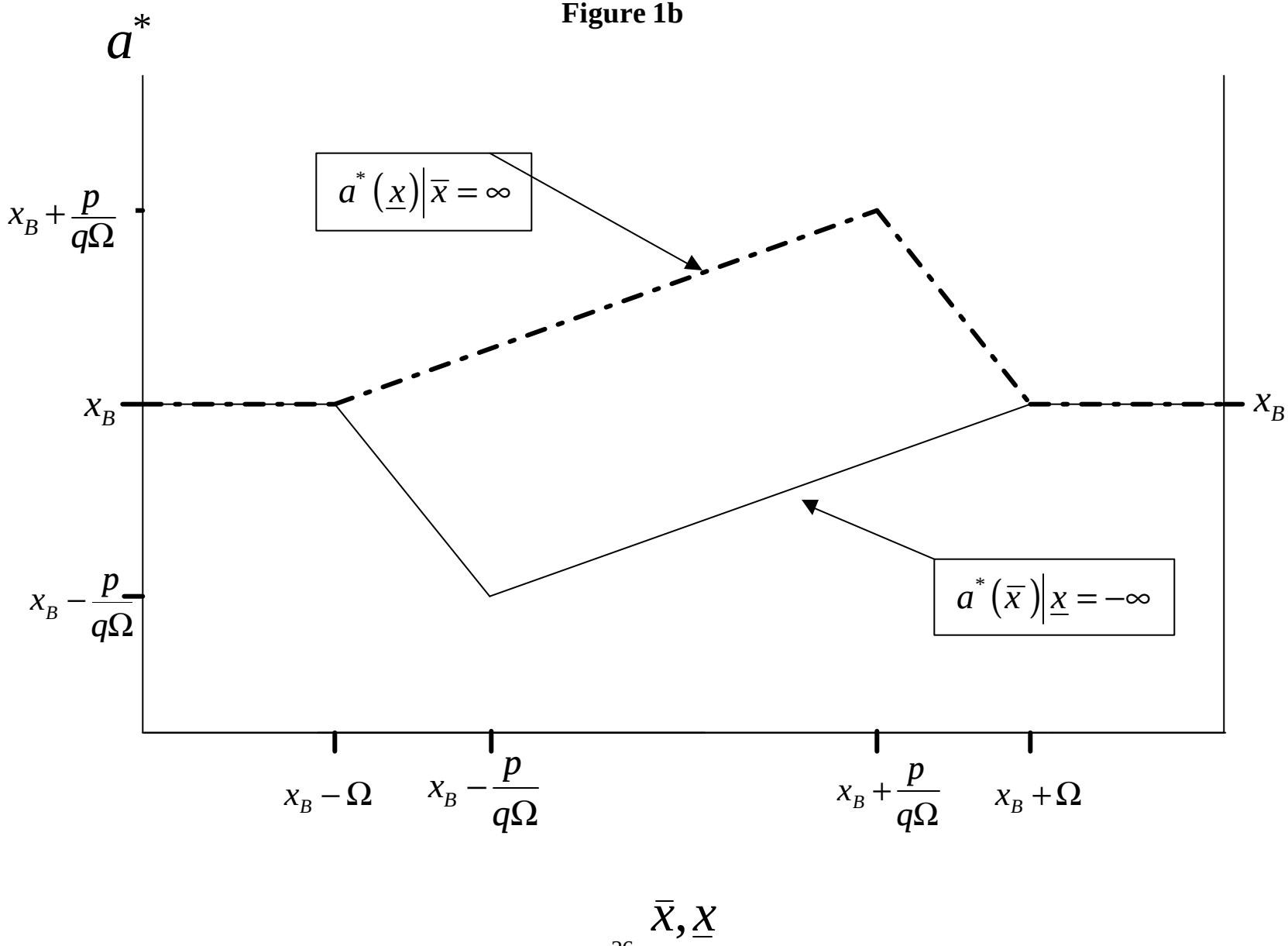
a^*
$a^*(\underline{x})\,|\,\overline{x}=\infty$
$x_B+\frac{p}{q\Omega}$
x_B
x_B
$x_B-\frac{p}{q\Omega}$
$a^*(\overline{x})\,|\,\underline{x}=-\infty$
$x_B-\Omega$
$x_B-\frac{p}{q\Omega}$
$x_B+\frac{p}{q\Omega}$
$x_B+\Omega$
$\overline{x},\underline{x}$

Figure 1C

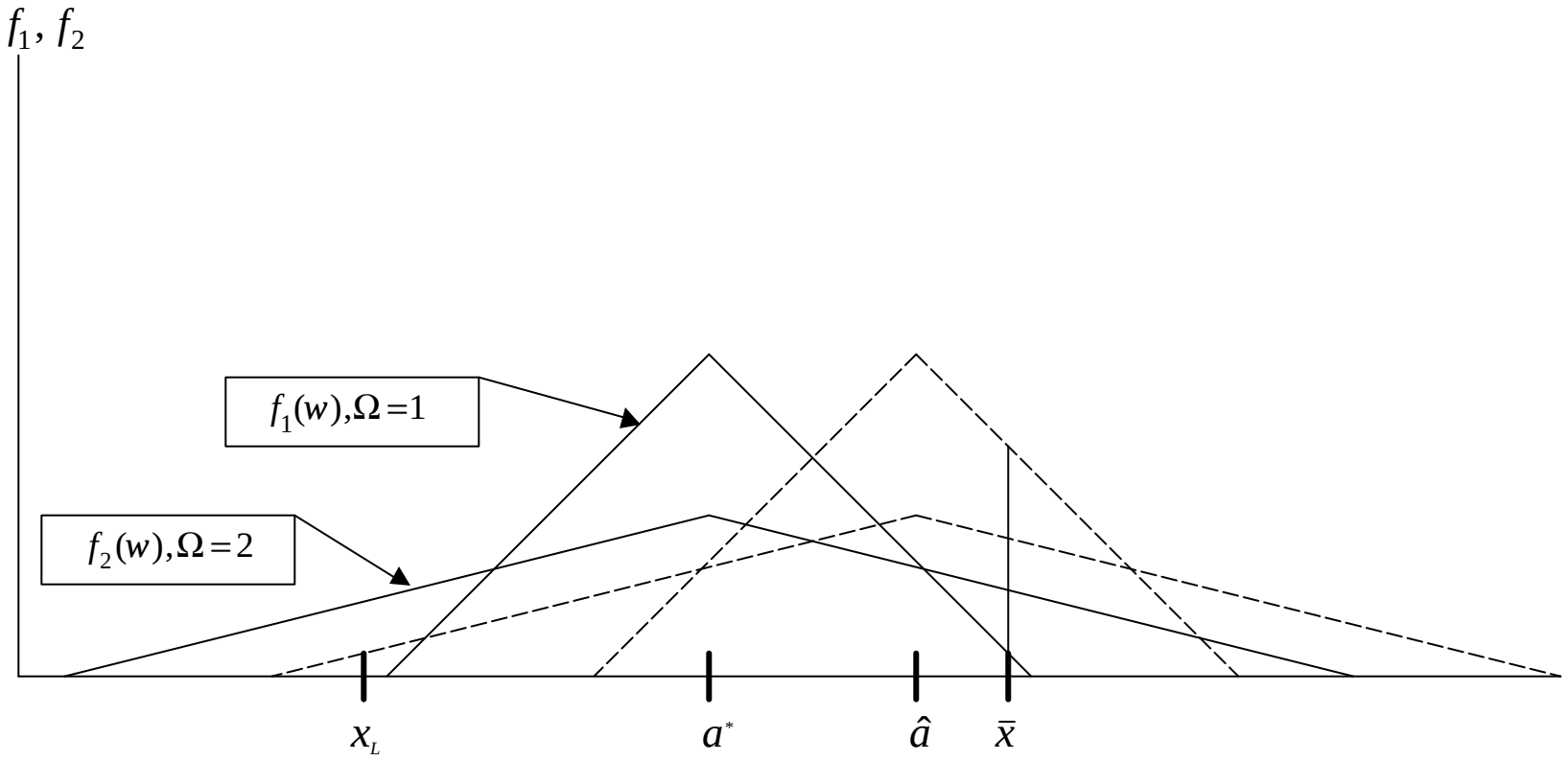

Figure 2a

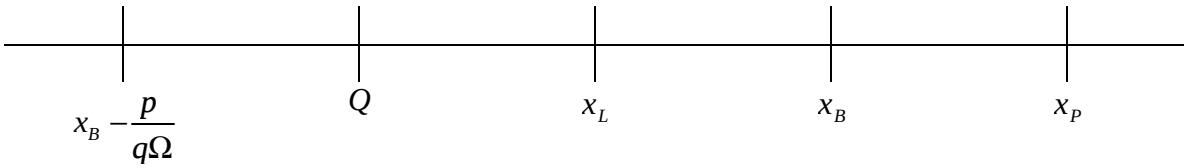
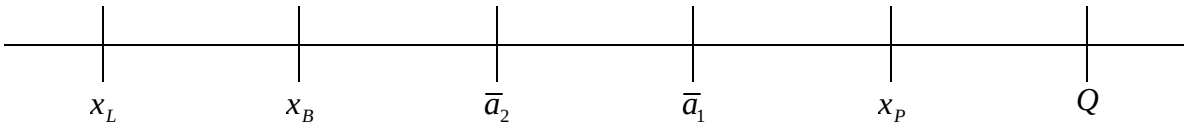
Figure 2b