Agency Budgetary Risk Preferences under Context Dependent Uncertainty: An Analytical Inquiry[*]

George A. Krause[†]
University of South Carolina

Draft as of
October 22, 2010

[†] Associate Professor of Political Science, Department of Government and International Studies, University of South Carolina, Columbia, SC 29208. George.Krause@sc.edu (e-mail).

Abstract

Little attention has been given to the systematic analysis of how bureaucratic agencies make decisions under conditions of uncertainty. Investigating the risk preferences of administrative agencies allows for greater understanding of how these organizations arrive at such decisions. In this study, the theoretical relationship between an agency's budgetary decision making and the amount of uncertainty (volatility) that it experiences is examined. A plausible range of theoretical conditions that reflect agency budgetary risk averse, risk neutrality, and risk acceptant behavior are derived from this deductive analysis, taking into account the differential context in which uncertainty effects agency utility under divided versus unified party government. This paper concludes by discussing the implications of these theoretical results for understanding administrative agencies' preference for organizational slack.

Agency Budgetary Risk Preferences under Context Dependent Uncertainty: An Analytical Inquiry

Administrative agencies are central to the implementation of public policies. Analyzing

how agency decisions are made is vital for understanding policymaking. Organizational

theorists have long maintained that agency decision making occurs under circumstances of

incomplete information and uncertainty (March and Simon 1958; Simon 1976; Stinchcombe

1990). Thompson (1967: 159) asserts that uncertainty is the fundamental dilemma facing

complex organizations, and coping with this issue is at the core of the administrative process (see

also, Crozier 1964). This portrait of agency decision making suggests that organizations must

make decisions in the face of ambiguity (March and Olsen 1976).

Only a very small body of research exists that directly considers public sector agency

response in an uncertain world (Carpenter 2002; Bendor and Moe 1985; Bendor, Taylor, and

Van Gaalen 1985, 1987) or its risk bearing propensities (Bozeman and Kingsley 1998; Moon

1999).[1] Unfortunately, these studies either restrict analysis to a particular type of risk bearing

behavior based on assumption (e.g., risk neutrality) or analyze this issue in an exploratory

manner without any theoretical foundations.

Thus, we know relatively little concerning the extent to which bureaucratic institutions

are willing to preserve themselves in the face of an uncertain environment. This is because we

do not know how agencies will explicitly behave in response to uncertainty. To address this

research puzzle, we must analyze the "first principles" of how bureaucratic organizations

respond to uncertainty. Before we can analyze agency budgetary risk preferences, for instance,

---

1 A parallel literature on redundancy in bureaucratic organizations has addressed the issue of
organizational decision making from a different angle (Bendor 1985; Heimann 1993).

initial primitive assumptions must be made concerning the relationship involving budgetary

resources sought by the agency and uncertainty with respect to agency utility. Analyzing the

nature of agency risk bearing behavior in an explicit, systematic fashion is an essential enterprise

if we wish to better understand how such decisions made by bureaucratic actors typically occur

under incomplete and imperfect information.

In this study, a simple comparative–static analysis of agency budget decision making is

advanced as a means to understand how bureaucratic agencies respond to uncertainty. The

purpose here is not to create a model of equilibrium budget outcomes, but rather to concentrate

on the relationship between agency choice and uncertainty in order to get theoretical leverage on

the various ways in which a bureaucratic agency makes decisions consistent with its risk

preferences. A decision theoretic approach is employed to answer this question since a game

theoretic model requires *a priori* assumptions about risk preferences, rather than deriving such

behavior from first principles which are treated as the initial conditions for the latter type of

models.[2] Thus, budgetary resources are not viewed as a means of organizational wealth

maximization consistent with neoclassical theory of the bureaucratic firm (Niskanen 1971;

Tullock 1965), but instead as a means of coping with uncertainty in the agency's environment

---

2 Game theoretic models try to determine the strategy undertaken by an actor while assuming a particular
form of risk–bearing behavior in their decision making. For instance, the risk averse agent and risk
neutral principal assumptions are standard in most principal–agent theory applications (cf. Miller and
Whitford 2002). The aim here is to both analytically identify and empirically quantify the nature of
risk–bearing involved in agency decision making that is often assumed from the outset rather than
investigated in its own right. Therefore, our concern is with directly analyzing the first principles of
agency risk bearing behavior that provides both theoretical and substantive leverage into how
bureaucratic agencies cope with uncertainty. Legislative influence, however, is not completely ignored
here since the agency budget request residual (BR) is operationalized in relation to what it received last
year via appropriations in both the theoretical and empirical analysis. In addition, legislative influence
also has a direct bearing on one particular type of uncertainty confronting the bureaucratic organization,
appropriations uncertainty.

(Cyert and March 1963; Downs 1967: 138–139; Wilson 1989).[3]

The aim here is to analytically examine the behavioral range of possibilities employed by an agency in handling resource and task uncertainty in its policy environment. Theoretical conditions that allow for the full potential range of agency decision making under uncertainty that encompasses budgetary risk aversion, budgetary risk neutrality, and budgetary risk acceptant behavior are derived from this comparative–static analysis based on the funding request that it submits to political principals. Moreover, a qualitative distinction is made between unified and divided party government so as to reflect the different political regimes that agencies encounter, and hence, underlie the shifting decision rules that transpire in budgetary decision making (Wildavsky 1988). This qualitative distinction in agency risk bearing behavior is consistent with March's (1999: 244–245) admonition that agency risk preferences be supplemented with context dependent considerations, rather than being treated in a generic fashion. The theoretical results are capable of providing basic insight into the relative willingness administrative agencies place on organizational maintenance (e.g., Crozier 1964; Cyert and March 1963; Downs 1967; Niskanen 1971; Rourke 1984). Put simply, analyzing agency risk propensities can uncover the extent to which bureaucratic agencies wish to buffer themselves from uncertainty (Crozier 1964; Downs 1967; Thompson 1967).

Substantive Uncertainty and Organizational Decision Making

The essence of this paper focuses on the risk bearing nature of agency budgetary

---

3 This neoclassical view of bureaucratic organizations can be accounted for as a rival hypothesis in an empirical analysis to ensure that estimated risk coefficients are unbiased. Using postwar era data on the Securities and Exchange Commission, Krause (2003) soundly rejects the Niskanen hypothesis of the agency seeking positive economic rents when analyzing its response to appropriations and task uncertainty.

decisions under uncertainty. *By uncertainty, we mean the degree of volatility (variance) that the agency experiences in relation to essential items that are beyond its complete control.[4]* The source of uncertainty confronted by the agency might pertain to budgetary appropriation outcomes that are determined by political institutions, task demands placed on the agency, or other aspects germane to administration. Thus, our focus is on the *substantive uncertainty* facing the agency, rather than *nuisance uncertainty* that pertains to the probability a given course of action is undertaken or its subsequent outcome. The latter type of uncertainty does not yield substantive content about how agencies respond to specific types or degrees of uncertainty that they must confront in their policy and decision making environment. The focus of the present study on substantive uncertainty is consistent with organizational theories that define uncertainty as the degree of budgetary appropriations or task volatility experienced by the agency. This definition of uncertainty is germane to the functioning of bureaucratic organizations (Downs 1967; March 1999: 180–183; March and Olsen 1976; Thompson 1967; Wilson 1989).

The relationship between bureaucratic organizations' funding requests and substantive uncertainty, holding utility fixed, can provide answers to assessing the theoretical conditions associated with risk bearing nature of agency behavior based on its funding requests.[5] This requires the analytical derivation of theoretical conditions as to what constitutes risk averse, risk neutral, and risk acceptant agency budgetary behavior. The purpose of this essay is to tackle this

4 This view departs from much of the research on models of incomplete information where uncertainty is deemed a discrete probabilistic choice. Rather, our definition of uncertainty is analogous to standard research on portfolio choice under uncertainty involving the "risk–return" relationship confronting holders of wealth related assets (Tobin 1958; Hirshleifer and Riley 1992).

5 Although bureaucratic organizations engage in what could be termed as "internal" budgeting with respect to various programs within the agency before they seek to make requests externally for funds, the focus here is on the agency request since the unit of analysis is at the (macro) organizational level.

specific research problem so that substantive insights into organizational decision making can be drawn. For instance, an agency might favor protecting itself in response to rising uncertainty by requesting for additional funding (*budgetary risk aversion*).[6] This is consistent with the view that bureaucratic agencies wish to buffer themselves from uncertainty (Crozier 1964; Downs 1967; Pfeffer and Salancik 1978; Thompson 1967). These theoretical conditions can also shed light in situations where agency budgetary decisions are unaffected by uncertainty (*budgetary risk neutrality*) that imply indifference between obtaining greater versus lesser organizational maintenance under such circumstances; and also if agencies seek relatively less funding in those instances when uncertainty rises (*budgetary risk acceptance*) that indicate an agency is less concerned with organizational maintenance, and possibly more concerned with trying to do "more with less" as a means of enhancing their reputation with elected officials. This type of decision making behavior can arise when the agency feels that its performing beyond its own expectations (March 1999: 20), or because it desires to appease politicians' preference for limiting administrative resources (Banks 1989; Miller and Moe 1983).

Recent survey research on managerial risk taking behavior in public sector organizations is not grounded in a theory of risk preferences (Bozeman and Kingsley 1998; Moon 1999). These empirical studies examine the risk taking behavior of public managers by assessing the managerial propensity for such behavior predicated on such items as red tape, trust among agency personnel, hierarchical complexity, centralization, and influence by elected officials. Neither study analyzes risk bearing behavior in relation to uncertainty, nor is capable of

---

6 This analysis defines risk bearing preferences in terms of organizational maintenance because an agency's desire to protect its technological core from environmental influences is important for protecting its policy mission (Thompson 1967: 67). Therefore, we posit later that budgetary risk averse (acceptant) agencies receive *increasing* (*decreasing*) positive marginal utility from budgetary resources.

distinguishing between different risk bearing behavioral conditions displayed by administrative agencies. More generally, neither study treats risk preferences as being rooted in an explicit first principles deductive account of behavior.

How do bureaucratic organizations handle uncertainty? First, administrative agencies might employ bureaucratic rules and procedures (e.g., standard operating procedures) to their advantage so that they are better equipped to deal with uncertainty (Crozier 1964; Cyert and March 1963; Downs 1967: 59– 60; Wilson 1989). Second, an agency's task domain might be restricted in order to cope with uncertainty. Still another way for administrative agencies to deal with this uncertainty is to request additional funding that it otherwise would not have pursued in order to obtain slack resources for organizational mission purposes (Cyert and March 1963; Downs 1967). This final way of coping with uncertainty serves is the focus of this study. An investigation of agency budgetary decision making is an intuitively appealing way to investigate uncertainty on two levels. On a practical level, agency funding requests serve as a viable approach since budgets are vital to the performance of administrative agencies (Wilson 1989), and are also a fundamental component in capturing the inherent tensions that exist between political and bureaucratic institutions (Bendor and Moe 1985; Miller and Moe 1983; Niskanen 1971). On a conceptual level, administrative institutions possess control over the budget requests that are submitted by them to OMB or Congress, and thus their own budget requests serve as a choice variable revealing agency preferences.

Agency Budget Requests as an Organizational Buffering Mechanism

Agency budget requests are used to set forth the policy, programmatic, and administrative plans that the agency wishes to pursue in a given year. Lance LeLoup (1984: 81–83) notes that agency goal expectations as an organizational unit are revealed most directly in budget estimates. Providing explicit, theoretical conditions for different forms of budgetary risk bearing behavior displayed by administrative agencies can enable us to discern the extent to which these organizations seek slack resources for a given level of utility.

Budgetary resources sought by a bureaucratic organization can be viewed as a hedge against uncertainty. In other words, an administrative agency employs budget requests as a buffering mechanism for the organization against uncertainty in order to fulfill its policy mission. This conceptualization of uncertainty, which is compatible with research on organizational decision making, follows from agencies' desire to protect or buffer their technological cores from environmental influences (Thompson 1967: 67).[7] Anthony Downs (1967: 138–139) echoes this point when he states that organizational slack has three positive benefits for the agency that directly pertain to coping with uncertainty. First, agencies can adjust to unexpected surges in workload without having to seek additional appropriations. Second, additional resources can reduce internal agency tensions by dampening resource battles for programs and subunits within the agency during more uncertain periods. Organizational slack resources also affords agencies an opportunity to undertake marginal, yet useful nonprogrammed activities that would be likely targets for deleting when operations are cut (e.g., long range

---

7 Thompson specifically uses the concept of buffering applied to boundary spanning of organizational subunits; whereas, in this study it pertains to agency resource preferences. Both usages treat buffering as a means of coping with uncertainty experienced by administrative organizations.

planning, basic research). As a result, an agency budget strategy that seeks organizational slack as a cushion to absorb uncertainty is a rational response for obtaining bureaucratic flexibility.

This does not mean that agencies seeking relief from uncertainty via greater slack resources will attempt to maximize organizational wealth as postulated by neoclassical theories of the bureaucratic firm (Niskanen 1971; Tullock 1965; but see Blais and Dion 1991 for a critical perspective). Although agencies might request more budgetary resources than they actually need to perform activities (Cyert and March 1963), the extensive layers and filters of the budgeting process are designed to monitor agency behavior, and thus strongly dissuade outlandish budgetary requests (Padgett 1980). For instance, formal models of agency budgeting reveal that through auditing (or threat thereof) agencies will possess a strong incentive not to pad budgets in a conspicuous manner (Banks 1989; Banks and Weingast 1992; Bendor, Taylor, and Van Gaalen 1985, 1987). Bureaucratic agencies' ability to fool politicians into giving them excessive amounts of funding without much substantiation to back up usage is highly improbable (Foreman 1988). Fenno (1966: 340) notes that members of Congress do not like being deceived by agencies during the budgetary process, and that deception is easily discovered (Wilson 1989: 252).[8] Moreover, administrators who take such risks are susceptible to political intervention, thus jeopardizing the loss of future political support (Kettl 1992: 106). Given that agencies need to make a sincere attempt to form a credible reputation in the political arena (Bendor, Taylor, and Van Gaalen 1985; Gormley 1989; Kaufman 1981; Wilson 1989), it is not surprising that

---

8 In very rare episodic cases politicians may wish to be fooled by agencies in order to grant them more funding (e.g., U.S. Drug Enforcement agency appropriations in the 1980's). However, such behavior on behalf of democratic institutions is rather atypical.

they possess a strong incentive to be forthright about their activities.[9] Thus, administrative

agencies seek increased budgets for the purposes of adequately fulfilling their policy mission

(Wilson 1989). Next, we undertake a simple comparative–static analysis of agency budgetary

decision making under uncertainty. The purpose of this exercise is to examine how an agency's

budgetary request will vary in relation to the policy environment uncertainty (volatility) for a

given fixed level of utility.

Comparative–Static Analysis of Agency Budgetary Decisions under Uncertainty

Background

Administrative agencies make budgetary decisions (requests) in an uncertain

environment. The manner in which agencies respond to this uncertainty is captured through the

nature of their risk bearing behavior. Three possible types of budgetary risk bearing behavior

can be exhibited by an administrative agency under conditions of uncertainty: risk aversion, risk

neutrality, and risk acceptance. Each type of risk bearing behavior is defined in terms of the

agency's well being – i.e., organizational maintenance. Specifically, the degree of risk bearing

behavior is defined in terms of an agency's willingness to request additional funding this year

from what it received last year in actual appropriations (*budgetary residual*) to handle the

uncertainty confronting the bureaucratic organization. Greater uncertainty translates into a more

ambiguous decision making situation for the agency. This means that agency decision making

will be made more difficult when they face greater volatility – i.e., more ambiguity displayed by

---

9 Empirical survey state level evidence by Duncombe and Kinney (1987) that supports this latter view
that agency officials place great importance on maintaining good relations with political principals.

political environment as well as from the environmental demands placed upon them.[10] Agencies

might wish to respond to uncertainty by incorporating this information into the budget requests

that they submit to elected officials.[11] In the realm of appropriations uncertainty, for instance,

the limiting case of no uncertainty would be equivalent to a constant growth funding rule,

whereby the agency can expect the same resource growth year after year.

An agency can employ different budgetary decision rules in response to uncertainty a

since its objectives are conditional upon climate and conditions in the policy environment

(Wildavsky 1988).   As a result, we claim that an agency's organizational response to uncertainty

will be altered by the context in which it is experienced (March 1999: 244–245). The distinction

between divided and unified party government is informative for the purposes of studying

agency decision making under uncertainty for two reasons. First, seminal research on budgetary

decision making by Davis, Dempster, and Wildavsky (1966) maintains that policy coherence

manifested through institutional stability translates into more stable expectations, and thus

facilitates more informed agency decision making in an uncertain environment. Relatedly,

Epstein and O'Halloran (1999: 78) contend that under a divided government regime, bureaucrats

will possess less policy flexibility, insofar that they experience greater difficulty in being able to

---

10 A skeptic might contend that these budgetary allotments are part and parcel of purposive behavior, and
thus do not reflect uncertainty. While these variations might very well be purposive, they are so only on
behalf of political institutions. The actual budgetary appropriation is a function of chief executive–
legislative bargaining, thus beyond the bureaucratic agencies' scope of decision making control.

11 Although there are other potential factors that influence agency budget requests, such as the
ideological preferences of political institutions, agency clientele support, but to name a few, the central
purpose of this study is to isolate the effect of uncertainty on agency budget requests, ceteris paribus.
Krause (2003) controls for these other factors in his statistical analysis of risk coefficients.

shape coherent public policies compared to an era of unified government.[12]

Therefore, greater policy coherence and more stable policy expectations occur in the political environment during periods of unified government compared to divided government, all else being equal. This is because the political signals that agencies receive are noisier (ambiguous) under divided government. We assume that an agency is assumed to receive lower gains (greater declines) in marginal utility from uncertainty under divided government compared to unified government for budgetary risk acceptant (risk averse) behavior, all else being equal. Thus, uncertainty is assumed to have a less deleterious effect on agency utility under unified government in the risk averse case, while it will exert a more favorable impact on agency utility for risk acceptant behavior during this same political regime.[13] Next, a comparative–static theoretical analysis is employed to determine how administrative agencies cope with uncertainty.

Theoretical Framework

We must begin by making assumptions concerning the agency's utility associated with both the sought after budgetary residual (BR) and the uncertainty (σ) that it confronts must be made. The agency's budgetary residual is defined as: $BR = F_{Rt} - F_{At-1}$, where BR is simply the

---

12. This view runs counter in two ways from what a traditional power accrual story would predict since a coalition of politicians under divided government an agency will experience greater discretion (Bryner 1987; Dahl and Lindblom 1953; Hammond and Knott 1996). First, the focus here is not on the ability of administrative agencies to play political principals off of one another to accrue power, but rather the extent to which the agency can be protected from political and policy uncertainty. Second, divided government results in greater uncertainty (variance) than unified government since conflict among political principals rises during such eras. Thus, the agency receives stronger mixed messages concerning the direction of policy administration during the former periods, even if the average policy is of a more moderate ideological nature.

13 Since agency behavior is unresponsive to uncertainty in the risk neutral case by definition, the divided–unified government dichotomy is irrelevant in this particular case.

first difference between the agency's budget request in the current year (F_{Rt}) and what it actually

received in legislative appropriations from the previous year (F_{At-1}).[14] It is assumed that the

agency seeks a level of funding that is greater than what they received from the previous year –

i.e., BR > 0.[15] To reiterate, the purpose here is to determine agency budgetary risk preferences

for a given positive fixed level of utility, all else being equal.

We assume that an agency's utility function consists of two variables expressed as:

$$U(BR, \sigma) = f(BR) + g(\sigma), \tag{1}$$

where agency utility is an additive function of the budgetary residual (BR) and the uncertainty

(σ) it encounters. An agency is assumed to always accrue positive marginal utility from BR

since it is safe to presume that these organizations will prefer more money as opposed to less, *all*

else being equal.[16] This is because what the agency does not ask for in terms of budgetary

resources, it will not likely acquire from political principals regardless of the nature of its risk

---

14 This formulation is consistent with the linear decision budgetary rule that is commonplace in adaptive–based budgetary models: $F_{Rt} = F_{At-1} + \xi_t$ (Davis, Dempster, and Wildavsky 1966; Padgett 1980: 355). By rearranging terms and converting into percentage terms (i.e., converting into logs and then multiplying by 100) one obtains the expression noted above where ξ_t is equivalent to BR_t. Thus, the budgetary residual sought by the agency can be alternatively thought of as being a budgetary request return. An analysis of incrementalism and its critics are beyond the scope of this essay. Rather, our focus is on assessing the risk bearing budgetary behavior of bureaucratic organizations by assessing the impact of uncertainty on agency behavior based on a plausible behavioral model of administrative behavior.

15 This simplifying assumption is for mathematical tractability purposes since otherwise a negative root might exist with a power functional form. However, an actual budget appropriation reduction from one year to the next is not precluded since the current year budgetary appropriation is not germane for this assumption to hold. Relaxing this assumption does not alter the theoretical predictions produced by the general solution appearing in the Appendix.

16 The positive marginal utility assertion does not mean to imply that agencies will pad budgets in a conspicuous manner since there are other factors that will constrain them (e.g., political preferences, macroeconomic conditions, and agency task demands). The present theoretical analysis treats these items as being fixed in order to have a tractable problem that can be analytically solved. These factors can be readily controlled for in empirical analyses (see Krause 2003).

preferences.[17] The rate of change in the positive marginal utility associated with the agency

budgetary residual (BR), however, will depend upon the nature of agency's budgetary risk

bearing behavior. With this said, the agency cannot seek an infinite (unconstrained) level of

resource expansion because of the implicit budgetary constraint that is formally imposed on the

agency by holding utility fixed at a specified positive value when analyzing the relationship

between the agency budgetary residual and uncertainty.

Agency Budgetary Risk Aversion

Given (1), a budgetary risk averse agency's utility function (U) can be more concretely

defined as a power function[18]:

$$U = c + BR^{\alpha} - \sigma^{\beta} \qquad\qquad (2)$$

$$\text{where } \alpha > 1, \qquad \beta > 1 \quad \text{(Divided Government)}$$

$$\alpha > 1, \quad 0 < \beta < 1 \quad \text{(Unified Government)}$$

c is a positive constant, and agency utility is assumed to be increasing at a successively higher

rate α with respect to the budgetary residual (BR) that the agency wishes to obtain, and declining

at the rate β with respect to uncertainty (σ). Budgetary risk aversion indicates that a bureaucratic

organization will obtain successively greater utility increases for trying to obtain larger amounts

of additional funding, but disutility from increased uncertainty. Assuming public bureaus

confront less coherent and variable policy signals from political institutions, and thus exhibit less

stable policy expectations under divided government vis–a–vis unified government, uncertainty

---

17 It is uncommon for politicians to appropriate a higher level of funding than requested by the agency.

18The power function is employed since its interpretation is intuitively straightforward and can be better
linked to empirically testable propositions. When this distributional form is relaxed for a general one, the
comparative-static results hold (please see Appendix).

will exert a greater than proportional negative effect on agency utility under periods of divided government. Conversely, uncertainty will have a smaller than proportional negative impact on agency utility during times of unified government. Taking the first and second order partial derivatives of agency utility with respect to BR yields:

$$\frac{\partial U}{\partial BR} = \alpha\, BR^{\alpha-1} > 0; \quad \frac{\partial^2 U}{\partial BR^2} = (\alpha^2 - \alpha) BR^{\alpha-2} > 0. \tag{3}$$

Budgetary risk averse agencies, holding all else constant, will exhibit an increasing rate of positive marginal utility with respect to seeking greater budgetary funding – i.e., U′(BR) > 0; U″(BR) > 0. This, in turn, suggests that budgetary risk averse agencies place a high premium on organizational maintenance. Likewise, taking the first and second partial derivatives for agency utility (U) with respect to uncertainty (σ) results in:

$$\frac{\partial U}{\partial \sigma} = -\beta \sigma^{\beta-1} < 0;$$

$$and$$

$$\frac{\partial^2 U}{\partial \sigma^2} = (-\beta^2 + \beta)\sigma^{\beta-2} < 0 \ \ (Divided\ Government)$$

$$\frac{\partial^2 U}{\partial \sigma^2} = (-\beta^2 + \beta)\sigma^{\beta-2} > 0 \ \ (Unified\ Government)$$

$$\tag{4}$$

where a risk averse agency operating under divided (unified) government experiences successively larger (smaller) declines in marginal utility attributable to increases in uncertainty – i.e., U′(σ) < 0; U″(σ) < 0 (divided government), and U″(σ) > 0 (unified government). While a risk averse agency is one that receives disutility from uncertainty, it has stronger disdain for uncertainty under a divided government regime than a unified government regime. This is because both policy coherence and expectations stability are comparatively weakened under

14

divided government due to the increased conflict among political overseers (Davis, Dempster, and Wildavsky 1966; Epstein and O'Halloran 1999: 78).

The key issue is simple – What can be formally deduced from these utility based relationships? Will agencies seek greater or less funding in response to increasing uncertainty? If so, at what rate do agencies seek to obtain greater or less funding? How does the distinction between divided and unified government affect such agency budgetary decisions in an uncertain environment? In order to analytically capture the relationship between agency budgetary decision making and uncertainty, agency utility must be held constant at a fixed positive value, $\overline{U}$ so that $U = \overline{U}$ and solve for the budgetary residual (BR) in (2):

$$BR = (-c_1 - c_2 + \sigma^\beta)^{\frac{1}{\alpha}}. \tag{5}$$

$$\text{where } 0 < c < \overline{U},$$

thus $\overline{U}$ serves as the supremum for c by definition since BR > 0 by assumption. The direction of this relationship can be determined by taking the first derivative of (5) with respect to σ:

$$\frac{dBR}{d\sigma} = \frac{1}{\alpha}(\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-1} \bullet \beta\sigma^{\beta-1} > 0 \tag{6}$$

$$= \frac{\beta}{\alpha}\sigma^{\beta-1}(\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-1} > 0.$$

Therefore, a risk averse agency will request greater budgetary funding in response to rising uncertainty, ceteris paribus. Substantively, this implies that budgetary risk averse agencies place a strong premium on organizational maintenance via their attempts to obtain additional funding, holding all else constant. The second derivative of this function provides us with information on the rate at which this positive relationship varies as uncertainty changes. The nature of these budgetary risk preferences may vary between divided and unified party government since

uncertainty in the former regime will have a greater detrimental effect on agency utility than it does in the latter regime for reasons discussed earlier. Taking the derivative of (6) yields:

$$\frac{d^2 BR}{d\sigma^2} = \frac{(\beta^2 - \beta)}{\alpha} \bullet \sigma^{\beta-2} \bullet (\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-1} + (\frac{\beta^2}{\alpha^2} - \frac{\beta^2}{\alpha}) \bullet \sigma^{2\beta-2} \bullet (\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-2} \overset{>}{\underset{<}{=}} 0 \text{ , (7)}$$

where:

$$\frac{d^2 BR}{d\sigma^2} > 0 : \text{ if } \frac{\beta}{\alpha} > 1, \quad \sigma < \left[\left(\frac{\frac{\beta}{\alpha} - 1}{\beta - \frac{\beta}{\alpha}} \right) \bullet (\overline{U} - c) \right]^{\frac{1}{\beta}} \tag{7a}$$

$$\frac{d^2 BR}{d\sigma^2} = 0 : \text{ if } \frac{\beta}{\alpha} = 1, \quad \sigma = \left[\left(\frac{\frac{\beta}{\alpha} - 1}{\beta - \frac{\beta}{\alpha}} \right) \bullet (\overline{U} - c) \right]^{\frac{1}{\beta}} \tag{7b}$$

$$\frac{d^2 BR}{d\sigma^2} < 0 : \text{ if } 0 < \frac{\beta}{\alpha} < 1, \quad \sigma > \left[\left(\frac{\frac{\beta}{\alpha} - 1}{\beta - \frac{\beta}{\alpha}} \right) \bullet (\overline{U} - c) \right]^{\frac{1}{\beta}} . \tag{7c}$$

The rate at which the agency is willing to seek additional funding in response to uncertainty under divided government, where uncertainty has a successively larger negative impact on agency utility, is conditional on the ratio of the rate at which agency utility increases with respect to both the budgetary residual sought by the agency (BR) and declines in relation to uncertainty (σ) – i.e., $\frac{\beta}{\alpha}$. There are three possible scenarios in this instance. If the rate at which agency utility declines with increases in uncertainty exceeds the rate at which agency utility rises with increased budgetary funding being sought by the agency – i.e., $\frac{\beta}{\alpha} > 1$, then an agency will prefer proportionally greater budgetary resources in response to changes involving uncertainty – i.e., $\frac{d^2 BR}{d\sigma^2} > 0$. If the rate at which the budgetary residual contributes to agency utility in a manner that is identical to that which uncertainty detracts from it – i.e., $\frac{\beta}{\alpha} = 1$, then increases in

uncertainty will have a proportional effect on the amount of funding that the agency wishes to obtain – i.e., $\frac{d^2 BR}{d\sigma^2} = 0$. In the special case where the impact on agency utility attributable to the budgetary residual that the agency is trying to obtain exceeds that of uncertainty's impact on agency utility – i.e., $0 < \frac{\beta}{\alpha} < 1$, the rate at which marginal changes in budget requests vary in response to movements in uncertainty will be less than proportional – i.e., $\frac{d^2 BR}{d\sigma^2} < 0$. Thus the more pronounced the negative effect of uncertainty on agency utility relative to that of the budgetary residual's positive effect on agency utility, a budgetary risk averse agency will possess greater the impetus for acquiring successively higher level of resources in order to hedge against rising uncertainty, ceteris paribus.

The second order derivative for periods of unified government unequivocally indicates that marginal increases in the budgetary residual requested by the agency successively declines as uncertainty rises. This is expressed as:

$$\frac{d^2 BR}{d\sigma^2} = \frac{(\beta^2 - \beta)}{\alpha} \bullet \sigma^{\beta-2} \bullet (\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-1} + (\frac{\beta^2}{\alpha^2} - \frac{\beta^2}{\alpha}) \bullet \sigma^{2\beta-2} \bullet (\overline{U} - c + \sigma^\beta)^{\frac{1}{\alpha}-2} < 0 \quad (8)$$

where the less pervasive effect of uncertainty on agency decision making under unified government translates into a successively lower desire to obtain budgetary resources as a means to cope with uncertainty, all else being equal. This result makes intuitive sense since, as noted earlier, a unified government regime is marked by greater policy coherence and stability for public organizations compared to times of divided government.

Agency Budgetary Risk Neutrality

The budgetary risk neutral agency's utility function can be defined as:

$$U = c + BR^\alpha - \sigma^\beta \quad (9)$$

$$\text{where} \quad \alpha = 1, \beta = 0 \quad \text{(Divided and Unified Government)}$$

c is a positive constant, and agency utility is assumed to be increasing at a constant rate α with

respect to BR, and does not vary with respect to uncertainty (i.e., β = 0). Thus, budgetary risk

neutral behavior by an agency indicates that it will obtain increases in utility by trying to obtain

additional funding, but neither gain or lose utility from uncertainty fluctuations. Taking both the

first and second order partial derivatives of agency utility with respect to BR yields:

$$\frac{\partial U}{\partial BR} = \alpha \, BR^{\alpha-1} > 0; \quad \frac{\partial^2 U}{\partial BR^2} = (\alpha^2 - \alpha) BR^{\alpha-2} = 0. \tag{10}$$

A budgetary risk neutral agency exhibits a constant rate of positive marginal utility with respect

to the budgetary funding being sought through their request – i.e., $U'(BR) > 0$; $U''(BR) = 0$.

Substantively, budgetary risk neutral agencies are those which are not as concerned with

organizational maintenance compared to budgetary risk averse agencies with respect to the

amount of funding that they seek as a hedge against uncertainty. Taking the first and second

order partial derivatives for agency utility with respect to σ results in:

$$\frac{\partial U}{\partial \sigma} = -\beta \sigma^{\beta-1} = 0;$$

$$and \tag{11}$$

$$\frac{\partial^2 U}{\partial \sigma^2} = (-\beta^2 + \beta)\sigma^{\beta-2} = 0 \ (\textit{Divided and Unified Government})$$

where a budgetary risk neutral agency's utility is orthogonal to uncertainty, independent of

whether an agency is operating under divided or unified government – i.e., $U'(\sigma)$, $U''(\sigma) = 0$.

Therefore, the relationship between the agency budget residual and uncertainty can be derived in

the usual manner by taking the first and second order derivatives of BR with respect to σ:

$$\frac{dBR}{d\sigma} = \frac{1}{\alpha}(\overline{U} - c + \sigma^{\beta})^{\frac{1}{\alpha}-1} \bullet -\beta\sigma^{\beta-1} = 0 \tag{12}$$

and

$$\frac{d^{2}BR}{d\sigma^{2}} = \frac{(\beta^{2} - \beta)}{\alpha} \bullet \sigma^{\beta-2} \bullet (\overline{U} - c + \sigma^{\beta})^{\frac{1}{\alpha}-1} + (\frac{\beta^{2}}{\alpha^{2}} - \frac{\beta^{2}}{\alpha}) \bullet \sigma^{2\beta-2} \bullet (\overline{U} - c + \sigma^{\beta})^{\frac{1}{\alpha}-2} = 0 \tag{13}$$

Risk neutral budgetary behavior displayed by the agency indicates that its budget requests will

remain unaffected by uncertainty. Such a result is suggestive of indifference that the budgetary

risk neutral agency will have concerning maintenance of the organizational apparatus. Why

might this indifference occur? One possible explanation might be these types of agencies wish

to balance maintaining favorable political relations with organizational maintenance. Thus,

a budgetary risk neutral agency will neither request for additional or less funding in response to

rising uncertainty, ceteris paribus. Alternatively, budgetary risk neutrality may also emblematic

of a sluggishness or inertia that does not easily afford bureaucratic agencies the opportunity or

willingness to request more or less funding in response to fluctuations involving uncertainty.

Agency Budgetary Risk Acceptance

Based on the power functional form, a risk acceptant agency's utility function appears as:

$$U = c + BR^{\alpha} + \sigma^{\beta} \tag{14}$$

where $0 < \alpha < 1,\ \ 0 < \beta < 1$ (Divided Government)

$0 < \alpha < 1,\ \ \ \ \ \ \beta > 1$ (Unified Government)

c is a positive constant, and agency utility is assumed to be increasing at a declining rate α with

respect to BR, and rising at the rate β with respect to uncertainty. Budgetary risk acceptance by

administrative agencies means that they experience a rise in utility for not only trying to obtain

additional funding, but also when they face increasing uncertainty. The rate of change in the

marginal effect of uncertainty on agency utility, however, will be conditional on the distinction

between divided and unified government discussed earlier. Under unified (divided) government,

variations in uncertainty will have a larger (smaller) than proportional positive marginal impact

on agency utility. This is because uncertainty will have a more deleterious effect on agency

utility during periods of divided government compared to unified government, all else being

equal, since institutional policy coherence and stability of agency expectations are lessened in

the former era. Once again, taking both the first and second order partial derivatives of agency

utility with respect to BR in the budgetary risk acceptance case yields:

$$\frac{\partial U}{\partial BR} = \alpha\, BR^{\alpha-1} > 0; \quad \frac{\partial^2 U}{\partial BR^2} = (\alpha^2 - \alpha)BR^{\alpha-2} < 0 . \qquad (15)$$

Agency budgetary risk acceptant behavior will exhibit a decreasing rate of positive marginal

utility with respect to seeking greater budgetary funding – i.e., $U'(BR) > 0$, $U''(BR) < 0$, thus

indicating that agency behavior will be less concerned with organizational maintenance in the

face of rising uncertainty compared to that of both risk averse and risk neutral scenarios.

Solving for the partial derivatives for agency utility (U) with respect to uncertainty (σ) produces:

$$\frac{\partial U}{\partial \sigma} = \beta\sigma^{\beta-1} > 0;$$

$$and$$

$$\frac{\partial^2 U}{\partial \sigma^2} = (\beta^2 + \beta)\sigma^{\beta-2} < 0 \;\; (Divided\; Government) \qquad (16)$$

$$\frac{\partial^2 U}{\partial \sigma^2} = (\beta^2 + \beta)\sigma^{\beta-2} > 0 \;\; (Unified\; Government)$$

where risk acceptant agency behavior derives positive utility from uncertainty – i.e., $U'(\sigma) > 0$.

20

Furthermore, such an agency operating under divided (unified) government experiences successively smaller (larger) rise in marginal utility attributable to increases in uncertainty – i.e., U″(σ) < 0 (divided government), and U″(σ) > 0 (unified government). Simply, an agency behaving in a risk acceptant manner during periods of divided government has a stronger dispreference for uncertainty relative to when it is operating under a unified government era for the same reasons noted under budgetary risk aversion. Thus, holding the nature of risk bearing behavior fixed, uncertainty will exert a more deleterious impact on agency utility under divided government as compared to unified government. Based on these relationships, the connection between agency budget request behavior reflected in the BR variable in response to uncertainty (σ) is made by solving for BR and setting U = $\overline{U}$ based on (14):

$$BR = (\overline{U} - c - \sigma^{\beta})^{\frac{1}{\alpha}} \tag{17}$$

$$\text{where } 0 < c < \overline{U} \, ,$$

thus $\overline{U}$ serves as the supremum for c by definition since BR > 0 by assumption. Taking the first derivative of BR with respect to σ in (17) yields:

$$\frac{dBR}{d\sigma} = \frac{1}{\alpha}(\overline{U} - c - \sigma^{\beta})^{\frac{1}{\alpha}-1} \bullet -\beta\sigma^{\beta-1} < 0 \tag{18}$$

$$= \frac{-\beta}{\alpha}\sigma^{\beta-1}(\overline{U} - c - \sigma^{\beta})^{\frac{1}{\alpha}-1} < 0 \, .$$

Therefore, risk seeking budgetary behavior displayed by administrative agencies translates into a preference for relatively lower funding increase from the previous year's appropriation as uncertainty rises, ceteris paribus. This result suggests that an agency exhibiting risk acceptant budgetary behavior is less concerned with organizational maintenance since it will request for a

smaller increase in funding based on last year's appropriation in response to a rising uncertainty, holding all else constant. The rate at which this inverse relationship between agency budgetary request behavior and uncertainty changes depends upon the nature of the political regime. Taking the derivative of (18) provides us with the general result under periods of divided government:

$$\frac{d^2BR}{d\sigma^2} = \frac{-(\beta^2-\beta)}{\alpha} \bullet \sigma^{\beta-2} \bullet (\overline{U}-c-\sigma^\beta)^{\frac{1}{\alpha}-1} + (\frac{\beta^2}{\alpha^2}-\frac{\beta^2}{\alpha}) \bullet \sigma^{2\beta-2} \bullet (\overline{U}-c-\sigma^\beta)^{\frac{1}{\alpha}-2} > 0 \quad (19)$$

where marginal decreases in agency budgetary requests will be less than proportional for each unit rise in uncertainty. The less pervasive effect of uncertainty on organizational decision making during times of divided government case for the risk acceptant agency is suggestive of public bureaucracies' willingness not to cut their budgetary preferences in as bold a manner in response to uncertainty when confronting a situation where policy coherence and stable policy expectations are weakened.

Under periods of unified party government, the comparative–statics concerning the rate of change in the inverse relationship between agency budget requests and uncertainty is ambiguous. Since $\frac{\beta}{\alpha} > 1$ by definition for a budgetary risk acceptant agency under unified government, thus we obtain:

$$\frac{d^2BR}{d\sigma^2} = \frac{-(\beta^2-\beta)}{\alpha} \bullet \sigma^{\beta-2} \bullet (\overline{U}-c-\sigma^\beta)^{\frac{1}{\alpha}-1} + (\frac{\beta^2}{\alpha^2}-\frac{\beta^2}{\alpha}) \bullet \sigma^{2\beta-2} \bullet (\overline{U}-c-\sigma^\beta)^{\frac{1}{\alpha}-2} \overset{>}{\underset{<}{=}} 0 \quad , (20)$$

where: $\qquad\qquad \frac{d^2BR}{d\sigma^2} > 0: \; if \; \sigma > \left[\left(\frac{\beta-1}{\frac{\beta}{\alpha}-1} \right) \bullet \left(\overline{U}-c \right) \right]^{\frac{1}{\beta}}$ $\qquad\qquad$ (20a)

$$\frac{d^2 BR}{d\sigma^2} = 0 : \ if \ \sigma = \left[\left(\frac{\frac{\beta-1}{\beta}}{\frac{\alpha}{\alpha} - 1} \right) \bullet \left(\overline{U} - c \right) \right]^{\frac{1}{\beta}} \qquad (20b)$$

$$\frac{d^2 BR}{d\sigma^2} < 0 : \ if \ \sigma < \left[\left(\frac{\frac{\beta-1}{\beta}}{\frac{\alpha}{\alpha} - 1} \right) \bullet \left(\overline{U} - c \right) \right]^{\frac{1}{\beta}} . \qquad (20c)$$

Unlike the budgetary risk aversion under divided government, where conditional relationships are determined by the impact BR and σ each have on agency utility – i.e., $\frac{\beta}{\alpha}$, the rate at which the budgetary risk acceptant agency is trying to obtain additional funding in response to uncertainty under unified government involves a more complicated relationship that is difficult to substantively interpret because both the comparative–static findings differ somewhat and also $\frac{\beta}{\alpha} > 1$ by definition in this latter case. Specifically, the nature of agency budgetary decision making under uncertainty is conditional on the *absolute* level of uncertainty that the agency experiences (σ) in relation to the relative balance between the rate of positive marginal utility attributable to uncertainty and the ratio of positive marginal utility with respect to both uncertainty and the budgetary residual, multiplied by a fixed level of agency utility raised to a fractional power that lies between zero and unity since $\frac{\beta}{\alpha} > 1$. This latter complex mathematical expression is henceforth, referred to as the *relative positive marginal utility expression* or *RPMUE*. In the case of (20a) when the *level* or *amount* of uncertainty is larger than RPMUE, the agency budget request will decline at a decreasing rate in response to successive increases involving uncertainty, all else being equal. When the level of uncertainty is equivalent to RPMUE as is the case in (20b), the budgetary residual of the agency will decline at a constant (proportional) rate in response to increasing uncertainty, ceteris paribus. Finally,

23

when the amount of uncertainty is less than RPMUE as appears in (20c), the agency budgetary residual will decline at an increasing rate in response to rising uncertainty, holding all else constant. In sum, the more pronounced the positive effect of uncertainty on agency utility relative to that of the budgetary residual vis–a–vis the level of uncertainty that the organization experiences, the greater the impetus a budgetary risk acceptant agency has for acquiring successively fewer funding resource gains as a response to increasing uncertainty, ceteris paribus. This type of behavior makes logical sense given that agencies are only willing to reduce funding requests in a smaller than proportional manner when uncertainty is high in absolute terms relative to the ratio of the impact of uncertainty to budgetary residual being sought by the agency each with respect to their utility. Conversely, when the level of uncertainty is low relative to this ratio impact of each variable on agency utility, the agency displaying risk acceptant behavior will be inclined to reduce funding requests in a larger than proportional manner.

Conclusion

Although it is commonly known that bureaucratic agencies operate under conditions of uncertainty (e.g., Downs 1967; Gormley 1989; March and Olsen 1976; March and Simon 1958; Simon 1976; Stinchcombe 1990; Wilson 1989), this fact is overlooked in most existing scholarship of bureaucratic decision making. The few exceptions either assume risk bearing behavior in an *a priori* fashion (Bendor and Moe 1985; Bendor, Taylor, and Van Gaalen 1985, 1987), or derive it in a manner that limits agency response only to the special case of risk neutral behavior (Carpenter 2002). The most common assumption in principal–agent models of political

24

control over the bureaucracy posit a risk averse agency (cf. Miller and Whitford 2002). Recent

empirical studies that do attempt to assess risk bearing behavior by public organizations fail to

provide explicit theoretical conditions that allow one to qualitatively differentiate between

various types of risk bearing behavior (Bozeman and Kingsley 1998; Moon 1999). Our current

understanding and treatment of uncertainty in administrative decision making reflects a "black

box" where its nature for understanding organizational behavior remains unknown. Because

these type of organizations typically experience both less policy coherence and stable

expectations during an era of divided government relative to a period of unified government

(Davis, Dempster, and Wildavsky 1966; Epstein and O'Halloran 1999), we assume that the slope

of the marginal effect of uncertainty has a comparatively less favorable effect on agency utility

for the former political regime than the latter. Therefore, we claim that how agencies cope with

uncertainty necessitates the analysis of different risk bearing conditions in the presence of

context dependent utility (March 1999: 244–245).

Although administrative agencies can cope with uncertainty in several ways, we focus on

the extent to which administrative organizations seek fiscal resources with the purposes of

creating slack resources for organizational and policy mission purposes (Cyert and March 1963;

Downs 1967; Wilson 1989). Specifically, we have set out to determine the extent to which an

administrative agency is willing to extract additional budgetary resources (organizational slack)

as a means of buffering itself from the uncertainty that it is experiencing, holding all else

constant. Thus, the acquisition of budgetary resources acts as a hedge that provides bureaucratic

flexibility via slack resources (Downs 1967: 138–139) General theoretical conditions have been

derived that enable one to differentiate among risk averse, risk neutral, and risk acceptant

budgetary behavior displayed by administrative agencies. The general nature of this modeling

exercise and subsequent comparative–static results pertaining to our research puzzle has the

important advantage of not placing restrictions on the empirical testing of agency response to

uncertainty for different types of information processing capabilities ranging from naive

adaptation to Bayesian updating. The analytical results of this study demonstrate that

administrative agencies wish to raise the amount of funding it seeks when confronted with a rise

in uncertainty under conditions of budgetary risk aversion, all else being equal. Agency

budgetary behavior that reflects risk acceptant behavior entails a desire to lower the amount of

funds that they request in response to an increase in uncertainty. Administrative organizations

display budgetary risk neutral behavior when its budget requests are unresponsive to uncertainty.

This study has broader implications for understanding how administrative institutions

make decisions within a political environment. The comparative–static results obtained here are

suggestive of the possible tension between organizational maintenance versus political

responsiveness that agencies undeniably confront in the presence of uncertainty. This tension is

consistent with the long standing observation that administrative agencies do wish to possess

discretionary authority, but also possess a strong desire to maintain or enhance their reputation

with elected officials (Kaufman 1981; Wilson 1989). The analytical results presented here

reveal that an agency's allegiance to an organizational mission via slack resources is

comparatively strongest in the case of budgetary risk averse behavior, followed by budgetary

risk neutrality, with budgetary risk acceptance being the least concerned with resource

preservation. Furthermore, an agency's relative preference for organizational slack under

divided party government will tend to be greater than or equal to that which occurs during

unified party government with respect to risk averse or risk acceptant agency budgetary decisions. These analytical results demonstrate that for a given type of budgetary risk bearing behavior displayed by an administrative agency, these entities will become at least as much, if not more, marginally protective of their organizational mission in times of divided party government compared to eras of unified party government, all else being equal. These predictions are consistent with the perspective set forth in past descriptive studies which maintains that agencies will seek comparatively greater resources as a rational response to obtaining administrative and policy flexibility (Downs 1967), and also in order to make the organizational mission more coherent (Wilson 1989).

While this study serves as an initial foray into the theoretical foundations of agency risk propensities, it is an essential first step for subsequent model building that goes beyond the first principles of how agencies cope with uncertainty. Before this next stage can be meaningfully pursued, however, scholars must be explicit about the assumptions that undergird our analysis of strategic bureaucratic interaction with other political actors. This study has proposed one such approach with the purpose of understanding how administrative agencies make budgetary decisions under conditions of uncertainty. Future research should develop models and subsequent empirical tests of other types of organizational decision making where variations involving uncertainty can influence the manner in which these entities make decisions. Our understanding of administrative decision making processes will be enhanced as we begin to explicitly consider the contextual nature uncertainty plays in both our theories and empirical analyses of how public organizations arrive at decisions.

Appendix: General Solution to the Theoretical Conditions of Agency Budgetary Risk Preferences

The general solution that demonstrates the comparative–statics hold for the budgetary

risk bearing behavior for the three conditions (risk aversion, risk neutrality, and risk acceptance),

and also taking into account the qualitative distinction between divided and unified government,

irrespective of the functional form adopted for purpose of analysis, is straightforward. If we

begin with the generic agency utility function involving its budgetary residual (BR) and the

uncertainty (σ) experienced as in (1):

$$U(BR, \sigma) = f(BR) + g(\sigma) \qquad (A–1)$$

where agency utility is an additive function of the budgetary residual (BR) and uncertainty (σ).

The partial derivatives of (A–1) are such that:

$$f'(BR) = \frac{\partial U}{\partial BR}; g'(\sigma) = \frac{\partial U}{\partial \sigma}. \qquad (A–2)$$

In order to solve for $\frac{dBR}{d\sigma}$ and $\frac{d^2 BR}{d\sigma^2}$ respectively, agency utility must be fixed so that $U = \overline{U}$.
Rewriting (A-1) based on a positive level of fixed utility gives us:

$$\overline{U} = f(BR) + g(\sigma). \qquad (A–3)$$

Differentiating (A-3) with respect to σ yields:

$$0 = f'(BR)\frac{dBR}{d\sigma} + g'(\sigma), \qquad (A–4)$$

and solving (A–4) in terms of $\frac{dBR}{d\sigma}$ gives us the following expression for the general first order
derivative to this problem:

$$\frac{dBR}{d\sigma} = \frac{-g'(\sigma)}{f'(BR)}. \qquad (A–5)$$

Because it is assumed that agency utility has a different (the same) directional relationship with

respect to BR and σ separately for risk aversion (risk acceptance) conditions, by definition

$\dfrac{dBR}{d\sigma} > 0\ \left(\dfrac{dBR}{d\sigma} < 0\right)$. In the risk-neutral case, by definition $\dfrac{dBR}{d\sigma} = 0$ since $g'(\sigma) = 0$

and $f'(BR) \neq 0$ by assumption. Solving for the second– order conditions involves

differentiating (A-5) via the quotient rule, and yields the general solution:

$$\frac{d^2 BR}{d\sigma^2} = \frac{-f'(BR) \bullet g''(\sigma) + g'(\sigma) \bullet f''(BR) \bullet \frac{dBR}{d\sigma}}{[f'(BR)]^2}, \qquad (A-6a)$$

and substituting the equivalent $\dfrac{-g'(\sigma)}{f'(BR)}$ for $\dfrac{dBR}{d\sigma}$ leads to:

$$= \frac{-f'(BR) \bullet g''(\sigma) + g'(\sigma) \bullet f''(BR) \bullet \frac{-g'(\sigma)}{f'(BR)}}{[f'(BR)]^2}. \qquad (A-6b)$$

Multiplying both sides by $f'(BR)$ and some combining terms yields the general solution:

$$= \frac{-[f'(BR)]^2 \bullet g''(\sigma) - [g'(\sigma)]^2 \bullet f''(BR)}{[f'(BR)]^3}. \qquad (A-6c)$$

The sign of the function associated with the general solution to the second order derivatives will

depend upon the sign of $f'(BR)$ as well as for both $f''(BR)$ and $g''(\sigma)$. They are as follows:

Case I. Agency Budgetary Risk Aversion under Divided Government:

$$\text{If } f'(BR) > 0 \text{ and } f''(BR) > 0, g''(\sigma) < 0, \qquad (A-7)$$

Then $\dfrac{d^2 BR}{d\sigma^2} > 0$ when $|\,[f'(BR)]^2 \bullet g''(\sigma)\,| > |\,[g'(\sigma)]^2 \bullet f''(BR)\,|$

Then $\dfrac{d^2 BR}{d\sigma^2} = 0$ when $|\,[f'(BR)]^2 \bullet g''(\sigma)\,| = |\,[g'(\sigma)]^2 \bullet f''(BR)\,|$

Then $\dfrac{d^2 BR}{d\sigma^2} < 0$ when $|\,[f\,'(BR)]^2 \bullet g''(\sigma)\,| < |\,[g'(\sigma)]^2 \bullet f\,''(BR)\,|$;

Case II. Agency Budgetary Risk Aversion under Unified Government:

$$\text{If } f\,'(BR) > 0 \text{ and } f\,''(BR) \bullet g''(\sigma) > 0, \text{ Then } \dfrac{d^2 BR}{d\sigma^2} < 0; \qquad \text{(A–8)}$$

Case III. Agency Budgetary Risk Acceptance under Divided Government:

$$\text{If } f\,'(BR) > 0 \text{ and } f\,''(BR), g''(\sigma) < 0, \text{ Then } \dfrac{d^2 BR}{d\sigma^2} > 0; \qquad \text{(A–9)}$$

Case IV. Agency Budgetary Risk Acceptance under Unified Government:

$$\text{If } f\,'(BR) > 0 \text{ and } f\,''(BR) < 0, g''(\sigma) > 0, \qquad \text{(A–10)}$$

Then $\dfrac{d^2 BR}{d\sigma^2} > 0$ when $|\,[f\,'(BR)]^2 \bullet g''(\sigma)\,| < |\,[g'(\sigma)]^2 \bullet f\,''(BR)\,|$

Then $\dfrac{d^2 BR}{d\sigma^2} = 0$ when $|\,[f\,'(BR)]^2 \bullet g''(\sigma)\,| = |\,[g'(\sigma)]^2 \bullet f\,''(BR)\,|$;

Then $\dfrac{d^2 BR}{d\sigma^2} < 0$ when $|\,[f\,'(BR)]^2 \bullet g''(\sigma)\,| > |\,[g'(\sigma)]^2 \bullet f\,''(BR)\,|$;

In the risk neutral case, the existence or absence of divided party government will not have a bearing on the relationship between BR and σ, thus the following will hold: $f\,'(BR) \neq 0$; $f\,''(BR), g''(\sigma) = 0$.

References

Banks, Jeffrey S. 1989. "Agency Budgets, Cost Information, and Auditing." *American Journal of Political Science.* 33(August): 670–699.

Banks, Jeffrey S., and Barry R. Weingast. 1992. "The Political Control of Bureaucracies under Asymmetric Information." *American Journal of Political Science.* 36(May): 509–524.

Bendor, Jonathan B. 1985. *Parallel Systems: Redundancy in Government.* Berkeley, CA: University of California Press.

Bendor, Jonathan, and Terry M. Moe. 1985. "An Adaptive Model of Bureaucratic Politics." *American Political Science Review.* 79(September): 755–774.

Bendor, Jonathan, Serge Taylor. and Roland Van Gaalen. 1985. "Bureaucratic Expertise versus Legislative Authority: A Model of Deception and Monitoring in Budgeting." *American Political Science Review.* 79(December): 1041–1060.

Bendor, Jonathan, Serge Taylor. and Roland Van Gaalen. 1987. "Politicians, Bureaucrats, and Asymmetric Information." *American Journal of Political Science.* 31(November): 796–828.

Blais, Andre, and Stephane Dion. eds. 1991. *The Budget–Maximizing Bureaucrat: Appraisals and Evidence.* Pittsburgh, PA: University of Pittsburgh Press.

Bozeman, Barry, and Gordon Kingsley. 1998. "Risk Culture in Public and Private Organizations." *Public Administration Review.* 58(March/April): 109–118.

Bryner, Gary C. 1987. *Bureaucratic Discretion: Law and Policy in Federal Regulatory Agencies.* New York: Pergamon Press.

Carpenter, Daniel P. 2002. "Groups, the Media, Agency Waiting Costs, and FDA Drug Approval." *American Journal of Political Science.* 46(July): 490–505.

Crozier, Michel. 1964. *The Bureaucratic Phenomenon*. Chicago, IL: University of Chicago Press.

Cyert, Richard M., and James G. March. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice–Hall.

Dahl, Robert A., and Charles E. Lindblom. *Politics, Economics, and Welfare*. New York: Harper and Row.

Davis, Otto A., M.A.H. Dempster, and Aaron Wildavsky. 1966. "A Theory of the Budgetary Process." *American Political Science Review*. 60(September): 529–547.

Downs, Anthony. 1967. *Inside Bureaucracy*. Boston, MA: Little, Brown.

Duncombe, Sydney, and Richard Kinney. 1987. "Agency Budget Success: How is it Defined by Budget Officials in Five Western States." *Public Budgeting and Finance*. 7(1): 24–37.

Epstein, David, and Sharyn O'Halloran. 1999. *Delegating Powers: A Transactions-Cost Approach to Policy Making Under Separated Powers*. New York: Cambridge University Press.

Fenno, Richard F. 1966. *The Power of the Purse*. Boston, MA: Little, Brown.

Foreman, Christopher H., Jr. 1988. *Signals From the Hill: Congressional Oversight and the Challenge of Social Regulation*. New Haven, CT: Yale University Press.

Gormley, William T. 1989. *Taming the Bureaucracy: Muscles, Prayers, and Other Strategies*. Princeton, NJ: Princeton University Press.

Hammond, Thomas H., and Jack H. Knott. 1996. "Who Controls the Bureaucracy?: Presidential Power, Congressional Dominance, Legal Constraints, and Bureaucratic Autonomy in a Model of Multi-Institutional Policymaking." *Journal of Law, Economics, and Organization*. 12(April): 119–166.

Heimann, C.F. 1997. *Acceptable Risks: Politics, Policy, and Risky Technologies*. Ann Arbor, MI: University of Michigan Press.

Hirshleifer, Jack, and John G. Riley. 1992. *The Analytics of Uncertainty and Information*. New York: Cambridge University Press.

Johnson, Cathy M. 1992. *The Dynamics of Conflict Between Bureaucrats and Legislators*. Armonk, NY: M.E. Sharpe.

Kaufman, Herbert. 1981. *The Administrative Behavior of Federal Bureau Chiefs*. Washington, D.C.: Brookings Institution.

Kettl, Donald F. 1992. "Micromanagement: Congressional Control and Bureaucratic Risk." In *Agenda for Excellence: Public Service in America*. Patricia W. Ingraham and Donald F. Kettl eds. Chatham, NJ: Chatham House Publishers.

Krause, George A. 2003. "Coping with Uncertainty: Analyzing Risk Propensities of SEC Budgetary Decisions, 1949–1997." Typescript. University of South Carolina.

LeLoup, Lance T. 1984. "Appropriations Politics in Congress: The House Appropriations Committees and the Executive Agencies." (Richard F. Fenno excerpt – *The Power of the Purse*). *Public Budgeting and Finance*. 4(4): 78–98.

March, James G., and Herbert A. Simon. 1958. *Organizations*. New York: Free Press.

March, James G., and Johan P. Olsen. 1976. *Ambiguity and Choice in Organizations*. Bergen, Norway: Universitesforlaget.

Miller, Gary J., and Terry M. Moe. 1983. "Bureaucrats, Legislators, and the Size of Government." *American Political Science Review*. 77(June): 297–322.

Miller, Gary J., and Andrew B. Whitford. 2002. "Trust and Incentives in Principal–Agent Negotiations: The 'Insurance/Incentive Tradeoff.'" *Journal of Theoretical Politics* 14(April): 231–267.

Moon, Myung, Jae. 1999. "The Pursuit of Managerial Entrepreneurship: Does Organization Matter?"

Public Administration Review. 59(February/March): 31– 43.

Niskanen, William A. 1971. *Bureaucracy and Representative Government*. Chicago: Aldine-Atherton.

Padgett, John. 1980. "Bounded Rationality in Budgetary Research." *American Political Science Review*. 74(June): 354–372.

Pfeffer, Jeffrey, and Gerald R. Salancik. 1978. *The External Control of Organizations*. New York: Harper and Row.

Simon, Herbert A. 1976. *Administrative Behavior*. Third edition. New York: Macmillan.

Stinchcombe, Arthur L. 1990. *Information and Organizations*. Berkeley, CA: University of California Press.

Tobin, James. 1958. "Liquidity Preference as Behavior Towards Risk." *Review of Economic Studies*. 25(66): 65– 86.

Tullock, Gordon. 1965. *The Politics of the Bureaucracy*. Washington, D.C.: Public Affairs Press.

Wildavsky, Aaron. 1988. *The New Politics of the Budgetary Process*. Boston: Little, Brown.

Wilson, James Q. 1989. *Bureaucracy: What Government Agencies Do and Why They Do It*. New York: Basic Books.

Wood, B. Dan, and Richard W. Waterman. 1994. *Bureaucratic Dynamics: The Role of a Bureaucracy in a Democracy*. Boulder, CO: Westview Press.