RETHINKING ALLISON'S MODELS

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The ideas in Graham Allison's Essence of Decision *(1971) have had an enormous impact on the study and teaching of bureaucracy and foreign policy making. While Allison's work has received considerable critical attention, there has been surprisingly little examination of the content and internal logic of his models. We subject each of Allison's three models to a systematic critical analysis. Our conclusion is that the models require substantial reformulation.*

Graham Allison's study of the 1962 Cuban missile crisis, published as "Conceptual Models and the Cuban Missile Crisis" (1969) and as *Essence of Decision: Explaining the Cuban Missile Crisis* (1971), is a landmark in our discipline's analysis of bureaucracy's role in foreign policy making. Prior to Allison's work, most studies of bureaucracy and foreign policy, though rich and informative, were largely descriptive and rather unfocused theoretically. They seldom presented an explicit analytical perspective, and readers were often left to infer what the authors believed were the fundamental properties of bureaucratic policymaking.

Allison's work demonstrated that a more self-consciously theoretical approach to the study of bureaucracy and foreign policy was both feasible and desirable. The earlier literature had rarely developed alternative explanations for events and decisions. But in formulating his three models—the *rational actor*, *organizational process*, and *governmental politics* models, labeled I, II, and III, respectively—Allison showed how to make explicit the explanations of events that had only been implicit in many of these earlier studies. In so doing, Allison helped to place the study of bureaucracy's influence on foreign policy on a more scientific foundation.

Allison's work received high praise in reviews by a wide range of scholars such as Ole Holsti (1972), Francis Rourke (1972), and Harrison Wagner (1974). For example, as Wagner remarked in his review of *Essence of Decision*:

> It may, in fact, be the most generally persuasive attempt ever made to show the relevance of theorizing to the treatment of what are ordinarily thought to be the main problems of the study of international politics. Its general appeal is primarily due to the effectiveness of Allison's theoretical arguments in his analysis of the Cuban missile crisis, which contains a number of striking insights and some information that no one else had thought to look for. The results are a much more complex analysis of that event than anyone else has offered and a radically different understanding of what happened from the one most people had previously adhered to. To the extent that these considerable virtues are the direct result of Allison's reflections on the theoretical literature mentioned, they seem to be the product of his efforts to make these three paradigms as explicit as possible, enabling him to derive as much insight from the assumptions of each as he could, and to develop alternative explanations for this event, which had the heuristic effect of leading him to look for possibilities that had not occurred to analysts more nearly the prisoners of a single, and poorly articulated, set of assumptions. These are, I think, among the important benefits to be derived from explicit theory construction, and Allison's example is therefore one well worth taking seriously. (pp. 446–47)

As predicted in the reviews, Allison's approach has indeed had a substantial impact on both the study and the teaching of bureaucracy. His three models have been widely applied, and other scholars have followed his lead by developing additional models to account for aspects of policymaking left unexplained by Allison's analyses.[1] Moreover, Allison's book is still widely used in courses on bureaucracy, public administration, and organization theory. We have frequently used it in our own classes; one of us (Hammond) is alone responsible for the sale of several hundred copies to students in the past 15 years. As Holsti's review suggested, the book is so useful because it shows students how to formulate and evaluate alternative explanations for political events (1972, 137). Indeed, for courses dealing with bureaucracy and foreign policy there are few alternatives to *Essence of Decision*. Even now, over 20 years later, the book remains heavily cited by scholars in a remarkably wide range of disciplines.[2]

Allison's work did attract considerable critical attention from the outset (e.g., Art 1973; Ball 1974; Bobrow 1972; Caldwell 1977; Cornford 1974; Freedman 1976; Krasner 1972; Perlmutter 1974; and Yanarella 1975). Even those praising the book (e.g., Holsti 1972; Rourke 1972; and Wagner 1974) also expressed reservations. However, none of these early criticisms comprehensively examined the internal logic of all three of Allison's models, and it is precisely the logical structure of his work that is particularly beginning to show its age.

With the advantage of two decades of hindsight, much more is known about the properties of models of bureaucracy and policymaking. It is now clear that alternative versions of Allison's models could and should be developed to highlight somewhat more fundamental factors in policymaking. Since Allison's work still has wide currency in our discipline, the

time is ripe for a critical analysis of his models and arguments.

We make five arguments about Allison's work. First, while a key purpose of modeling is to force the analyst to clarify the assumptions on which the analysis will be based, it is often difficult to determine for Allison's models just what the assumptions are. If one cannot determine what is driving a model, its explanatory power cannot be accurately assessed. Second, the hypotheses drawn from a model should, ideally, be logically derived from the initial assumptions. But many of Allison's hypotheses seem, at best, only loosely related to the models' initial assumptions. Third, whatever the logical status of Allison's propositions (are they rigorously derived from his assumptions, or are they freestanding conjectures?), it is possible to demonstrate, on strictly logical grounds, that several key propositions in Model II are simply incorrect.

Fourth, a well-crafted model must strike a balance between simplicity and complexity. Too simple a model misses key aspects of the problem one is trying to understand; too complex a model is analytically intractable and yields few testable hypotheses. Of course, what is too simple and what is too complex is partly a matter of what analytical technology is available. Nonetheless, even given what was available 20 years ago, we think that it is fair to say that Allison's Model I is (and was) much too simple. On the other hand, we will also argue that Model III is, in some ways, too complex. Finally, Allison's Models I, II, and III are based on three bodies of literature (rational choice theory, organization theory, and bureaucratic politics, respectively) that only specialists in these fields know well. Specialists in other fields, such as foreign policy making, have often used *Essence of Decision* as an introduction and guide to these literatures. Unfortunately, Allison misinterpreted parts of each of these three fields. In some cases, the misinterpretations were, in our judgment, quite substantial. Thus, unsuspecting readers may be led into a double error—believing that the models are better constructed than they are and that they accurately reflect the literatures on which they are based.

We examine the various sets of assumptions on which the models are based. These sets of assumptions will be used to develop a typology of policymaking models, thus providing a context for analyzing the models in *Essence of Decision*. We then probe the logic of the three models and conclude by discussing some further implications of our arguments.

We should emphasize that our general purpose here is to examine the *theoretical* aspects of Allison's work. There is, to be sure, a large and growing empirical literature on the Cuban missile crisis. Some of this literature is quite new, drawing on evidence only recently made available to the public (see Allyn, Blight, and Welch 1989/90; Blight, Nye, and Welch 1987; Bouchard 1991, ch. 4; Brugioni 1991; Garthoff 1988, 1989; Hampson 1984/85; Lukas 1987; Trachtenberg 1985; and Welch and Blight 1987/88). But for the most part, we will not address empirical issues raised by Allison's analysis.

A TYPOLOGY OF MODELS

Before plunging into a detailed analysis of Allison's three models, it is advisable to distinguish one from another by defining their key properties. As several early critics of Allison's work noted, however, this is more difficult than one might think (see, e.g., Cornford 1974, 241; Wagner 1974). It seemed particularly difficult to disentangle Models II and III, Wagner arguing that "it is not entirely clear whether Model III is independent of Model II or an extension of it; certainly bureaucratic bargaining seems to be constrained by many of the factors discussed under Model II, and many of Allison's readers seem to mingle the two together in speaking of the lessons of his book" (1974, 448). Hence, we will begin by asking a very general and deceptively simple question about Allison's three models: On what assumptions is each one based?

Four different kinds of assumptions appear to be important, and they lead to a typology of models of policymaking useful for characterizing Allison's three models. The first class of assumptions concerns the number of actors. The classical approach to the study of international relations postulates that the government of a sovereign state behaves as if it were a unitary actor. Allison's contrasting approach, exemplified by his Models II and III, is to decompose the government into multiple actors. Note, however, that a shift to multiple actors immediately requires specification of whether the multiple actors have the same or conflicting goals. Very different models—and very different understandings of policymaking—follow from different assumptions here. Though Allison is less explicit here than he might be, he appears to assume in both Models II and II that the actors' goals are in conflict. But even if actors have the same objectives, this does not mean that policymaking is a trivial problem. As any student of bureaucracy knows, even when there is no serious conflict over goals, coordinating the actions of a large number of executive branch actors is no easy task. Thus, a model could logically—and quite meaningfully—stipulate multiple actors whose objectives are the same. Hence, when we consider the number of actors posited by a model, a second type of assumption, namely, whether or not the actors' goals are the same, is necessarily involved. If a central goal of *Essence of Decision* is to understand the relative virtues of government-as-single-actor versus government-as-multiple-actors models, the results of the comparison will be misleading if this second kind of variable is neglected.

The third class of assumptions concerns the degree of rationality attributed to decision makers. As Allison stresses, the classical approach assumed that decision makers are rational. In contrast, students of behavioral organization theory like Herbert Simon

Figure 1

A Typology of Policymaking

	DECISIONMAKERS ARE: Perfectly rational		Imperfectly rational	
Single Decisionmaker	1a complete information	1b incomplete information	2a complete information	2b incomplete information
Many Decisionmakers, same goals	3a complete information	3b incomplete information	4a complete information	4b incomplete information
Many Decisionmakers, conflicting goals	5a complete information	5b incomplete information	6a complete information	6b incomplete information

and James March, as well as political psychologists like Robert Jervis and John Steinbruner, maintain that all agents have limits to their cognitive capacities. Though there is a continuum of possibilities here, we can simplify by dichotomizing. A model could stipulate either that agents are perfectly or imperfectly rational.

Finally, a model may assume that decision makers are perfectly rational yet also postulate that they are imperfectly informed, either about which outcomes will occur (prospective uncertainty) or about what has already transpired (retrospective uncertainty).[3] It seems intuitively obvious—and here explicit theorizing supports intuition—that either informational problem can strongly affect the predictions of models. Thus, the fourth kind of assumption concerns the amount of information attributed to decision makers. We simplify by assuming that with "complete information" there is neither retrospective nor prospective uncertainty. Thus, all players know the structure of the game (including payoffs), who has done what in the past, and the outcome that will result from any set of moves. With "incomplete information" there can be either retrospective or prospective uncertainty, or both.

These four classes of assumptions can be combined to yield the typology of models in Figure 1. The typology will help us identify various possible models of the policy process. To serve this purpose, a typology's categories should be mutually exclusive (overlapping categories make identification uncertain) and collectively exhaustive, so that any candidate can be "typed" as an instance of some class. A quick inspection of this typology reveals that the cells are indeed mutually exclusive and collectively exhaustive.

With this typology we can now attempt to characterize Allison's three models. Model I, the rational actor model, clearly belongs in cell 1. Indeed, the overwhelming bulk of Allison's discussion in *Essence of Decision* suggests placement in cell 1a, with its assumption of a single, perfectly rational actor with complete information. We will soon argue, however, that the complete information assumption neglects what international relations theorists have identified as a central aspect of their field, namely, actors' pervasive uncertainty about the capabilities, motives, and actions of others. Considerable insight, in other words, is to be gained by extending Model I into cell 1b, the realm of incomplete information. Further insight into the workings of single-actor models could be obtained by relaxing the assumption of perfect rationality, thus moving into cell 2. As examples we might cite psychological analyses of individual bounded rationality in foreign policy decision making (e.g., George 1980, chaps. 2–3; Jervis 1976).

At first glance, it might seem that Model II, the organizational process model, belongs in cell 4b. After all, boundedly rational actors, facing uncertain environments and using simple adaptive strategies, are the heart of this model. However, at several places in his discussion of Model II Allison mentions conflicting goals. For example, he refers to "parochial priorities," the "quasi-resolution of conflict," and organizational "imperialism" (1971, 81–82, 93). He even refers to agenda manipulation: "The short list of alternatives [generated by an organization] reflects not only the cost of alternative generation but, more important, each organization's interest in controlling, rather than presenting, choices—for example, by serving up one real alternative framed by two extremes" (p. 90). One can also find, in his discussion

of Cyert and March (1963), references to organizations as a "coalition of participants" and "bargaining among potential coalition members" (p. 76). Thus, Model II might appear more properly to belong somewhere else, perhaps in cell 6.

As an empirical observation, an assumption of conflicting goals in an organizational process model is unassailable. For most important issues (virtually by definition of *important*), organizations and their leaders disagree about objectives. However, we do think that some interesting hypotheses—particularly about the kinds of problems involving bureaucratic coordination that Allison discusses in regard to Model II—could be generated by "withdrawing" into cell 3. This class of models is ideal for examining pure coordination problems among perfectly rational actors. Anyone who thinks that pure coordination problems are trivial should consider Schelling's examples, which only scratch the surface of coordination problems (1960, 54–58). If different members of a team observe different aspects of the environment and these environmental signals are noisy, formidable communication and division-of-labor problems typically arise.[4] Even in the context of goal consensus and perfect rationality (i.e., each agent, like a perfect Bayesian statistician, extracts the maximal amount of information from each noisy observation), there remain structural issues of who should communicate what to whom.[5] If we make the problem dynamic (e.g., involving optimal adaptation to a changing environment), the complexities multiply—even for actors with the same goals. Understanding of these particular issues is probably hindered, not helped, by construction of models involving conflicting goals.

The heart of Model III is multiple decision makers with conflicting goals—hence the third line of the typology. However, as Harrison Wagner pointed out, it is unclear whether this model assumes perfect or bounded rationality: "Model III . . . contains no discussion of behavioral assumptions at all. Yet one could presumably construct a theory of bureaucratic bargaining based on the decision theorists' assumptions, and another based on Herbert Simon's" (1974, 448).

Allison's own summary of the core of Model III (1971, 162) emphasizes bargaining and other obviously political processes as central to policymaking and deemphasizes issues involving information processing. Moreover, his discussion of power involves actors who are apparently able to make complex strategic calculations about how to maximize their influence (pp. 168–69). These actors thus seem to have the cognitive capacity usually assumed by rational choice models of policymaking, so that readers might conclude that classical rationality is presumed for Model III, leading to its placement in cell 5.[6] Moreover, since Allison explicitly states that bureaucratic politics games "are not played under conditions of perfect information" (p. 178), Model III seems to belong in cell 5b.

However, other of Allison's statements about Model III suggest a different classification. For example, Allison refers to foul-ups ("e.g., choices that are not made because they are not recognized or are raised too late, misunderstandings, etc." [pp. 145–46]); the limited attentional capacities of decision makers (pp. 176–78); and problems of misperception, misexpectation, and miscommunication (pp. 178–79). Of incrementalism in decision making, he writes "Analysis is drastically limited. Important policy outcomes are neglected. . . . By proceeding incrementally and comparing the results of each new policy with the old, actors reduce or eliminate reliance on theory" (p. 154). All these characteristics bear a strong family resemblance to the decision processes of ordinary, imperfectly rational humans.

In terms of our typology, then, Model II (which initially might seem to belong in cell 4, probably 4b) can also be classified in cell 6, perhaps even 6b. Model III, which might seem to belong somewhere in cell 5 (probably 5b) can also be classified in cell 6, perhaps even 6b. Thus, we find that Models II and III, which have different intellectual pedigrees and which Allison presumably intended to be distinct, apparently share much of the same analytical turf.

We can see at the outset, then, that our simple typology raises some serious questions about just what is driving each of Allison's models. We do believe that Allison's initial instincts were on the right track. As our typology suggests, there is room for several different classes of models, and it is an essential enterprise to assess the relative explanatory and interpretative power of models in each of these different classes. It is necessary, however, to specify much more precisely what is assumed for each of these models. For this reason, Allison's subsequent enterprise of *combining* Models II and III into one overarching *bureaucratic politics* model (see Allison and Halperin 1972) is probably a step in the wrong direction. Combining two theories before clarifying their defining properties can easily produce inconsistent claims (Landau 1972, 227). Hence, we are inclined to follow Cornford's (1974) lead in arguing that there are virtues in separating Models II and III and in clarifying their internal logic prior to synthesizing.

We close by noting that identifying a particular model as belonging, say, to cell 1a does not necessarily yield a detailed prediction about what policy outcomes to expect from the model.[7] Such an identification does have certain implications—for example, that the relevant government will not encounter surprises (by virtue of the complete information assumption) and will exhibit transitive preferences (the unitary actor and rationality assumptions). But such predictions fall well short of the kind of policy-relevant claims naturally sought by students of foreign policy. The burden of generating falsifiable predictions lies on the models, not on the typology.

ANALYSIS OF MODEL I

Allison's analysis of rational decision making is the most coherent and most easily understood of his

models. A rational actor model in international relations should have two essential components: a decision-theoretic one and a game-theoretic one. The former covers attributes of the decision maker(s), the latter, strategic interactions. We have two major points to make about Allison's rational actor model. First, the decision-theoretic component is too simple: one can easily construct a far more complex rational actor that better reflects the complexities of real decision makers and the choice situations they confront. Second, the model neglects strategic interactions.

Before examining the details of Model I, we must discuss one difficulty with analyzing Allison's treatment of the model: his tendency to distance himself from his own presentation. As he notes "Since the purpose of the Model I account is to present a strong, typical explanation, it seems fair to let the account reflect only conventional evidence plus additional facts that the Model itself would naturally uncover" (1971, 248). This raises the problem whether one should critique (1) the classical version of single-actor rational choice that scholars have traditionally used, (2) Allison's interpretation of this standard model, or (3) what Allison himself thinks this model should look like if (given its premises) one developed and applied it "properly." We are inclined to think that approach 1 or 2 best characterizes Allison's treatment; Allison never tells the reader what he thinks Model I would be like if properly developed. This matters because we think a more fully developed version of Model I would have substantially more explanatory power than Allison's Model I. For simplicity, we will treat the model as Allison's own and criticize it as such, understanding that it has a different status in Allison's thought than his Models II and III.[8]

Decision-theoretic Aspects

Model I employs two key decision-theoretic assumptions about nation–states, postulates found in most canonical formulations in international relations. First, the nation can be treated as a single actor endowed with a set of goals and the capacity for pursuing these goals. Second, this single actor pursues these goals rationally. Though it is easy to criticize the assumption that the nation is a single actor, many abstract analyses require treating an aggregation of human beings as a single unit. For some purposes such aggregation is useful and appropriate. We will, instead, focus our attention on Allison's treatment of rationality.

In common parlance and in Allison's usage, rational decision making consists of four key steps: define one's goals, list all options for achieving these goals, evaluate each option in terms of the extent to which it achieves the goals, and choose the option that best achieves the goals. As Allison points out, students of international politics and foreign policy have long used this model (if only implicitly). He demonstrates how the model might be used to make sense of three major decisions in the missile crisis: why the Soviet Union placed the missiles in Cuba in the first place, why the United States responded with a naval quarantine, and why the Soviet Union withdrew its missiles.

Allison's rational actor model is as simple a version of rational choice as one could imagine. His purpose in formulating this model was to show how something much like it underlies many different bodies of thought in international relations. But in this particular enterprise lies what we see as the model's major fault. It is *too* simple, for it omits several significant properties of rational actors and important problems they face. The model can be enriched in several different ways.

Goals. An ambiguous aspect of Model I is whether rational actors are presumed to have just one goal. Before explicating the model, Allison notes that the Model I theorist "presents an argument for *one objective* that permits interpretation of the details of Soviet behavior as a value-maximizing choice" (1971, 11; emphasis added). Later he discusses how this analyst "produced an argument for *one goal* (rectifying the nuclear balance) that made the Soviet emplacement plausible" and "proceeded as if his assignment had been: make a powerful argument *for one objective* that permits the reader to see how, given the strategic problem, if he had been playing the Soviet hand, he would have chosen that action" (pp. 246, 253; emphasis added). And in applying Model I to the Soviets' decision to install the missiles, Allison's discussion appears largely oriented toward inferring which *one* of the five possible goals best explained the Soviets' decision. For example, in ending his discussion of Cuban defense as a possible motive, he concludes, "Cuban defense might have been a subsidiary effect of the Soviet gamble, but not its overriding objective" (p. 50).

Yet in discussing the international relations theorists Hans Morgenthau and Raymond Aron, Allison notes in particular, "Criticizing the attempts of theorists such as Morgenthau to explain national action by reference to a single goal, Aron argues that governments pursue a spectrum of goals, tempered by 'the risk of war [that] obliges [them] to calculate forces or means' " (1971, 27). And in his presentation of Model I, Allison seemingly allows the possibility that a rational actor might have multiple goals: "National security and national interests are the principal categories in which strategic goals are conceived. Nations seek security and a range of other objectives" (p. 33).

Although Allison does not explicitly discuss this matter of multiple goals, it raises important issues in understanding and applying Model I. Nothing whatsoever in the theory of rational action requires an actor to have just one goal. This is a significant feature of the theory, for empirically, an actor with only one goal is odd indeed. In fact, we normally use the term *monomaniacal* to refer to the *irrationality* of people motivated by only one objective. Typically, we expect rational actors to have multiple goals. Indeed, nothing in the axioms of rational action states

that it is nonsensical to harbor multiple goals. The goals may conflict. But in a rational choice model a utility function is postulated to resolve all *intra*personal conflict.[9] Thus, rationality lies in the considered and consistent pursuit of whatever goals one happens to have.

We can support our arguments by reference to the Soviet Union's possible motives for placing nuclear missiles in Cuba. Presumably there was, as Allison concluded, a strong concern for the strategic balance. The recent U.S.–Soviet conferences tend to bear this out (Blight and Welch 1989). However, it is not unreasonable to think that the Soviets were also concerned about defending Cuba. The Bay of Pigs invasion had given the Soviets (and the Cubans) cause for concern. Moreover, the Kremlin would have been pleased if placing missiles in Cuba would have diminished the prestige of the United States in the eyes of West Europeans and nonaligned countries.

The Soviets' concern for the strategic balance may well have been of overriding importance; other concerns may have been of negligible significance in their minds. Nonetheless, it is reasonable to think that the Soviets would have been less inclined to place the missiles in Cuba if this action would have clearly *impaired* these other goals. Thus, these other goals cannot be considered irrelevant to an understanding of the Soviets' motives and choices.

For each of these other goals, Allison may be correct in arguing that there was some other action better than placing nuclear missiles in Cuba. However, the bare fact that the chosen action is not *optimal* for the other goals (such as defending Cuba) does not imply that these other goals were completely irrelevant to the decision.

Time. Allison's rational actor model is characterized by a single-time-period orientation. Thus, the rational actor considers a problem occurring at a point in time; and once an alternative is chosen and implemented, the matter is over. Allison himself mentions this feature as a limitation of the model, labeling it "static selection."

One might argue that a single-time-period model is appropriate for crises. However, even in a crisis, the effects of options may be spread over multiple time periods. Consider, for example, President Kennedy's concern for the United States' international reputation for firmness and resolve: such reputational consequences may endure for years. Thus, in estimating the effects of any option, a rational agent must aggregate, into a single measure, costs and benefits that may be spread over a long time. Aggregating streams of costs and benefits is a rather different kind of choice problem than aggregating costs and benefits that all occur at the same time.

Incorporating multiple time periods in a model of rational choice leads directly to the issue of time preferences. Is the rational actor patient, valuing distant benefits nearly as much as current ones, or impatient, sharply discounting benefits that are enjoyed long after the moment of choice? Note that actors with identical goals but different time preferences would value the same option differently, due to their different degrees of impatience.

Uncertainty. Allison's rational actor model also ignores the problem of uncertainty. While Allison obliquely considers uncertainty in his discussion of Model II, the problem is completely neglected in Model I. This is a striking omission, since the traditional literature in international relations, which Allison cites as having implicitly used rational actor models for centuries, emphasizes how a state's uncertainty about other states' goals and capabilities shapes its own choices.

There do exist formal models of rational choice that show how an actor should make optimal choices under uncertainty. Some of these models were formulated well before Allison conducted his study. (Indeed, he cites relevant texts on statistical decision theory and game theory [1971, 285, n. 87].) Thus, several different types of uncertainty were analyzed and well understood by rational choice theorists before Allison's article or book was written. One kind of uncertainty that was well understood was a nonstrategic, prospective type, involving exogenous and unpredictable acts of nature. Though probably less important than the strategic aspects considered below, they were not irrelevant in the Cuban missile crisis. Bad weather, for example, would have made a surgical air strike more difficult. Unexpected equipment problems, such as those that plagued U.S. helicopters in the aborted Iranian hostage operation, also fall under the domain of statistical decision theory. No rational military planner would assume that all his equipment will work with certainty. And these problems can be sensibly addressed within the confines of the single-actor assumption. Indeed, statistical decision theory classically developed under this assumption, as did the related probabilistic methods in operations research.[10]

Observe that just as introducing multiple time periods raises the issue of decision makers' time preference, introducing uncertainty raises the issue of decision makers' attitudes toward risk. Whether they are risk-averse, risk-neutral, or risk-seeking must be specified in order to complete a rational actor analysis. However, it must be recognized that these issues, though analyzed in more recent international relations theories (e.g., Bueno de Mesquita 1981, 1985), were not salient in rational choice theorizing in political science prior to *Essence of Decision*.

In addition to uncertainty about states of nature, it is empirically clear that U.S. decision makers were very uncertain about the Soviets' motives for placing missiles in Cuba. Allison himself pointed up this problem, describing the markedly different U.S. interpretations of Soviet behavior (1971, 40–56).[11] These interpretations placed the Cuban adventure in the context of larger Soviet strategies, and the magnitudes of these strategies' payoffs were hotly debated by U.S. policymakers.

However, game theory was poorly equipped to address this kind of uncertainty when Allison wrote *Essence of Decision*, and one's evaluation of the book must take this history into account. But over the last dozen years, much of the frontier work in game theory *has* addressed the issues of incomplete information about another player's preferences and imperfect information about a player's past actions. Moreover, this kind of analysis has diffused into formal models of foreign policy crises (Morrow 1989; Powell 1990; Wagner 1989). In this respect, therefore, Allison's rational actor model is seriously out of date.

Game-theoretic Aspects

In international relations, the prime motivation for the unitary rational actor assumption is to conserve the intellectual resources of scholars and to focus these resources on analyzing the strategic relations among nations. It is therefore a surprising and serious omission that Model I does not explicitly examine how other nations might react to a state's moves.

To be sure, Allison's description of the U.S. decision to institute a naval quarantine is replete with references to possible reactions by the Soviets. This, however, is in chapter 2, where he *applies* Model I to the crisis. In chapter 1, where the model itself is presented, there is relatively little in his informal analysis—and nothing in his rational actor model—describing how a rational actor should think through the possible countermoves that an adversary might take in response to the first actor's moves.

Indeed, in chapter 1 Allison persistently blurs the distinction between decision theory and game theory. Under the head "A Rigorous Model of Action," presenting the analytical core of Model I, he writes: "In modern statistical decision theory and game theory, the rational decision problem is reduced to a simple matter of selecting among a set of given alternatives, each of which has a given set of consequences: the agent selects the alternative whose consequences are preferred in terms of the agent's utility function which ranks each set of consequences in order of preference" (1971, 29). And in several other places he refers to the basic "value-maximizing" postulate of Model I (pp. 30–31, 34, 36).

It is true, of course, that a basic premise of decision theory is that actors maximize utility or (in risky circumstances) expected utility. The idea of choosing the alternative that the decision maker prefers above all others makes sense when that decision maker is isolated from all other people. These are the so-called Robinson Crusoe problems (Tsebelis 1989). But clearly, most of the important choices in the Cuban missile crisis were made in a strategic setting—outcomes depended on the behavior of both governments, thus intertwining the fates of the two nations. The relevant branch of rational choice theory for such situations is game theory, not decision theory. And in the branch of game theory that is most relevant to the anarchic context of international politics (noncooperative game theory, which assumes that players cannot make binding agreements), actors are not presumed to maximize utility in any simple, decision-theoretic sense.

Figure 2

The Prisoner's Dilemma

		Player 2: Cooperate	Player 2: Defect
Player 1	Cooperate	R, R	S, T
Player 1	Defect	T, S	P, P

Prisoner's Dilemma Assumption: T>R>P>S

The fundamental prediction of noncooperative game theory is that the outcome of a strategic interaction will be a Nash equilibrium, defined as follows: Given the choice of player 2, player 1 is doing as well as possible; and given the choice of player 1, player 2 is doing as well as possible. Yet the idea of a Nash equilibrium is never mentioned in *Essence of Decision*. The analysis is purely in terms of the value-maximizing choice of an isolated decision maker (1971, 29–31, 34, 36), and there are several important reasons why the outcome of a Nash equilibrium may not be transparently linked to value maximization. We consider three of these.

Games with Undesirable Equilibria. First, *all* the players in a game may dislike the outcome of a particular Nash equilibrium. This can happen not only in a subjective sense (both parties prefer the whole loaf to the half each agreed to take) but in a stronger, objective sense. A Nash equilibrium can be Pareto inferior, that is, there may exist another (feasible) outcome that *both* players prefer to the Nash equilibrium.

This point is particularly important in games where the Nash equilibria are deficient by the Pareto criterion. The outstanding example of this type of game is, of course, the prisoner's dilemma (Figure 2). If this game is played only once, the only Nash equilibrium is the Pareto inferior outcome of (P, P). In such a situation there is no transparent connection between each player's preference ordering $(T > R > P > S)$ and the outcome. Not only is the outcome of mutual defection ranked third by each player, but *both* players prefer the payoff deriving from mutual cooperation.

Games with Multiple Equilibria. Second, in many situations it is impossible for both actors to get their most preferred outcomes, even if the Nash equilibria are Pareto optimal. A well-known example of this in international relations is the game of chicken (Figure

Figure 3

A Game of Chicken

		Player 2: concede	Player 2: aggress
Player 1	concede	0, 0	-3, 8
Player 1	aggress	8, -3	-10, -10

Figure 4

A Game with a Mixed Strategy Equilibrium

		USSR: Put missiles in Cuba	USSR: Do Not Put Missiles in Cuba
U.S.	Intensive Inspection	1, -1	-1, 1
U.S.	Casual Inspection	-1, 2	2, 0

3). There are two Nash equilibria in chicken: (*aggress, concede*) and (*concede, aggress*). In the first outcome, player 1 gets its most preferred outcome, and player 2 is stuck with its third best. In the second equilibrium, matters are reversed. The presence of these two equilibria, with their markedly different payoffs, points up another important difference between decision- and game-theoretic analyses. If there is only a single decision maker, then there is either a unique alternative that is value-maximizing or several alternatives. Neither case presents a problem; for even if there are several such alternatives, they must by definition yield the same payoff and are therefore equivalent. But in a multiperson situation, the equilibria need not be equivalent; they can differ sharply in both relative and absolute senses. Accordingly, the players in chicken are not indifferent between the two equilibria.

Hence, once again, there is no simple relation between the game-theoretic notion of equilibrium outcomes and the decision-theoretic idea of value maximization. It is true that *if* player 1 aggresses, player 2's value-maximizing choice is to concede. But player 2 would itself be better off aggressing—so long as player 1 concedes. Thus, contrary to Allison's claim that "in modern statistical decision theory and game theory, the rational decision problem is reduced to a *simple matter* of selecting among a set of given alternatives" (1971, 29; emphasis added), chicken exhibits an intricate strategic structure. Indeed, due to its complexity—the potential for mutual disaster if each side tries to get its maximal payoff or mutual accomodation if both sides try to avert disaster—predicting the outcome of chicken is by no means trivial. *Any* of the four outcomes could plausibly occur. Whether this is a defect of game theory in not making a falsifiable claim for this game or an indeterminacy inherent in the situation, we cannot say. What we can say is that just assuming rationality does not, in itself, reduce the decision problem to a "simple matter."

In our experience teaching models of politics, most students begin a course believing that preferences and outcomes are tightly linked in rational choice models and that the paradigmatic rational choice answer to the question, "Why did this outcome occur?" has the form, "Because actor so-and-so wanted it."[12] Such explanations do not come close to tapping the potential of rational choice analyses. They completely overlook the complexities arising both from strategic interaction and from the institutional context of the game. Indeed, by slighting such complexities, these uses of rational choice theories *degrade* their value; much of the intellectual benefit of rational choice analyses is that by black-boxing inner mental processes, we can concentrate our attention on relations among decision makers.

Endogenous Uncertainty in Games of Complete Information. The preceding remarks about the game of chicken informally suggest that game theory might view some interactions as being fundamentally indeterminate. We will now sharpen this point. It has been well known for decades that uncertainty can arise *endogenously* in strategic situations. To illustrate the point squarely in the matter at hand, consider the representation of one aspect of the Cuban missile crisis (Figure 4).

In the situation shown in Figure 4, if the United States carries out intense inspections, the USSR would prefer not to put the missiles in Cuba ($1 > -1$). However, if the USSR holds back, then the United States would rather not incur the cost of intense inspections ($2 > -1$). But if the United States conducts only cursory inspections, then the USSR does want to install the missiles ($1 > 0$). This, however, takes us full circle, since if the USSR is going to install the missiles, the United States wants to inspect closely ($1 > -1$). Hence, in this kind of situation, there is no equilibrium in pure strategies; but there is an equilibrium if each player uses mixed strategies, that is, plays probabilistically.[13] Thus, uncertainty will arise endogenously from the strategic logic of the situation. The only equilibrium in this circumstance is where each side keeps the other guessing about its course of action, just as in the child's game of stone–scissors–paper.[14]

It is evident, therefore, that strategic uncertainty was relevant in the crisis and that some theoretical tools were available to aid analysis. (For a recent

analysis of the Cuban missile crisis using a model of strategic uncertainty, see Wagner 1989.)

Many readers of *Essence of Decision*, we suspect, conclude that models of states as unitary rational actors provide an inadequate account of this crisis. Such a conclusion is not well founded. Allison's version of a rational action explanation is so oversimplified that it should not have been *expected* to perform well.

ANALYSIS OF MODEL II

Allison's discussion of Model II is one of his strongest sections. He extracts several insights from organization theory and applies them to the missile crisis in interesting ways. For example, though the Soviets may have had sound engineering reasons for building the missile sites in their characteristic pattern, Model II suggests an interesting alternative explanation—it was simply a bureaucratic routine being enacted. In the study of foreign policy making and implementation, Allison's chapters on bureaucratic routines were pioneering efforts.

Nonetheless, we have some reservations about his analysis. The core of Model II is the idea, developed by Herbert Simon and James March, that individual decision makers are boundedly rational (see Allison 1971, 71). We have two main concerns with Allison's interpretation of this theoretical core. First, Model II assumes that imperfectly rational agents would usually use simple decision rules (p. 83). In itself, this assumption is consistent with much of the writing of the Carnegie School.[15] But Model II goes beyond this premise by suggesting that these simple rules, or *standard operating procedures*, sharply limit and constrain *behavior*, that is, that simple rules generate simple, predictable behavior (pp. 78–79, 83, 87–91). We believe that this conclusion greatly underestimates how complex behavior—of even a single decision maker—can arise out of the use of simple rules. Second, suppose we grant that *individual* decision makers are sharply constrained in their cognitive abilities. What does this premise imply about how constrained *organizations* are? Consistent with the viewpoint of Simon's *Administrative Behavior*, we argue that organizations can significantly ease the constraints on information processing that confront individuals (1947, 79–80). Taking these two points together, our position is that the use of simple decision rules by individual decision makers does not imply that the behavior of an organization will be simple, unsophisticated, or predictable. Thus, we agree with March and Simon, who argue that "complex processes can be aggregated from simple elements" (1958, 178).

Decision Rules Versus Behavior

Allison's basic image of organizations in Model II is that of simple, predictable behavior generated by simple rules:

> Major lines of organizational action are straight—i.e., behavior at one time, t, is marginally different from behavior at $t - 1$. Simple-minded predictions work best: behavior at $t + 1$ will be marginally different from behavior at the present time.
>
> The preeminent feature of organizational activity is its programmed character: the extent to which behavior in any particular case is an enactment of preestablished routines.
>
> The fact that the fixed programs (equipment, men, and routines that exist at the particular time) exhaust the range of buttons that leaders can push is not always perceived by these leaders. (1971, pp. 91, 81, and 79, respectively)

This image resonates strongly with our intuitive conceptions. We are all familiar with the stereotype of an inertial bureaucracy mindlessly following its procedures regardless of consequences. As with many popular images, this one is not completely wrong—far from it. The picture of simple, rule-governed action provides important insights into organizational behavior. However, precisely because the image is so intuitive, we must be careful. Familiarity in model building breeds laziness, if not contempt. The notion that simple rules generate simple behavior is so commonsensical that it is easy not to question it. Yet the link between rules and behavior is more subtle than is captured by either Model II or its associated popular image. Complex behavior *can* emerge from simple rules. We now describe six ways this can happen.

Varying, and Possibly Stochastic, Inputs. Many choice rules work on inputs—information, people, objects—that vary significantly. This variability, in tandem with even a simple rule, can produce complex behavior. A good example of this is the behavior of one of the simplest strategies in the prisoner's dilemma, Tit for Tat (TFT). This strategy—cooperate on the first round and thereafter play what one's partner did on the previous round—is only a tad more complicated than the *simplest possible* rules (always cooperate or always defect (all-D)). However, whereas those unconditional strategies generate behavior as simple as themselves (regardless of their strategic environment), in variegated environments TFT will behave in correspondingly complex ways. Against all-D, TFT cooperates once and never again; against a nice partner TFT cooperates forever; against a sneaky nasty strategy, TFT will cooperate as long as its partner does, retaliating against a defection but then returning to cooperation if its sneaky partner apologizes. Moreover, if the environment is noisy (unobserved random disturbances affect the players' payoffs), TFT produces variable behavior even when playing an equally simple strategy—itself (Bendor 1987).

Because simple rules can be activated by random shocks in an organization's environment, its behavior can be, in a certain sense, surprising, as well as complex. For example, disaster relief could be highly routinized and preprogrammed, but the organiza-

tion's behavior would not be *unconditionally* predictable. For these organizations, it need not be true that the best predictor of the organization's behavior at time t is its behavior at $t - 1$.[16]

Recursive Rules. Many public agencies seem to follow a simple history-dependent rule of the form, decision $t + 1 = f$(decision t). Such rules are called *recursive*. To figure out what the decision will be in period $t + k$, in terms of the decision made in period t, one just reapplies the rule $f(\cdot)$ over and over again. Thus, decision $t + 2 = f$(decision $t + 1$) $= f[f$(decision t)], and so on. Do such recursive choice rules always generate simple behavior? They do not. Interesting developments over the last 10 years in a field of mathematics known as *chaos theory* have shown that if a recursive rule is nonlinear, it can create a pattern that is so complex as to appear random, even though the rule itself is completely deterministic. For example, consider the simple recursive rule $x_{i+1} = k \cdot x_i(1 - x_i)$, where k is a constant between 0 and 4. Let the initial value x_1 be between 0 and 1. How will x behave over time? It turns out that if k is close to 4, the behavior of x is "chaotic," wandering all over the [0, 1] interval and never settling down. For example, let $k = 3.7$ and $x_1 = .4$. Then the next 10 values of x_i (rounded to four places) are .888, .368, .8605, .4441, .9134, .2926, .7658, .6636, .8259, and .5319.

Merely inspecting these values of x_i, one would probably attribute them to a stochastic process. Yet the underlying equation is not only deterministic but also very simple, being only one degree higher than linear. Moreover, it is not a historically rich rule, for it depends only on the decision in the previous period. Real precedent-governed agencies have a much more complex memory structure.

Simple Linear (Though Probabilistic) Rules. Since Model II repeatedly refers to the linear nature of organizational behavior, one may object to the previous example because it is nonlinear. We respond in two ways. First, linearity is an empirical hypothesis; we have no a priori guarantee that organizations typically behave linearly. Second, we now demonstrate, via another example, that behavior can be surprisingly complex even if linearity is retained.

Consider the following model of experiential learning. Suppose an administrator has two options, x and y, and knows that neither one is sure to work or doomed to fail. Objectively, the probability that x succeeds is p, the chance that y works is q, where $0 < q < p < 1$. (They need not sum to one.) These probabilities are constant and independent over time. In the first period, the decision maker has a propensity to try x denoted $p_1(x)$ and a propensity to try y denoted $p_1(y) = 1 - p_1(x)$. Over time, the administrator adapts via a simple learning rule. If in period i x was tried successfully, the administrator's propensity to try x again is strengthened:

$$p_{i+1}(x) = p_i(x) + a[1 - p_i(x)].$$

The parameter a represents the rate of learning and is between 0 and 1. If x failed, the administrator's propensity to try it weakens: $p_{i+1}(x) = bp_i(x)$, with b also between 0 and 1. The equations for alternative y have the same form. Note that these equations are linear.

However, whereas an expected utility maximizer will behave simply in the long run—choosing x always—a decision maker using this linear adaptive rule will never settle down on either alternative. Instead, the adaptive decision maker will use alternative x in the long run $(1 - q)/[(1 - p) + (1 - q)]$ proportion of the time and y the remainder. Thus, the simple linear adaptive rule produces more complex behavior than does the optimal strategy.

Combinatorial Effects. Several times in *Essence of Decision*, Allison uses the metaphor of chess when discussing how leaders are constrained in their choice of options. This is odd, because chess is the paradigmatic example of a choice situation that involves only a handful of basic rules yet exhibits truly Byzantine strategic complexity. There are only six distinct pieces in chess; each moves in only a few ways. (We may consider each piece, with its legal moves, as equivalent to a standard operating procedure.) Therefore, each player is "limited" to shuffling and reshuffling this combination of standard operating procedures over the 64 possible locations.

But the quantitative impression thereby conveyed, namely, that the limited number of procedures creates a roughly equal (even in respect to order-of-magnitude) number of moves is grotesquely inaccurate. As is well known and as Allison himself noted, the number of possible sequences of play (i.e., behavior) in chess is staggeringly large (1971, 286, n. 93). A common estimate is 10^{120}, a number so large as to be equivalent, for all practical purposes, to infinity. Human beings can never exhaust the richness of chess. This is pure combinatorial explosion: the rules are deterministic. Nor does the complexity depend upon stochastic inputs. It is simply a matter of stringing together the handful of rules to generate new positions, whence one reapplies the basic rules, and so on. The example of chess suggests that our intuitions grossly underestimate combinatorial complexity.

Moreover, when we compare chess to the strategic maneuverings of two real military forces (to return to *Essence of Decision*'s empirical domain), the odds are good that chess is *simpler*. No matter how one counts distinct "pieces" in, say, a navy, there are surely more than seven! No matter how crudely one wants to count the basic standard operating procedures of, say, a destroyer, it has more than the handful available to even the most complex chess piece. And the "board" of any moderately large battle is more variegated than the (nontopographical) eight-by-eight chessboard. Therefore, chess, the paradigmatic choice environment of behavioral decision theory, provides a *lower bound* for the complexity of behavior one would expect to see in a clash between two governments. Thus, in this instance *Essence of Deci-*

sion seriously misapplied the lessons of the Carnegie School.

Hierarchies of Procedures. In a sense the linking of procedures into a larger unit (creating a "program," in Allison's terminology) is just a type of combinatorial complexity. In this sense the remarks just made apply. However, hierarchies of rules create another way for complex behavior to arise from simple rules. Suppose the Department of Defense used the simple budgeting rule, "Every year we allocate 10% of our budget to research and development." Naturally, this rule would be accompanied by a host of procedures concerning for example, how the designs of weapon systems should be specified. For our purpose, we focus on the relation between this one rule and consequent behavior.[17]

Again, the rule's simplicity is deceptive. The allocation of a portion of the Defense Department's resources to research and development has created a historically unprecedented number of new weapons, introduced at an equally unprecedented rate. Each new weapon is accompanied by its own standard operating procedures, as well as the procedures "frozen into" the hardware itself. Thus simple high-order rules can generate new lower-order ones. (For a discussion of this point, see March and Simon 1958, 150, 170.)

Large Sets of Rules. Our first three points showed how a single rule could produce complex behavior. The next two points showed how a few simple elemental rules could aggregate into complex behavior. Here we wish to underscore an obvious empirical point: even if we set aside combinatorial complexity, some agencies have a great many rules. Consider the Internal Revenue Service code. The gradual, barnaclelike accumulation of exemption piled upon exemption, modification upon modification, has created a code of rules that is awesomely complex.

Very large sets of rules create problems for scholars, as well as citizens. An observer may find it difficult to predict organizational behavior because of not knowing *which* rule will be evoked out of the set of all possible rules. There are two related reasons for this. First, large sets of rules increase the possibility that two or more rules may conflict: more than one rule will apply to any one situation, and it will be unclear which has priority. Second, though many organizational rules have an *if/then* structure like computer programs ("If condition x obtains, apply procedure y"), the conditional part of the rule—the description of condition x—is often much less precise than in computer programs. This also makes it more difficult to predict which rule will be evoked.

The classic illustration of both problems—conflicting rules and imprecise conditionals—is the legal system. If one regards the judiciary as an organizational system, the model of rule-governed behavior seems apt. A judge's behavior is, after all, supposed to be informed by legal rules. But even knowing the whole set of rules that could guide the judge's decision may not enable one to predict behavior, because one does not know *which* of the many legal precedents the judge will select. Again, behavior is unpredictable despite the stable set of rules. The test is not, Did the decision follow from an organizational rule? The test is, Could one have *predicted* which organizational rule would be evoked?

It should be understood that we are not here advancing empirical hypotheses. We are not asserting that any particular set of officials or agencies use any of the rules described in our first five points. Our argument is theoretical. The relation, implicitly assumed by Model II, between simple rules and simple behavior is weaker than one might think. The examples illustrate that rules can generate relatively complex behavior even when the rule is deterministic (points 1 and 2) or linear (point 3) or the game is isolated from stochastic shocks (point 4). Accordingly, the suspicion grows that simple rules will produce simple organizational behavior only if (1) the rules are deterministic *and* (2) the rules are linear *and* (3) the game is isolated from stochastic shocks *and* (4) individual choice rules are not aggregated in a combinatorially rich way *and* (5) individual choice rules are not grouped hierarchically so that higher-level rules generate new lower-order ones (and new ensuing behavior). These conjunctions indicate a shrinking of the parametric space in which the postulated simple behavior will occur. In terms of our prior beliefs about bureaucratic behavior, one may feel confident in asserting, say, that individual choice rules are linear, or that they are deterministic, or the like. But would many scholars in this field confidently assert all five conditions? We doubt it.

Bounded Rationality: Individual and Organizational

A second problem of Model II concerns the relation between individual and organizational constraints on rationality. Organization theorists have often moved "rather cavalierly from theories of individual cognition and choice to theories of organizational cognition and choice" (March and Shapira 1982, 11). This tradition has sometimes been carried to the point of anthropomorphizing organizations, positing that organizational constraints on information processing simply mirror individual constraints.

This quick passage from individual to organizational limits on rationality is evident in *Essence of Decision*: "Simon and the Carnegie School focus on the bounded character of human capabilities. Firms are physically unable to possess full information, generate all alternatives" (Allison 1971, 174). Again, "The physical and psychological limits of man's capacity as alternative generator, information processor, and problem solver constrain the decision-making processes of individuals and organizations" (p. 71).[18]

Undoubtedly the bounded rationality of single de-

cision makers constrains the information-processing capacities of agencies in some fashion. However, we maintain that the relation between the two is more complex than is portrayed by either Model II, in particular, or much of organization theory, more generally. For normative reasons—and because the literature has focused heavily on the tendency of institutions to be dumber than their members (via, e.g., conformity pressures)—we are especially interested in how organizations can be *smarter* than the individuals who compose them. We therefore consider three reasons why organizations can process information more effectively than individuals can.

From Serial to Parallel Information Processing. In a neglected passage of *Organizations*, March and Simon note an important difference between individual and collective cognition: "The individual possesses only a single focus of attention, hence can only deal with one aspect of the problem at a time. In organizations, however, there is no limit to the number of attention centers that can be allocated to the parts of a problem" (1958, 193). They go on to note the advantages of parallel processing. Clearly, if one large problem can be decomposed into many subproblems, an agency can greatly speed up its information processing by assigning a different official to each subproblem.[19] Of course, there is no guarantee that any given division of labor will be an effective decomposition. The trick, as many students of organizational design have noted, is to figure out a scheme of specialization that "carves nature at the joints" (see Gulick 1937; March and Simon 1958; Simon 1947; Simon, Smithburg, and Thompson 1950). When this can be done, the serial constraint can be substantially eased.

This organizational advantage is obvious. Just mentioning the phrase, *division of labor*, helps us recognize an organization's advantage over an individual. In the simplest model of problem decomposition (an additive one) information processing is essentially the same as performing a physical task, like Frederick Taylor's ([1911] 1947) pig iron loading. Obviously, the more people, the more pig iron is loaded or the faster information is processed. Otherwise, why bother to hire the additional people? Yet in the organizational decision theory literature, this obvious point is sometimes overlooked.

A second, more subtle advantage of specialization is that it enables decision makers to become experts in their domains. Becoming an expert means relying less on ordinary folk heuristics, with their attendant biases and more on scientifically based inferences, with their lower rates of error (Hogarth 1987; Nisbett and Ross 1980). As Nisbett and Ross replied to a colleague who, having read a draft of *Human Inference*, asked, "If we're so dumb, how come we made it to the moon?"—

> Humans did not "make it to the moon" by trusting the availability and representativeness heuristics or by relying on the vagaries of informal data collection and interpretation. On the contrary, these triumphs were achieved by the use of formal research methodology and normative principles of scientific inference. Furthermore. . ., no single person could have solved all the problems involved in such necessarily collective efforts as space exploration. Getting to the moon was a joint project, if not of idiot savants, at least of savants whose individual areas of expertise were extremely limited- . . . . Finally, those savants included people who believed that redheads are hot-tempered, and who at the advice of an acquaintance's brother-in-law bought their last car at the cocktail-party. (1980, 250)

Reliable Systems, Unreliable Components. In his book on the Polaris missile system, Sapolsky (1972) observed that several teams worked independently to develop a key component. The Navy's Special Projects Office deliberately established this redundant structure to increase the odds that the essential component would be ready by a specified date. By doing so, the Special Projects Office loosened the connection between the reliability of an organizational subunit (one of the problem solving teams) and the larger organization—in contrast to the message of Model II.

More generally, a properly designed agency can display large disparities between the reliability of different organizational levels (Bendor 1985; Grofman, Owen, and Feld 1983; Landau 1969). Consider a representation of the Polaris project. There are n teams trying to develop the same component. The probability that any one of the teams will succeed in the specified time is p, where $0 < p < 1$. If the performance of the teams is independent, the probability that the organization will succeed equals p(at least one of the teams succeeds), which equals $1 - [(1 - p)^n]$. This probability increases steadily toward one as n increases, so long as p exceeds zero. Thus, in this simple setting, the performance of subunits and units need not be closely connected.

From Tunnel Vision to Innovation. Model II's image of organizational change is of sluggish entities dominated by a single way of thinking. Yet modern bureaucracies are often populated by different kinds of professionals with distinctive mindsets. What is commonplace to one professional culture may be dramatically new—even bizarre—when introduced to an agency dominated by another profession. Observe, for example, the clash between civil engineers and environmental analysts in the Corps of Engineers (S. Taylor 1984). The questions raised by new environmental analysts about water projects, though alien to the engineers and the Corps, were standard in the community of environmental analysts. Or consider the idea of vouchers for schools. To a professional with a background in educational administration, vouchers are a dramatic departure from the status quo. But to an economist specializing in education policy, they are an obvious extension of the basic principle of market competition. In both examples, innovation was based on straightforward applications of professional expertise; heroic mental efforts were not required.

Scholars typically understand the main lesson of Model II to be that routines and standardized scenarios constrain and rigidify organizational behavior (e.g., Art 1973, 476–79; Gallucci 1975, 145; Jefferies 1977, 231–32; Krasner 1972, 169–75; Levy 1986; Peterson 1976, 113; Scott 1981, 6; Thompson 1980, 27; Williamson 1979, 140). (For a partial exception to this pattern, see Posen 1984, 46–47.) True, Allison occasionally mentions the possibility of organizational innovation and at times portrays standard operating procedures as efficient ways of handling standard problems.[20] But most of chapter 3's theoretical exposition emphasizes the negative, constraining effects of organizational routines. And this pattern is strikingly reinforced in chapter 4's empirical application of Model II to the missile crisis. Virtually without exception, the episodes covered there describe how the permanent bureaucracies of both countries fouled things up. Toward the end of chapter 4, Allison pointedly asks, "Were the organizations on top of which the President was trying to sit going to drag the country over the nuclear cliff in spite of all his efforts?" (1971, 141). The heroes of this chapter are clearly the unbureaucratic president and his advisors. Therefore, the common interpretation that Model II's main lesson concerns the rigidifying, maladaptive effects of bureaucracy is well founded.

This is an irony of intellectual history. As Allison noted, the central ideas of Model II are rooted in the Carnegie School. Yet a founding volume of that tradition, Simon's *Administrative Behavior*, views routines far more positively:

> Habit performs an extremely important task in purposive behavior, for it permits similar stimuli or situations to be met with similar responses or reactions, without the need for a conscious rethinking of the decision to bring about the proper action. Habit permits attention to be devoted to the novel aspects of a situation requiring decision. A large part of the training that goes to make a championship football team, crew, army battalion, or fire company is devoted to developing habitual responses that will permit immediate reactions to rapidly changing situations.
>
> Habit, like memory, has an artificial organization counterpart, which has been termed by Stene "organization routine." (1947, 88)[21]

Indeed, Simon goes much further than this in praising the general role of organizations in amplifying individual rationality:

> It is impossible for the behavior of a single, isolated individual to reach any high degree of rationality. The number of alternatives he must explore is so great, the information he would need to evaluate them so vast that even an approximation to objective rationality is hard to conceive. . . . One function that organization performs is to place the organization members in a psychological environment that will adapt their decisions to the organization objectives, and will provide them with the information needed to make these decision correctly. . . . In the course of this discussion it will begin to appear that organization permits the individual to approach reasonably near to objective rationality. (pp. 79–80).

Hence, chapter 4 of *Essence of Decision* inverts Simon's view. Instead of organizations boosting individual rationality, the bureaucracy's rigid conduct nearly nullified Kennedy's best efforts.[22]

Why do Simon's and Allison's books assess standard operating procedures in particular and organizations in general so differently? We believe that different baselines of evaluation are at work here. In *Administrative Behavior*, Simon began with the premise that *individuals* are boundedly rational. With this as a starting point, it is not surprising that he emphasized the enabling aspects of standard operating procedures and specialization. Given the real limits on individual cognition, technically demanding projects such as going to the moon can be handled only by collective endeavor. In contrast, *Essence of Decision* begins with Model I, which presumes perfectly rational individuals. Whether Allison intended unboundedly rational decision makers to be the standard for evaluating Model II actors is not completely clear; but the book's structure and the frequent use of Model I as an analytical benchmark suggest that this was the implicit standard.[23] With that baseline, it is not surprising that Model II organizations, staffed by boundedly rational individuals, appear more the problem than the solution. But we would ask, How well could the United States have gathered information about the Soviet missiles in Cuba, conducted the blockade, and carried President Kennedy's message to the world had there been *no* routines to rely on? How effective would the U.S. response been if it had had to invent all procedures on the spot? Had Allison disentangled the different effects of bounded rationality and organizational action by inserting a model of a unitary-actor-with-imperfect-rationality in between Models I and II, his evaluation of the *net* effects of organization—holding constant the degree of individual rationality—might have changed considerably.

ANALYSIS OF MODEL III

Allison's central argument in Model III is easily stated: "The name of the game is politics: bargaining along regularized circuits among players positioned hierarchically within the government. Government behavior can thus be understood according to a third conceptual model, not as organizational outputs but as results of these bargaining games" (1971, 144). It proved difficult, however, to build a clear and coherent model around this claim. Some of the fault lies with the literature on which Allison had to rely. For the rational actor model, he could draw on well-specified, axiomatically constructed theories. The organizational process model is based on works that advance propositions that are thematically (though not deductively) connected. In contrast, the literature on bureaucratic politics is more discursive and far less explicitly theoretical. Allison himself remarked on this difficulty: "Unfortunately, the interests of these analysts have not led them to invest much labor in

squeezing their insights into propositions. Consequently, the paradigm . . . can be no more than a tentative formalization" (p. 147). Even his tentative formalization, however, attracted far more critical attention from reviewers of *Essence of Decision* than either of his other models.

Criticisms of Model III can be grouped into four categories. First, many critics argued that Model III misconstrues the nature of executive branch policymaking. In particular, we will argue, the central claim (that policymaking necessarily involves bargaining among executive branch decision makers) must be questioned. Second, we will point out that Model III said surprisingly little about the fact that executive branch policymaking takes place within a *hierarchy*. Hierarchy's impact on policymaking is something that both Allison and many of his critics overlooked. Third, we will argue (as did several critics) that Model III is the least precisely formulated of Allison's approaches. Not only are its fundamental assumptions much less clear than those of Models I and II, but many of the propositions seem to be ad hoc observations not derived in any rigorous sense from the assumptions. Finally, while many critics questioned Model III's premise of policymaking-as-bargaining and some pointed out that Model III's ambiguities raise questions about its status as a model, few critics made an argument about Model III that we think is equally important, namely, that the model is simply too complex. There are so many different assumptions, variables, and relationships in Model III that it is almost impossible to determine the role and impact of any one of them. For Model III to be useful for systematic analysis, it must be simplified considerably.

Does Policymaking in the Executive Branch Proceed Via Bargaining?

It is not hard to distill from the bureaucratic politics literature the claim that policymaking in the executive branch proceeds via bargaining. Yet this claim is not a completely accurate reading of the literature. And whatever the literature says, the claim turns out to be vulnerable to several different kinds of criticisms. We will examine these difficulties by posing a series of questions about the properties of Model III.

Do Executive Branch Decision Makers Always Have Different Goals? Given our typology of models of policymaking in Figure 1, the assumptions of Model III would clearly seem to place it on row 3: there are many decision makers and they have conflicting goals. However, row 2 of the typology raises the possibility that these multiple decision makers may sometimes have the *same* goals. Indeed, Krasner suggests that considerable similarity in policymakers' views should be expected: "The President chooses most of the important players and sets the rules. He selects the men who head the large bureaucracies. These individuals must share his values. Certainly they identify with his beliefs to a greater extent than would a randomly chosen group of candidates" (1972, 166).

Moreover, Art (1973) argues that shared "mindsets" often influence foreign policymaking. He notes, for example, that in the decisions to intervene in Korea and the Dominican Republic, "there was unanimity on the need to use military force, once the principals involved realized that nothing short of that would achieve American objectives" and that for Cuba and Vietnam, "the need to use force was questioned by one or two principal advisors; but they were clearly out of the mainstream of the President's thinking and his advisors' outlooks" (p. 481). The implication of Art's point is clear: "If shared images dominate senior players' outlooks and if they are truly *shared*, then what is the merit in asserting that governmental actions are the resultants of pulling, hauling, and bargaining?" (p. 476). To the extent that Model III assumes that actors have conflicting goals, these examples suggest some clear limits to the model's empirical domain.

Does Conflict Imply That Policymakers Have Different Goals? When executive branch conflict does occur, understanding its causes requires that we distinguish between differences over goals and differences over beliefs about how to achieve the goals. The relative absence of conflict in Art's four cases might suggest that the key decision makers did share objectives. However, even if actors' goals are identical, they may disagree about how to achieve those ends, and these conflicting beliefs might foment arguments. While Allison does mention the importance of differing beliefs, he does not adequately distinguish between conflicts caused by differing beliefs and conflicts caused by differing goals.

What kind of policymaking should we expect among actors with conflicting beliefs? Thompson and Tuden (1959) suggested that when there is agreement on beliefs about causation but disagreement on goals, then bargaining will be observed, as in Model III. But where there is agreement on goals but disagreement on beliefs, they suggest that "collegial" judgment will prevail. Collegial problem solving involves efforts to ascertain the justification for differing beliefs and to change the beliefs of other actors. If agreement on beliefs remains elusive, more overtly political activities might occur, though it seems likely that actors would try these only as a last resort. Why yield something by bargaining when one might persuade others of the empirical correctness of one's position? When stakes are high, outcomes uncertain, and beliefs deeply held, debates over how to reach a common end may become rancorous; passionate disagreements need not indicate goal conflict. But such debates differ significantly from those caused by conflicting objectives.

As an empirical question, Did President Kennedy and the various members of the ExCom have conflicting goals? Decisions were certainly made in a partisan context. Recall the criticisms by congressional Repub-

licans and the administration's nervousness about the upcoming congressional elections. But by Allison's own account this was more a matter between the president and his critics *outside* the administration than among ExCom members (1971, 187–200). Certainly, administration officials argued over which action to take; but these disagreements could have stemmed mainly from honest differences in beliefs about the effects of various options. While Allison criticizes Sorensen (1963) and Schlesinger (1965) for presenting "the efforts of the ExCom in the Cuban missile crisis as essentially rational deliberation among a unified group of equals" (p. 146), it is not apparent from Allison's own account whether differences in personal and institutional goals (hence, "politics") or differences in beliefs (hence, "collegial," and possibly "rational," decision making) were more important in the ExCom debate.[24]

Why Would a President Bargain with Other Executive Branch Officials? One of Model III's great ambiguities concerns the nature of the president's relations with other officials in his administration. At one point, for example, Allison approvingly comments on Neustadt's picture of the president's role in policymaking: "Sometimes Neustadt's 'President-in-sneakers' is the central political gamesman. Sometimes the President merely observes the pulling and hauling among various groups within the government. Sometimes the President is the target of the tactics of a bureaucratic group" (1971, 158). Later, Allison also states, "Where an outcome was for the most part the triumph of an individual (e.g., the President) or group (e.g., the President's men or a cabal) this model attempts to specify the details of the game that made the victory possible" (p. 173). It would seem, then, that the extent of the president's involvement in policymaking—and his ultimate success—can vary from case to case.

Yet the central thrust of Model III is not this bland point that the president's influence varies across issues. Instead, it is the much bolder hypothesis that in order to make policy the president must bargain with members of his own administration. As Allison himself put it, "The primary source of the paradigm is the model implicit in Neustadt's work, though his concentration on Presidential action has been generalized to a concern with action as a resultant of political bargaining among a number of independent players, the President being only a 'superpower' among many lesser but considerable powers" (1971, 162). This raises an obvious question: Since the president has personally appointed the top officials in his administration and can dismiss them at any time and since he has substantial formal authority (especially on foreign policy issues) to order them to do what he wants, why must the president bargain with them?

The literature on which Allison based *Essence of Decision* certainly does not lend unqualified support to the idea that superiors will bargain with their subordinates. For example, March and Simon (cited by Allison for Model II) note that such bargaining has some "potentially disruptive consequences":

> Bargaining almost necessarily places strains on the status and power systems in the organization. If those who are formally more powerful prevail, this results in a more forceful perception of status and power differences in the organization (generally dysfunctional in our culture). If they do not prevail, their position is weakened. Furthermore, bargaining acknowledges and legitimizes heterogeneity of goals in the organization. Such a legitimation removes a possible technique of control available to the organizational hierarchy. (1958, 131).

Thus, bargaining is something the president would seek to avoid, if at all possible. The question is whether he can avoid it.

Model III, of course, is based on the bureaucratic politics literature, and this literature reveals ample support for an argument that the president often *can* avoid having to bargain with subordinates. For example, Huntington's *Common Defense* has a substantial section analyzing when policymaking is *legislative* in character and when it is *executive* (1961, 146–59). It is interesting to note that Allison quotes a passage from this section (*Essence of Decision*, 156). Indeed, he even cautions that Huntington's analysis "overemphasizes participant equality as opposed to the hierarchy that structures the game" (p. 162). Hence, it is all the more puzzling that Allison nowhere actually *uses* Huntington's arguments. Instead, he just assumes that executive branch policymaking will always be legislative in nature; the possibility of executive policymaking is simply ignored.[25]

Thus, if presidential power is a *variable*, as Huntington suggests, when are presidents powerful and when not? The literatures on bureaucratic politics and organization theory reveal two basic reasons why a president may sometimes be in a disadvantageous position vis-à-vis members of his own administration. The first is that subordinates may have sources of political support outside the executive branch. The second turns on Weber's classic argument about informational asymmetries between a superior and his subordinates. Allison's presentation of Model III does mention these two sources of power (1971, 168–69); but his model does little to explore the role of either factor in policymaking.

Do Subordinates Have Political Support outside the Executive Branch? While the president has much more formal authority than his appointees, his authority in the larger political system is far from absolute. Because Congress has an important constitutional role in policymaking, agencies in the executive branch find it useful to cultivate support in Congress. While the president can often order his political appointees and their respective bureaucracies to do his bidding, they may be able to hurt him politically if they disagree with his choices and make their disagreements known to outside supporters. Hence, the president may end up bargaining with subordinates not because they are intrinsically powerful but because their outside supporters can make life difficult

for him. Thus even though the most obvious manifestations of bureaucratic politics may take place inside the executive branch, what is driving the politics may be happening outside.[26]

Of course, when the most important actors in the environment support the president, he need not bargain with any subordinates who are allied with them. Moreover, even if influential decision makers, whether inside or outside the executive branch, have diverse views and even if some of them are hostile to the president, the president may still be left relatively free to select who will be his allies. As Art suggests, "When senior executive players are split on their policy stances, the President, by virtue of the division, has considerable leeway to choose that which he wishes to do, or that which he thinks he ought to do, or that which he reasons he must do" (1973, 475). It is primarily when most of the environment is hostile and the president lacks countervailing support that he must bargain with his nominal subordinates. In sum, support outside the executive branch does not always mean influence inside it.

Do the President's Subordinates Have Informational Advantages? Even a subordinate who lacks support outside the executive branch may still enjoy an informational advantage over the president. Nonetheless, it is not obvious that bargaining will be the empirical manifestation of informationally based influence. Three categories of informational asymmetries can be distinguished. For a president to exercise his authority over the executive branch, he must become aware of what problem needs to be addressed, decide what to do about it, and have his choice implemented. For each of these three tasks, subordinates may have more information or expertise than the president.[27] This puts them in a position where they can manipulate what problems he is aware of, what advice he receives, and how his final choice is implemented.

However, the standard works on bureaucratic politics in the era of *Essence of Decision* (e.g., Downs 1967; Halperin 1974; Rourke 1969; Tullock 1965), as well as the more recent literature on incentives (e.g., Bendor, Taylor, and Van Gaalen 1987), suggest that there are ways the president can alleviate these informational problems. A wide-ranging communication network can alert him to a problem; and if he then attends closely to the problem, he can learn a good deal about it, thereby reducing his subordinates' informationally based influence. And once he knows what he is doing, he is not without weapons, as Krasner observed: "The Chief Executive involves himself in those areas which he determines to be important. When the President does devote time and attention to an issue, he can compel the bureaucracy to present him with alternatives. . . . Even when Presidential attention is totally absent, bureaus are sensitive to his values. Policies which violate Presidential objectives may bring Presidential wrath" (1972, 168–69). Kohl (1975) provides systematic support for this argument: in an empirical test of several models of president–subordinate relationships, the attention of the president and his top aides and the coherence of their ideas emerged as key variables. Bureaucratic politics flourished largely when the president and aides paid little attention to an issue or lacked clear policy preferences about it.

Finally, even if informational asymmetries persist, the subordinates' influence depends on the president not realizing that he is ignorant. The subordinates' influence is maximized when the president is unaware of what constitutes good advice or that a problem exists or that implementation should be monitored. Even here, however, we think their influence would not make itself felt through *bargaining*. If the president does not realize that he is ignorant, the very fact that his subordinates try to bargain with him should alert him that something odd is going on. To influence the president, the subordinates would have to use their informational advantage in more subtle ways.

Was U.S. Policy in the Cuban Missile Crisis Determined by Bargaining? While our purpose is largely theoretical, it is of interest to ask whether Model III accurately describes U.S. policymaking during the missile crisis. It seems to us that the most obvious manifestations of politics—coalition formation, bargaining, logrolling, splitting the difference, leaks to the press—were largely absent from the ExCom deliberations.[28] Instead, our reading of *Essence of Decision* is that policymaking revolved around President Kennedy and that decision making lay largely in his hands. Allison's own evidence reveals that the participants themselves believed that one person was in charge. Recall, for example, his observation that Dean Acheson, emerging from an unsuccessful effort to convince the president to approve an air strike, "left with no question in his mind about where the buck stopped" (1971, 207). Allison even quotes Robert Kennedy's observation, as the crisis reached its peak, "It was now up to one single man. No committee was going to make this decision" (p. 208).

Moreover, a key tenet of Model III is that policy outcomes are *resultants*—unintended by any one actor—that emerge out of the dynamics of bargaining. But if policy outcomes are unintended resultants and if Model III accurately describes the ExCom deliberations, one must then conclude that the choice of the blockade was unintended by President Kennedy. But Allison provides no evidence that the president preferred some other option. On the contrary, his story suggests that the blockade was the option most favored by the president and his closest associates; it was not chosen by the president as part of a bargain or political compromise with other ExCom members.[29]

A Model of Bureaucratic Politics Needs a Model of Hierarchy

Model III was intended to synthesize the bureaucratic politics studies of Hilsman, Huntington, Neustadt,

Schilling, and others. What is odd about the model—a model of politics in a hierarchy—is that it says almost nothing about how the hierarchy affects the politics. References are made to "players in positions," "action-channels," and "the rules of the game" (1971, 164–66, 169–71); but it is almost impossible to infer from Allison's brief mention of these variables how they are expected to affect outcomes. This neglect of the impact of hierarchy is surprising, since Schilling (1962)—whom Allison discusses at length (pp. 154–56)—offered some useful insights about hierarchy's impact on policymaking. In his study of the 1950 defense budget, Schilling argued that the shape of the military hierarchy affected who handled which issues. Schilling described several post–World War II plans to reorganize the defense establishment, noting claims that particular plans would reduce the interservice rivalry over the military doctrines justifying particular allocations of missions and budgets. One proposal was to reorganize the land, sea, and air forces into unified functional commands: one was for conducting limited war, one was for all-out war, and one was for continental defense. Such reshuffling, Schilling argued, would not end the key conflicts:

> Some of the issues which had formerly been subject to inter-service argument and determination would become matters for intracommand argument and determination (for example, the Air Force–Navy dispute over the relative merits of sea as compared to land-launched vehicles for the delivery of a nuclear strike would now take place within the confines of the All-Out War Command). Conversely, other issues formerly subjects of intraservice conflict would now become matters of intercommand dispute (for example, the argument within the Air Force over the allocation of resources between tactical and strategic air forces would now be joined between the All-Out War Command and the Limited War Command). (p. 228)

This rearrangement of the issues could affect how the conflicts were settled. As Schilling put it, "What reorganization would change, and it would be a consequential change, would be the political conditions under which these issues would be argued and resolved" (1962, 228). For example, since an organization's design thrusts some issues to the top while pushing others down and since top decision makers care more about some issues than others, different choices might be made in different structures.

Only recently have Schilling's ideas been used to develop a more explicit theory of hierarchy's impact on policymaking. The essential ideas in one set of studies, for example, are that policymaking involves making comparisons (of pieces of information, of policy options, or of proposals for implementation), and that an organization's structure affects who compares what with what, so that different structures can produce different policy outcomes (Hammond 1986, n.d.; Hammond and Thomas 1989). It is well known that a legislature's agenda, which specifies the sequence of voting on amendments, can greatly influence the outcome. An organization's formal structure can, via its impact on the sequence of decisions, have a similar impact on which policies are ultimately adopted.[30]

Allison apparently did judge that hierarchy was relatively unimportant in the missile crisis. He observed at one point, for example, that the ExCom "functioned with minimal reliance on the standard channels down into the second or third levels of the government, causing no little pain to the players left out of the action" (1971, 215). Hence, it may have seemed unnecessary to explore the impact of hierarchy. But what is at issue, we would argue, is whether the hierarchy's *particular configuration* influenced, for example, the CIA's information processing (which Model II treats as an apolitical concern) or the particular policy proposals advanced by the bureaucratic chiefs represented on the ExCom. Without considerably more attention to hierarchy as a variable, Allison could not have determined whether the bureaucratic hierarchy actually had a negligible impact on policymaking.

Logical Problems with Model III's Propositions

Thus far, our argument has been that Model III's conceptual development is inadequate. Some of the model's premises are ambiguous, and it is difficult to determine from Allison's discussion when bargaining will characterize policymaking and who will have to bargain with whom about what. These issues—central to a theory of bureaucratic politics—are left unresolved by Model III. Model III's propositions, which define how it should be applied to data, are no more satisfactory.

A *proposition*, in Allison's usage, is an empirically testable hypothesis that can shed light on the validity of the underlying theory. But it is difficult to know what to conclude from a careful examination of some of his propositions. For example, consider the proposition, "Where you stand depends on where you sit" (1971, 176). Several critiques noted that this proposition contradicts other aspects of Model III (Art 1973, 472–73; Ball 1974, 77; Caldwell 1977, 94; Krasner 1972, 165); Allison himself mentions many other influences, besides bureaucratic position, on the stances of participants. Moreover, empirical evaluation of the proposition is difficult, since, as these critics observed, some key participants do not "sit" anywhere. And even where the proposition can be empirically scrutinized and is found to lack support (as when, in the missile crisis, the secretary of defense initially took a relatively dovish stand despite the hawkish views of many of his uniformed subordinates), it is not clear what conclusions we should draw about Model III more generally.

In fact, some of the propositions seem to be only ad hoc generalizations lacking clear derivation from the underlying model.[31] For example, it is not at all apparent how the claim "In a nuclear crisis, the central decisions will be hammered out *not* in the formal forums, e.g., the National Security Council, but rather by an *ad hoc* group that includes the

President, the heads of the major organizations involved, plus individuals in whom the President has special confidence" (1971, 180) stems from the central argument of Model III, namely, that policymaking proceeds via bargaining. Hence, even if the proposition were found to have empirical support, one's judgments about the model from which it was (supposedly) derived would be largely unchanged. Such a proposition would seem to have little scientific value.

Model III Is Too Complex

Finally, some of Model III's problems stem from its extraordinary complexity. Whereas Allison's formulation of the unitary rational actor model is too "thin," Model III is simply too "thick." It incorporates so many variables that it is an analytical kitchen sink. Nothing of any possible relevance appears to be excluded, as the following passage illustrates:

> A Secretary of State's resolution of these conflicts depends not only upon the position, but also upon the player who occupies it. For players are also people; men's metabolisms differ. The hard core of the bureaucratic politics mix is personality. How each man manages to stand the heat in *his* kitchen, each player's basic operating style, and the complementarity or contradiction among personalities and styles in the inner circles are irreducible pieces of the policy blend. Then too, each person comes to his position with baggage in tow. His bags include sensitivities to certain issues, commitments to various projects, and personal standing with and debts to groups in the society. (1971, 166; emphasis original)

Indeed, after reading chapters 5 and 6 carefully, one is hard pressed to determine what, if anything, escapes the purview of Model III.

An analyst must make some hard choices about what variables a theory should include and what it should exclude. It is often argued that there is a trade-off between explanatory richness (ability to explain one case well) and theoretical generalizability (ability to explain many cases well). Thus, one may conclude that a complex theory, like Model III, can have considerable value. But the nature of this trade-off has been oversimplified: it is possible to include so many variables that the theory does not explain even one case very well. A model that is as complicated as the phenomena it represents is of little use.

This is the trouble with Model III: the relations of so many variables in Model III are left so obscure that it is difficult to use the model even to explain the Cuban missile crisis. In our view, it would have been advisable to pay closer theoretical attention to a smaller number of variables—perhaps just the impact of the domestic political environment and the nature of hierarchical relationships inside the executive branch (with a focus on authority, expertise, and external political support). In general, a model that includes everything explains nothing. If it does not simplify, it cannot explain.[32]

CONCLUSION

Allison's classic book showed an entire generation of scholars and students how to study bureaucracy's role in foreign policy making, and its role in making public policy more generally. *Essence of Decision* made a persuasive case for the use of formal reasoning, for the development of alternative models to explain an important event, for the derivation of testable propositions from the models, and for the testing of the propositions. This approach to bureaucracy was relatively unfamiliar to students of bureaucracy in the 1960s, and Allison's message remains important to this day. It is the rare scholar whose research on organizations and bureaucratic politics has been uninfluenced by the approach advanced by *Essence of Decision*. For these reasons, it legitimately remains one of the most frequently cited studies in the literatures on bureaucracy, foreign policy, and governmental policymaking. If its readers come away with just these methodological lessons, it will remain an important book.

But *Essence of Decision* is more than an exercise in methodology. A very ambitious work, it is simultaneously a treatise on models, a historical study of the Cuban missile crisis, and a heuristic guide to explaining other major foreign policy crises. We admire its reach. But in trying to do so much, it had to accept certain trade-offs.[33] Most importantly, there is an inevitable tension between attempting to explain a particular event (a task characteristic of historians) and attempting to construct models (a job more characteristic of social scientists).[34] The demands of specialization, of allocating one's limited time either to investigating particular historical facts or to developing the mathematical expertise needed in model building, imply that this trade-off is a difficult one. Moreover, these opportunity costs apply to readers as well as authors. Scholars who read *Essence of Decision* primarily to learn more about the missile crisis in particular or cold war diplomacy in general have typically invested much time studying important past foreign policy events. Consequently, they are not trained to read formal models. Thus, Allison would not only have incurred substantial opportunity costs had he tried to transform his analyses into genuine models, but he might also have lost much of his audience. It is, in short, exceedingly difficult for a single volume to be both a work on social science theories and a historical study. A fair assessment of the book must recognize these trade-offs and its ensuing compromises. Nevertheless, we are forced to conclude that the price paid by *Essence of Decision* on the theoretical dimension was that due to its attention to historical detail, it paid insufficient attention to the internal logic of the models.

Thus, a close examination of these models shows that they are much less rigorously formulated than is generally recognized, that the derivations are in some cases wrong and in others do not follow from the models, and that the meaning of the empirical tests is often quite ambiguous. Hence, the continued refer-

ence to, and use of, *Essence of Decision* has a rather troubling character. Aside from its important methodological points, what scholars and students have been learning from the models may lack foundation and, in some cases, may simply be incorrect. We conclude by emphasizing five of these problems.

First, modeling generally begins with some hunches of the theorist—or with the claims of the academic literature—about how the world works. The model should then reflect these judgments. But none of Allison's models are, in our view, sufficiently accurate renditions of the literatures that he himself cites in justification for the models. The traditional literature on war, crisis, and international politics has emphasized uncertainty and state-versus-state gaming. Model I almost ignores these properties. The organizational literature of Simon and March portrayed standard operating procedures and routines as *enabling* choice and action. Model II depicts them as *constraining* choice and action. The understanding of politics-in-hierarchies, available in the bureaucratic politics literature by the late 1960s, is not accurately reflected by Model III's analysis of bureaucratic bargaining. The role of hierarchy, which presumably structures the entire game of bureaucratic politics, is neglected—and the critical interplay between authority and expertise in a bureaucracy, a major topic of discussion in organization theory since Weber, receives almost no attention at all.

Second, in laying out his three models of policymaking, Allison has generally been credited with advancing the important point that intellectual progress comes from formulating, testing, and evaluating alternative models. Yet his presentation of Model I suggests that he saw it, at least in part, as something to be set up in order to be knocked down. This may explain Model I's inadequate development, even given the relatively crude state of the art of game theory and rational choice models when Allison was writing. Nonetheless, one cannot seriously evaluate the relative performance of two new models (II and III) if the baseline model is almost destined to fail. For this reason, what is often taken to be a major lesson of *Essence of Decision*—that rational choice explanations of policymaking are weaker than those of Models II or III—lacks foundation. Whatever their ultimate worth, rational choice models were not given a fair test.

Third, Allison's overall approach—the development of explicit models of policymaking—was based on the view that clarifying one's key assumptions is analytically helpful. Yet the assumptions of Models II and III were sufficiently ambiguous that it is difficult to discern the models' defining properties. Hence, it is unclear whether Models II and III belong to separate classes of theories or not.

Fourth, one of the purposes of developing an explicit model is rigorously to derive the logical implications of one's fundamental assumptions. Yet for neither of the two models (II and III) for which *Essence of Decision* is best known are the propositions rigorously derived. The general proposition to be drawn from Model II—that simple rules lead to simple, predictable behavior—is almost surely wrong; and Model III is so complicated that virtually no propositions can be rigorously derived from it at all.

Fifth, if propositions are not rigorously derived from a model yet receive some evidential support, it is difficult to know what one should learn from the empirical corroboration. We may learn something about the propositions; but lacking any logical relationship between them and the model, the empirical test teaches us little about the model or the hunch that originally generated it.

Some of the inadequacies of Allison's models stem merely from the fact that there has been considerable progress in the understanding of game theory and rational choice models, in the appreciation of the role of uncertainty and incomplete information, and in development of insights about organizations, hierarchy, and bureaucratic politics. Indeed, we have been at pains to point out what literature was available to Allison—and what was not—when he wrote his book. Yet many of the flaws we have pointed out in *Essence of Decision* do not stem from advances in these fields: they were there from the beginning, and a reasonable assessment of the book must recognize this fact. Since the book still has considerable currency in political science and in a wide range of other disciplines, continued use is thus likely to lead to the widespread perpetuation of major misunderstandings about the nature of bureaucracy and governmental policymaking. If the academic community is not made aware of these flaws, reliance on Allison's models is as likely to lead to error as it is to inform. Nonetheless, *Essence of Decision* richly deserved its two decades of intellectual prominence. The fact that the study of bureaucracy, organization, and foreign policy making has gone beyond it detracts in no way from its remarkable accomplishments.

Notes

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1. Perlmutter (1974) distinguished three different models, as did Snyder and Diesing (1977) and Steinbruner (1974). Kurth (1971) analyzed five models, Kohl (1975) six, while Caldwell (1977) distinguished 12 models! Allison himself cited Steinbruner's contribution of additional models and noted that "a number of others are clearly possible" (1971, 255; see also pp. 276–77).

2. E.g., in the 1990 *Social Science Citation Index*, *Essence of Decision* and Allison's 1969 article were cited 84 times in 58 different journals.

3. Though classical decision theory emphasized prospective uncertainty, retrospective uncertainty is also prevalent in crises: Did the enemy just launch a first strike, or are we picking up a flock of geese on our radar screen? This example also points up the connection between the two types of uncertainty: if one is unsure what one's opponent has done,

one will also probably be unsure how he will react to one's own move.

4. For just one example (which could have initiated a nuclear exchange), recall the U-2 that blundered into Soviet air space during the height of the Cuban missile crisis. As President Kennedy was reported to have remarked about this incident, "There is always some son-of-a-bitch who doesn't get the word" (quoted in Allison 1971, 141).

5. Even if individual attention were unconstrained, costly communication would mandate this issue. As Simon (1973) suggests, however, attention is often a major bottleneck.

6. Given this assignment, Model I should not be seen as the only rational choice model in *Essence of Decision*.

7. There is a tendency to jump to such claims, particularly regarding unitary rational actor models; but we shall argue that these claims oversimplify the models' implicational richness.

8. Ball argues that Model III "is the model closest to Allison's own heart," citing a seminar discussion at Harvard in October 1972, in which "Allison himself made this quite clear" (1974, 76).

9. Cognitive analyses (e.g., Steinbruner 1974) recognize that decision makers may sometimes fail to resolve intrapersonal conflict in a consistent manner.

10. In redundancy theory, one often analyzes the optimal amount of duplicate men and materiel to achieve a task when implementation is uncertain. These analyses are facilitated by assuming a single decision maker whose objectives are to be maximized.

11. Indeed, Blight and Welch (1989) present ample evidence that even latter-day *Soviet* analysts disagree about Khrushchev's motives.

12. Allison does challenge this notion, but only in discussing Model III in respect to bargaining *inside* governments.

13. Mixed strategies are covered in game theory texts going back to Luce and Raiffa 1957, chap. 4; see also Schelling 1960. Note that in the inspection game and similar two-player games, the mixed strategy equilibrium is replaced by a pure strategy equilibrium if the players move sequentially. The indeterminacy of a mixed strategy equilibrium does require some exogenously assumed uncertainty (i.e., the imperfect information occasioned by simultaneous play).

14. Clearly, the optimal outcome for the United States is to deceive the USSR, convincing the Soviets that we will inspect closely, but not to do so. A similar point about deception applies to the Soviets. Neither optimal outcome involves a mixed strategy. However, this does not invalidate the text's point, since neither outcome is an equilibrium.

15. For example, Cyert and March describe the general procedure—"Use simple rules"—as one of the "three basic principles" of choice (1963, 102). And certainly, the best-known rule in this literature, *satisficing* (searching for alternatives until finding one that exceeds a specified threshold) is a very simple procedure (Simon 1957, 204–5, 252–53).

16. March and Simon, who pioneered the metaphor of organizational behavior as governed by computer programs, recognized that behavioral flexibility could arise from a program's sensitivity to inputs: "The term 'program' is not intended to connote complete rigidity. The content of the program may be adaptive to a large number of characteristics of the stimulus that initiates it. Even in the simple case of the fire gong, the responses depend on the location of the alarm" (1958, 142). Again, "At the [programmed] limit, an environmental stimulus may evoke immediately from the organization *a highly complex* and organized set of responses" (p. 141, emphasis added).

17. What follows is therefore a conservative analysis that underestimates the complexity of the armed services' *rules* for research-and-development and procurement.

18. This view of Allison's appears to have influenced other international relations scholars. For example, Keohane wrote that "If individuals typically satisfice rather than maximize, all the more so do governments and other large organizations (Allison, 1971; Steinbruner, 1974; Snyder and Diesing, 1977)" (1984, 114).

19. Allison mentions this advantage once (1971, 80). He does not, however, emphasize it.

20. "If the SOPs are appropriate, average performance—i.e., performance averaged over the range of cases—is better than it would be if each instance were approached individually (given fixed talent, timing, and resource constraints)" (Allison 1971, 89). He immediately adds, however, "But specific instances, particularly critical instances that typically do not have 'standard' characteristics, are often handled sluggishly or inappropriately" (ibid).

21. See also: "An important objective of standardization is to widen as far as possible the range of situations that can be handled by combination and recombination of a relatively small number of elementary programs" (March and Simon 1958, 150).

22. In a striking essay, Norton Long also differed sharply with the viewpoint of *Essence of Decision*, chapter 4, arguing that it is the *bureaucracy* that via its "fact-finding [and] policy proposal . . . procedures," must discipline the tendency of *politicians* to manipulate "a free-wheeling world of rhetoric and emotion, . . . a world in which solid facts evaporate" (1954, 28). It is interesting to note that though Allison cited this essay in respect to Model III (1971, 315, n. 65), neither Model II nor Model III was influenced by its main theme.

23. Surprisingly, neither chapter 3 nor chapter 4 specifies an explicit baseline of evaluation: using routines and standard operating procedures constrains organizational behavior *compared to what*? To an organization that though still staffed by boundedly rational actors, did not use standard operating procedures? Or to how an organization with perfectly rational members would behave? Or to how a perfectly rational *individual* would behave? Since the answer is unclear, the reader is left to infer the baseline of comparison.

24. We do not underestimate the difficulty of determining whether actors' disagreements are due primarily to conflicting goals or to conflicting beliefs. In a debate involving a president, insiders whose goals differ from the president's may find it wise to pretend their disagreements are about means. As March and Simon observe about organizations, "Bargaining (when it occurs) will frequently be concealed within an analytic framework" (1958, 131).

25. After criticizing what he considers Allison's overemphasis on bargaining in foreign policy formation, Rourke does remark that "in domestic policy, on the other hand, models structured around bargaining are much more useful, since executive organizations here compete with the President on a relatively equal footing" (1972, 432).

26. While Allison cites Dahl and Lindblom in support of his point that Huntington overemphasized participant equality (1971, 315, n. 65), it is interesting to note that Dahl and Lindblom consistently maintain that outside political support enables subordinates to bargain with the president (1953, 341–44).

27. In the missile crisis, for example, President Kennedy was apparently uncertain whether an air strike would destroy *all* the Soviet missiles in Cuba. When he sought advice from the Tactical Air Command, its commander told him that no such guarantee was possible. This judgment apparently played a major role in Kennedy's ruling out the air strike option.

28. To be sure, there were leaks to the press from inside the executive branch *before* the president and his top advisors became convinced that Soviet missiles were indeed in Cuba (Allison 1971, 192). Once the ExCom was convened, however, Allison mentions nothing further about leaks intended to influence policymaking.

29. Our conclusions here are in line with those of most of Allison's critics; see, esp., Art 1973; Ball 1974; and Krasner 1972.

30. We are not suggesting that politics occurs only within formal channels; evidence on the importance of informal organization is too strong to ignore. We do think, however, that the informal relationships that do emerge will be efforts to overcome the impact of the formal structure. Thus, formal structure shapes informal structure.

31. Allison himself bemoans "the difficulty of formulating Model III propositions about outcomes" (1971, 173).

32. We are reminded of Lewis Carroll's (1893) parable about map-making: "That's another thing we've learned from your Nation," said Mein Herr, "map-making. But we've carried it much further than you. What do you consider the largest map that would be really useful?" "About six inches to the mile." "Only six inches!" exclaimed Mein Herr. "We very soon got to six yards to the mile. Then we tried a hundred yards to the mile. And then came the grandest idea of all! We actually made a map of the country, on the scale of a mile to the mile!" "Have you used it much?" I enquired. "It has never been spread out, yet," said Mein Herr: "The farmers objected: they said it would cover the whole country, and shut out the sunlight! So we now use the country itself, as its own map, and I assure you it does nearly as well."

33. For a more detailed discussion of these trade-offs and of the great heuristic value of conceptual frameworks (partially formalized models), see Bendor and Hammond 1989.

34. For evidence that Allison took the historian's job of explaining the missile crisis seriously, see 1971, 1–2. Here he asks four central questions. The first three—Why did the Soviet Union place strategic offensive missiles in Cuba? Why did the United States respond with a naval quarantine? Why were the missiles withdrawn?—concern particular aspects of this particular event. As such, they are indistinguishable from those posed by historians.

References

Allison, Graham. 1969. "Conceptual Models and the Cuban Missile Crisis." *American Political Science Review* 63:689–718.

Allison, Graham. 1971. *Essence of Decision: Explaining the Cuban Missile Crisis*. Boston: Little, Brown.

Allison, Graham, and Morton Halperin. 1972. "Bureaucratic Politics: A Paradigm and Some Policy Implications." In *Theory and Policy in International Relations*, ed. Raymond Tanter and Richard Ullman. Princeton: Princeton University Press.

Allyn, Bruce J., James G. Blight, and David A. Welch. 1989/90. "Essence of Revision: Moscow, Havana, and the Cuban Missile Crisis." *International Security* 14:136–172.

Art, Robert. 1973. "Bureaucratic Politics and American Foreign Policy: A Critique." *Policy Sciences* 4:467–90.

Ball, Desmond. 1974. "The Blind Men and the Elephant: A Critique of Bureaucratic Politics Theory." *Australian Outlook* 28:71–92.

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

Bendor, Jonathan. 1987. "In Good Times and Bad: Reciprocity in an Uncertain World." *American Journal of Political Science* 31:531–58.

Bendor, Jonathan, and Thomas H. Hammond. 1989. "Rethinking Allison's Models." Presented at the annual meeting of the American Political Science Association, Atlanta.

Bendor, Jonathan, Serge Taylor, and Roland Van Gaalen. 1987. "Stacking the Deck: Bureaucratic Missions and Policy Design." *American Political Science Review* 81:873–96.

Blight, James, Joseph Nye, Jr., and David Welch. 1987. "The Cuban Missile Crisis Revisited." *Foreign Affairs* 66:170–88.

Blight, James, and David Welch. 1989. *On the Brink: Americans and Soviets Reexamine the Cuban Missile Crisis*. New York: Hill & Wang.

Bobrow, Davis. 1972. *International Relations*. New York: Foreign Policy Association.

Bouchard, Joseph F. 1991. *Command in Crisis: Four Case Studies*. New York: Columbia University Press.

Brugioni, Dino A. 1991. *Eyeball to Eyeball: The Inside Story of the Cuban Missile Crisis*. New York: Random House.

Bueno de Mesquita, Bruce. 1981. *The War Trap*. New Haven: Yale University Press.

Bueno de Mesquita, Bruce. 1985. "The War Trap Revisited: A Revised Expected Utility Model." *American Political Science Review* 79:156–77.

Caldwell, Dan. 1977. "Bureaucratic Foreign Policy-Making." *American Behavioral Scientist* 21:87–110.

Carroll, Lewis. 1893. *Sylvie and Bruno Concluded*. London: Macmillan.

Cornford, J. P. 1974. Review of *Essence of Decision* by Graham Allison. *British Journal of Political Science* 4:231–43.

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

Dahl, Robert A., and Charles E. Lindblom. 1953. *Politics, Economics, and Welfare*. New York: Harper & Row.

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

Freedman, Lawrence. 1976. "Logic, Politics, and Foreign Policy Processes: A Critique of the Bureaucratic Politics Model." *International Affairs* 52:434–49.

Gallucci, Robert L. 1975. *Neither Peace nor Honor: The Politics of American Military Policy in Viet-Nam*. Baltimore: Johns Hopkins University Press.

Garthoff, Raymond. 1988. "Cuban Missile Crisis: The Soviet Story." *Foreign Policy* 72:61–80.

Garthoff, Raymond L. 1989. *Reflections on the Cuban Missile Crisis*. Rev. ed. Washington: Brookings Institution.

George, Alexander. 1980. *Presidential Decisionmaking in Foreign Policy*. Boulder: Westview Press.

Grofman, Bernard, Guillermo Owen, and Scott Feld. 1983. "Thirteen Theorems in Search of the Truth." *Theory and Decision* 15:261–78.

Gulick, Luther. 1937. "Notes on the Theory of Organization." In *Papers on the Science of Administration*, ed. Luther Gulick and Lyndall Urwick. New York: Columbia University.

Halperin, Morton H. 1974. *Bureaucratic Politics and Foreign Policy*. Washington: Brookings Institution.

Hammond, Thomas H. 1986. "Agenda Control, Organizational Structure, and Bureaucratic Politics." *American Journal of Political Science* 30:380–420.

Hammond, Thomas H. N.d. "Toward a General Theory of Hierarchy: Books, Bureaucrats, Basketball Tournaments, and the Administrative Structure of the Nation–State." *Journal of Public Administration Research and Theory*. Forthcoming.

Hammond, Thomas H., and Paul A. Thomas. 1989. "The Impossibility of a Neutral Hierarchy." *Journal of Law, Economics, and Organization* 5:155–84.

Hampson, Fen. 1984/85. "The Divided Decision-Maker: American Domestic Politics and the Cuban Missile Crisis." *International Security* 9:130–65.

Hogarth, Robin. 1987. *Judgment and Choice*. 2d ed. New York: Wiley.

Holsti, Ole. 1972. Review of *Essence of Decision* by Graham Allison. *Western Political Quarterly* 25:136–40.

Huntington, Samuel. 1961. *The Common Defense*. New York: Columbia University Press.

Jefferies, Chris. 1977. "Defense Decisionmaking in the Organizational–Bureaucratic Context." In *American Defense Policy*, 4th ed., ed. John Endicott and Roy Stafford, Jr. Baltimore: Johns Hopkins University Press.

Jervis, Robert. 1976. *Perception and Misperception in International Politics*. Princeton: Princeton University Press.

Keohane, Robert. 1984. *After Hegemony*. Princeton: Princeton University Press.

Kohl, Wilfrid. 1975. "The Nixon–Kissinger Foreign Policy System and U.S.–European Relations." *World Politics* 28:1–43.

Krasner, Steven. 1972. "Are Bureaucracies Important? (Or Allison Wonderland)." *Foreign Policy* 7:159–79.

Kurth, James. 1971. "The Widening Gyre: The Logic of American Weapons Procurement." *Public Policy* 19:373–404.

Landau, Martin. 1969. "Redundancy, Rationality, and the Problem of Duplication and Overlap." *Public Administration Review* 29:346–58.

Landau, Martin. 1972. *Political Science and Political Theory*. New York: Macmillan.

Levy, Jack. 1986. "Organizational Routines and the Causes of War." *International Studies Quarterly* 30:193–222.

Long, Norton. 1954. "Public Policy and Administration: The Goals of Rationality and Responsibility." *Public Administration Review* 14:22–31.
Luce, R. Duncan, and Howard Raiffa. 1957. *Games and Decisions*. New York: Wiley.
Lukas, Anthony. 1987. "Class Reunion: Kennedy's Men Relive the Cuban Missile Crisis." *New York Times Magazine*, 30 August.
March, James G., and Zur Shapira. 1982. "Behavioral Decision Theory and Organizational Decision Theory." In *Decision Making: An Interdisciplinary Inquiry*, ed. Gerardo Ungson and Daniel Braunstein. Belmont, CA: Wadsworth.
March, James G., and Herbert A. Simon. 1958. *Organizations*. New York: Wiley.
Morrow, James. 1989. "Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining." *American Journal of Political Science* 33:941–72.
Nisbett, Richard and Lee Ross. 1980. *Human Inference: Strategies and Shortcomings of Social Judgment*. Englewood Cliffs, NJ: Prentice-Hall.
Perlmutter, Amos. 1974. "The Presidential Political Center and Foreign Policy: A Critique of the Revisionist and Bureaucratic–Political Orientations." *World Politics* 27:87–106.
Posen, Barry. 1984. *The Sources of Military Doctrine*. Ithaca: Cornell University Press.
Peterson, Paul E. 1976. *School Politics, Chicago Style*. Chicago: University of Chicago Press.
Powell, Robert. 1990. *Nuclear Deterrence Theory*. Cambridge: Cambridge University Press.
Rourke, Francis. 1969. *Bureaucracy, Politics, and Public Policy*. Boston: Little, Brown.
Rourke, Francis. 1972. Review of *Essence of Decision* by Graham Allison. *Administrative Science Quarterly* 71:431–33.
Sapolsky, Harvey. 1972. *The Polaris System Development: Bureaucratic and Programmatic Success in Government*. Cambridge: Harvard University Press.
Schelling, Thomas. 1960. *The Strategy of Conflict*. Cambridge: Harvard University Press.
Schilling, Warner. 1962. "The Politics of National Defense: Fiscal 1950." In *Strategy, Politics, and Defense Budgets*, ed. Warner Schilling, Paul Hammond, and Glenn Snyder. New York: Columbia University Press.
Schlesinger, Arthur M., Jr. 1965. *A Thousand Days: John F. Kennedy in the White House*. Boston: Houghton-Mifflin.
Scott, W. Richard. 1981. *Organizations: Rational, Natural, and Open Systems*. 2d ed. Englewood Cliffs: Prentice–Hall.
Simon, Herbert A. 1947. *Administrative Behavior*. New York: Macmillan.
Simon, Herbert A. 1957. *Models of Man: Social and Rational*. New York: Wiley.
Simon, Herbert A. 1973. "Applying Information Technology to Organization Design." *Public Administration Review* 33: 268–78.
Simon, Herbert A., Donald Smithburg, and Victor Thompson. 1950. *Public Administration*. New York: Knopf.
Snyder, Glenn H., and Paul Diesing. 1977. *Conflict among Nations*. Princeton: Princeton University Press.
Sorensen, Theodore C. 1965. *Kennedy*. New York: Harper & Row.
Steinbruner, John. 1974. *The Cybernetic Theory of Decision*. Princeton: Princeton University Press.
Taylor, Frederick W. [1911] 1947. *The Principles of Scientific Management*. Reprint. New York: Harper & Row.
Taylor, Serge. 1984. *Making Bureaucracies Think: The Environmental Impact Statement Strategy of Administrative Reform*. Stanford: Stanford University Press.
Thompson, James C. 1980. *Rolling Thunder: Understanding Policy and Program Failure*. Chapel Hill: University of North Carolina Press.
Thompson, James D., and Arthur Tuden. 1959. "Strategies, Structures, and Processes of Organizational Decision." In *Comparative Studies in Administration*, ed. James D. Thompson et al. Pittsburgh: University of Pittsburgh Press.
Trachtenberg, Marc. 1985. "The Influence of Nuclear Weapons in the Cuban Missile Crisis." *International Security* 10:137–203.
Tsebelis, George. 1989. "The Abuse of Probability in Political Analysis: The Robinson Crusoe Fallacy." *American Political Science Review* 83:77–91.
Tullock, Gordon. 1965. *The Politics of Bureaucracy*. Washington: Public Affairs Press.
Wagner, R. Harrison. 1974. "Dissolving the State: Three Recent Perspectives on International Relations." *International Organization* 28:435–66.
Wagner, R. Harrison. 1989. "Uncertainty, Rational Learning, and Bargaining in the Cuban Missile Crisis." In *Models of Strategic Choice in Politics*, ed. Peter Ordeshook. Ann Arbor: University of Michigan Press.
Welch, David A., and James G. Blight. 1987/88. "The Eleventh Hour of the Cuban Missile Crisis: An Introduction to the ExComm Transcripts." *International Security* 12:5–92.
Williamson, Samuel. 1979. "Theories of Organizational Process and Foreign Policy Outcomes." In *Diplomacy: New Approaches in History, Theory, and Policy*, ed. Paul Lauren. New York: Free Press.
Yanarella, Ernest. 1975. " 'Reconstructed Logic' and 'Logic-in-Use' in Decision-Making Analysis: Graham Allison." *Polity* 8:156–72.

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