Politics and Uncertainty

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Theory, Models and Applications

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Ad memoriam patris mei

That randomness and probability are real phenomena, and therefore are not to be accounted for by our ignorance of true causes, is a proposition that I defend from a variety of perspectives.

Patrick Suppes, *Probabilistic Metaphysics*

One way of theory building is to collect empirical facts and assume that they will somehow speak for themselves, that an obvious classificatory scheme will emerge from their gross and conspicuous aspects. More often it turns out that either the facts by themselves do not suggest an obvious classificatory scheme, or if they do, that the obvious scheme is not very good. A better way is to develop on intellectual grounds what might be a good scheme, try it out and see what happens when empirical data are used.

Karl W. Deutsch, *Integration and the Social System*

The approach we have chosen and the concepts we are using can accommodate a great many theories. Within this framework many apparently unrelated theories and generalizations can be related and their usefulness enhanced.

Gabriel A. Almond and G. Bingham Powell, Jr., *Comparative Politics*

Contents

Figures

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Tables

Preface

This book is about uncertainty in politics, about the defining role that this real-world feature plays in political life, and about how political theory is to understand uncertainty in a systematic way that produces new knowledge. Although most readers will not deny the pervasiveness and significance of uncertainty in politics – particularly in this turbulent age of post-Cold War politics – paradoxically, political uncertainty has been traditionally viewed in ways that normally eschew inquiry. That is, either as an unsolvable mystery to be avoided except by the most fearless minds, as if the proposition "political uncertainty = unknowable" were true by definition, or as a statistical nuisance that is best treated as "measurement error" or an "error term" in quantitative models. Few have looked at political uncertainty in order to understand its character. As I argue in this book, however, political uncertainty is a defining quality of politics that cannot be ignored, either by theory or by public policy. Political uncertainty is also mostly a qualitative phenomenon with a well-defined character; only secondarily is it quantitative, and as such it should be directly addressed by contemporary political science using the appropriate tools of inquiry.

The main contribution of this book is to present a theory of political uncertainty applicable to understanding the diverse domains of political life, both domestic and international. I use specific instances of political phenomena related to coalitions, government policy, deterrence, collective action, conflict, and others as running examples to illustrate the broader theory and its potential scope. However, the applications I present are meant only to assist in the interpretation of the theory; they are not meant as in-depth analyses because those would require separate treatment. The theory addresses one of the central dual puzzles in politics: the aggregate behavior of political variables and the individual occurrence of political events, both of which are phenomena that occur with uncertainty. My theory has two branches, a macroscopic part for the explanation of aggregate political behavior in terms of well-defined forces, and a microscopic part for the explanation of individual political events in terms of their

occurrence structure. Unified principles provide linkages between the two levels of analysis. The theory attempts to advance the standards of contemporary political science in the areas of deductive formalization and empirical validity. I give greater emphasis to the former goal because my chief interest in this book is in theoretical development, an area that in spite of recent advances is still less well established in political science. Empirical methods are now more familiar in scholarship and in teaching.

On the deductive side, the theory is constructed in the traditional deductivist tradition, by defining concepts, postulating a set of axioms and assumptions, and, most important, deriving results that account for observed phenomena. I call the main theoretical results principles because formally these are either theorems or corollaries; but they are propositions about politics, not mathematical propositions as such (or they would be called theorems). Whereas theorems, lemmas, and corollaries are content-free statements (formal propositions), scientific principles are to do with substantive properties of the real world (a distinction that is often neglected). General principles explain the larger patterns of uncertainty in political behavior and events; special principles explain more specific aspects.

On the empirical side, the two levels of the theory differ in terms of the appropriate evidence and technical procedures used for drawing valid inferences. The macroscopic part of the theory uses predominantly quantitative empirical methods, such as maximum likelihood estimation, survival analysis, and other nonlinear data analysis approaches discussed in chapter 4. By contrast, the microscopic part of the theory uses predominantly qualitative case-oriented methods similar to those used in the empirical application of decision models or game-theoretic models to historical material. I illustrate how both types of methods are used to evaluate the theory, and I also hope that this will help discredit some enduring but false distinctions between qualitative and quantitative approaches, as if these were always mutually exclusive in scientific investigation.

From a methodological perspective I view my main contribution in the area of theoretical methodology as the development and application of appropriate formal tools for constructing political theory. My emphasis on appropriate tools is important because many of the mathematical models available today were developed with other sciences and a different set of questions in mind. Fortunately, many different theoretical tools exist because mathematics today covers diverse formal languages, some of which have been directly inspired by social phenomena (parts of probability theory, decisional calculus, game theory, graph theory). Theoretical methods will attract greater interest in political science, now that empirical methods are better known and established, because only they can directly

assist the scholar in the construction – not just in the testing – of viable theories. What is known as political methodology – including those procedures that are ordinarily taught in "methods courses" – should therefore cover tools for theoretic progress at least as much as tools for checking the empirics; otherwise, there will be little to test empirically, and what there will be will not be adequately systematized to benefit the accumulation of scientific knowledge.

This book is addressed to several scholarly communities, mainly academic but also some in policy areas. The book will be of primary interest to political scientists who wish to develop a better understanding of the nature of uncertainty as it operates in various areas of politics. I demonstrate how political uncertainty is uniformly affected by the same principles. Thus, political scientists who study conflict – domestic or international – will find through this theory much in common with those who study coalitions, policy processes, and collective action – areas where I demonstrate the existence of comparable patterns of political uncertainty that are governed by the same laws.

Another audience consists of social scientists and other academic scholars working in allied disciplines who also study politics from perspectives that differ from those of the political scientist, but who nonetheless acknowledge and wish to develop a better understanding of uncertainty in political life. This broader community includes political sociologists, economists, historians, political anthropologists, and archeologists – scholars who acknowledge uncertainty in the origins and historical evolution of political systems in various civilizations. These allied disciplines may use this theory for comparative purposes, exploring the application of principles across a wider range of time and space than is normal in contemporary political science.

A third community consists of philosophers, epistemologists, and other scholars who share an interest in the advancement of formal political theory, particularly an interest in the role played by *fortuna* in influencing the lives, fortunes, and governance of a collectivity. Members of this community may also be interested in my use of probabilistic causality – as opposed to the older deterministic causality used by more traditional political theories – as a newer and more effective epistemic basis for constructing the theory of political uncertainty presented in this book. While I was writing I also frequently had in mind students of politics in all the above disciplines, particularly those who may feel motivated to develop a better understanding of contemporary approaches to political uncertainty based on rigorous and systematic methods. As a university teacher, I am particularly concerned that students develop early on in their investigation of politics a disciplined and truthful understanding of uncertainty in

political life, not the more popular misconceptions of political uncertainty as unknowable or haphazard randomness. Pundits in the public arena make their living from political uncertainty; scholars make their living attempting to decipher it.

Finally, the book should be of interest to the more analytically inclined policy analysts who may wish to consider the implications of these principles of political uncertainty for their own areas of policy concerns. Logically, significant areas of public policy – from local government to national security – are endemically affected by political uncertainty, so improvements in our basic understanding of political uncertainty cannot be ignored without risk. As the best engineers know, there is nothing more practical than good theory.

The background needed to read this book is not advanced, but nonetheless may pose a challenge to some readers who share a substantive interest in the subject matter. Most readers will agree with the premise that political uncertainty is not an easily tractable topic. What some find difficult to accept is the obvious conclusion that to analyze politics with uncertainty but without tools that are sufficiently powerful is to require something impossible. There is no wholly satisfactory solution to this dilemma, only a trade-off compromise between how much can be explained about political uncertainty and how much formal power to apply in the investigation; not everything in life can be easily grasped. The approach I have chosen relies mostly on logic, sets, and elementary probability notions, with a minimum of basic calculus (a powerful analytical tool that is widely used in most scientific disciplines, including "softer sciences" such as biology and economics, but still largely underutilized in political theory). However, I have attempted to provide informal interpretations along the way, and the careful reader will note that there are only a few passages in which the precision of the mathematical language simply cannot be replaced by plain English (which was not invented to construct scientific theories, let alone to understand the world of uncertainty). Other analytical tools are reviewed or developed as needed either in the text or in appendix 4.

In terms of formal analysis, I have aimed to strike at a middle range, between basic mathematics (algebra, linear equations), which can contribute little to a theory of political uncertainty, and higher mathematics (advanced calculus, measure theory, stochastic differential equations, topology), which is not well known in political science. I believe this middle range contains many powerful tools that are presently underutilized or neglected in the construction of political theory. I hope to show – primarily through the principles of the theory presented in this book – how mathematical methods can produce new insights that are as true as those

derived by more conventional empirical methods (what I call Kline's thesis, discussed in chapter 3).

My recommendation to any reader interested in the subject matter of political uncertainty but who becomes frustrated by the formalism that I use is to plunge ahead anyway – as Claude Shannon (1951) demonstrated in a famous theorem from information theory, the human mind is capable of acquiring a considerable amount of knowledge even when the stream of signals contains gaps and noise. At the same time, I also hope that those who labor at sharpening their theoretical tools and revel in the sight of a beautiful nonlinear equation with an aesthetically pleasing form will find some new insights or applications, particularly concerning those aspects of political uncertainty that can be understood only through the medium of mathematics. These readers may also require a higher level of formalization, something that should be pursued elsewhere in the specialized journals but that I have tried to avoid in this book.

As I explain in greater detail in chapter 1, the book consists of four parts, along with a set of supporting appendices. Each part corresponds to a basic element of the theory. The first part – foundations – contains an introductory chapter in which I present the topic of political uncertainty in a disciplinary light, examining its place in political theory, the way in which it has historically been addressed, and the axioms I propose to use as foundations for the theory presented in subsequent chapters. The next two parts – the two main theoretical branches, called macropolitics and micropolitics for reasons I detail in chapter 1 – each contain three parallel chapters, dedicated to the basic concepts, the general principles, and the more specific results (special principles) in each branch of the theory. The chapters within each part of the theory are strictly sequential, but the two parts are less so. I chose to present the macroscopic part of the theory first because the microscopic part investigates in greater detail what lies within the "black box" of political behavior, so to speak, and so it seemed more natural to deal first with aggregate political behavior (macro level) and only later with the more specific individual events that compose it (micro level). However, readers with a greater interest in individual political events – particularly those political occurrences that are viewed as one-of-a-kind, as many historians think – may wish to read part III immediately after chapter 1. The fourth part contains a single chapter which synthesizes the macroscopic and microscopic analysis of political uncertainty by providing a unified treatment and explaining the linkages across levels of analysis.

I had not looked forward to writing appendices, but in a book of this nature they turn out to solve a number of common problems. Appendix 1 can be used as a dictionary reference to clarify the meaning of some new terms that are necessary in constructing a political theory in largely

unexplored conceptual territory. Appendix 2 explains and summarizes the formal notation used throughout the book; it also helps to identify the key concepts, as any system of notation should. I confess to not being entirely satisfied with the present state of notation, and I suspect that some more creative work along these lines will be necessary to provide the analysis of political uncertainty with a theoretically efficient set of analytical signs – at present an unappreciated need in political theory. Appendix 3 contains the proofs of theorems and corollaries, which I did not include in the text in order to maintain the flow of ideas. I do feel that something is lost by not showing how I first arrived at the main propositions (as opposed to their subsequent proof), but I also realize that moving the technical proofs to the appendix increases the readability of the book. Appendix 4 contains a summary of some formal tools that are useful in the task of theoretical construction – some of the middle-range tools that I referred to earlier. Its main purpose is to highlight some ideas from theoretical methods, not to provide any sort of formal training.

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Part I

Foundations

1 Introduction

> Uncertainty appears to be a characteristic of all political life. Systematic political analysis can reduce some of that uncertainty.
>
> Robert Dahl, *Modern Political Analysis*

Uncertainty is ubiquitous, consequential, and ineradicable in political life. However, since antiquity, the puzzle of political uncertainty has often frustrated progress in social science theory and public policy. Uncertainty is clearly recognized today, in the turbulent world of party realignments, foreign regime changes, and post-Cold War politics, but many earlier epochs in the many-thousand years' history of politics have been similarly affected by political uncertainty. The fall of the ancient Babylonian or Roman empires, the Chinese Warring States period, or the collapse of the Maya states in Mesoamerica all occurred in periods of similar political uncertainty.

In this first chapter I introduce uncertainty as a fundamental property of politics, crossing the traditional sub-disciplinary boundaries of international and comparative or domestic politics, identifying major forms of uncertainty that invite a unified explanation across different areas of politics. I then lay down a system of axioms and explain the main parts of the general theory of politics presented in this book. Because this chapter is a point of departure, the main goal is to air some of the major issues, while leaving for subsequent chapters the more intricate task of detailing the theory and its application to various areas of political science. An important property of political uncertainty is its duality across levels of analysis, a feature that is evident in the main concepts, principles, and applications discussed throughout this book.

1.1 Politics and uncertainty

1.1.1 *Nature of political uncertainty*

Political uncertainty refers to the puzzling lack of sureness or absence of strict determination in political life. Elections, wars, governmental

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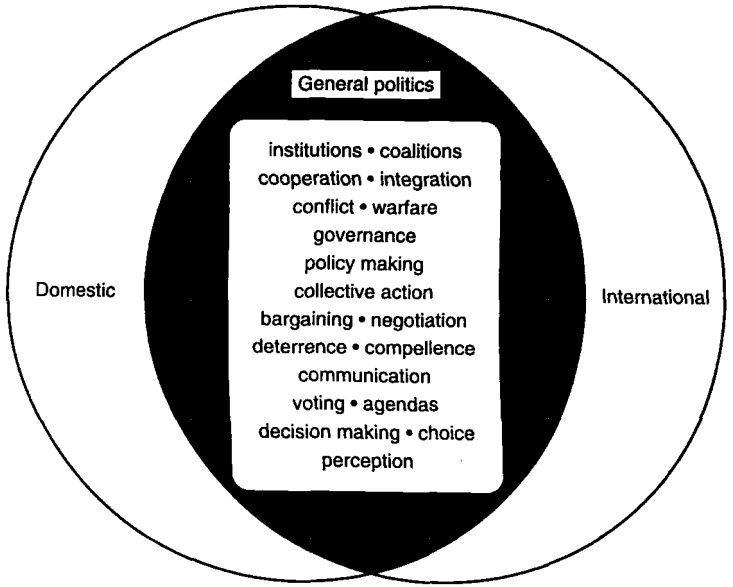

Figure 1.1. General and contextual areas of politics

processes, threats, collective action situations, and other political phenomena identified in figure 1.1 are all inherently uncertain political occurrences. My primary interest in this book is in these core phenomena of general politics, at the rich and fertile intersection of the domestic and international. For example, the uncertainty of coalitions is both domestic (cabinet governments) and international (alliances). The uncertainty of conflict has domestic (civil warfare), as well as international (interstate warfare) manifestations. The fundamental uncertainty of deterrence and compellence threats applies in both national and international contexts, as with other core phenomena in the domain of general politics. Of course, the context-specific details of domestic or international manifestations of these general political phenomena (conflicts, coalitions, deterrence, voting, communication, or others mentioned in figure 1.1) can be important as well, but the core phenomenon must be understood first. So, while often I shall use context-specific illustrations (e.g. interstate war in the next chapter), the main theoretical interest is in understanding the nature of uncertainty in general (context-free) politics.

Politics is fundamentally uncertain because it concerns social behavior "affecting the lives and fortunes of collectivities" or "how they are governed" (Brams 1985: chs. 1–2; Riker and Ordeshook 1973), how political systems are founded (Gerstein et al. 1988: 91; Taylor 1987), how a collectivity of individuals, groups, or states makes an "authoritative allocation of values" (Easton 1965), or how "collective action problems" arise and are managed (Olson 1965). Perhaps the most certain statement that can be made about these and other core puzzles of politics is that we never know for certain that they will happen. This is true in both contexts of politics – domestic and international, as indicated in figure 1.1.

Several extant definitions of politics make the role of uncertainty explicit:

> Political decisions can be defined as the "sovereign" collective decisions from which the individual is *less likely* to escape, because of both their spatial extension and their coercive intensity.[1]

Uncertainty means that in politics outcomes are neither predetermined (with probability 1) nor impossible (with probability 0), but lie somewhere in between. *Where* in between, and *how* and *why* are classic puzzles of politics, and the core questions I address with the new theory presented in this book. Were politics not perennially uncertain it would be like the world of eighteenth-century Laplacean mechanics – a world of lifeless pendulums and celestial orbits in which the future is exactly predictable once initial conditions are specified. Politics is fundamentally different because – as Aristotle would have put it – its uncertainty is essential, not accidental.

The fundamental cause of uncertainty in politics lies in the indeterminate nature of individual decisional acts and states of nature (lotteries) that are most commonly beyond the control of political actors, groups, or states.[2] These uncertain acts and events of normal social intercourse have significant effects on the life, fortune, or governance of collectivities – in other words, they are political. Unlike planetary orbits and other simple physical systems, the political behavior of individuals and collectivities is not

[1] Sartori (1973: 21), emphasis mine. Uncertainty appears as a constituent feature in numerous other definitions of politics, such as those by Almond (1990: 35), Easton (1965), Gilliant (1987), Masters (1989: 140), Merriam (1970), Moe (1990: 119), or Weber (1949). Uncertainty is also included as a substantive political property in traditional definitions of conflict (Blainey 1973; Howard 1983; von Clausewitz [1832] 1976: 89), as well as being "a noteworthy conclusion" in the cumulative domestic political conflict research program (Lichbach 1992: 348).

[2] By contrast, a classic example of deterministic *metaphor* in politics is the action–reaction model of conflict, where it is assumed that decision makers do not "stop to think" (Richardson 1960a: 12). See also Landau (1979: 78–102), Miller (1979), and Rapoport (1960: ch. 5) on the influence of physicalism on the theory and practice of politics, particularly the use of deterministic models (social physics).

governed by deterministic laws. Note that the indeterminacy of decisional acts and nature's lotteries covers both contexts of general politics – domestic and international.

I view the uncertainty of politics as having three constituent properties that motivate the need and suggest the opportunity for a general unified theory. First, political uncertainty is consequential, because uncertainty causes significant changes in "the lives and fortunes of collectivities" or "how they are governed" – changes that themselves take place with uncertainty from start to finish. Elections, crises, revolutions, public policy processes, wars, and other common political occurrences shown in figure 1.1 have this property, but so do less dramatic political events, such as town meetings, parliamentary hearings, or budgetary appropriations. Political uncertainty, often caused by incomplete information, can cause a coalition to be larger than just "minimum winning," or it can cause a collective action need to become a severe political problem, or it can cause voting agendas to become "multiple-stage" processes. In the area of collective action problems, it has been noted that

> the introduction of uncertainty yields a plethora of cases and few general results. Clear cut relationships between group size and collective rationality and/or group asymmetry are especially dificult to establish when uncertainty is present. (Sandler 1992: 90)

A better understanding of political uncertainty – its causes, properties, and consequences – can assist in establishing some general results for understanding collective action and related phenomena.

Recently, the uncertainties of the post-Cold War era have caused numerous changes in the foreign and domestic policies of many countries, as well as other no less significant changes in international institutions.[3] Clearly, uncertainty matters in politics. The principles presented in this book provide some general and specific results to understand the consequences of uncertainty.

Second, political uncertainty is ubiquitous, particularly since the "democratization or massification of politics" (Sartori 1973: 20). No area of politics – none of the themes in figure 1.1 – is immune from chance, just as gravity is everywhere in the physical world, or values pervade the ethical world. Coalitions, governmental policies, and conflict and cooperation are

[3] The effects of post-Cold War political uncertainty are numerous, both domestically (Giddens 1995; Gill 1994; Jones 1995; Landy and Levin 1995; Weisberg 1995), and internationally (Rosenau 1992; Russett and Sutterlin 1991; Singer and Wildavsky 1996). Similar uncertainties in politics earlier caused the development of the Concert of Europe (responding to uncertainty over emerging threats to international security) and the League of Nations (responding to uncertainty over the availability of permanent institutions for maintaining peace in times of crisis). Dahl (1984) and Nagel (1975) also use this consequential property of uncertainty in defining political power.

all affected by uncertainty. This property poses a considerable challenge because it can defeat theoretical efforts or lead to only abstract generalities lacking in empirical referents or concrete insights. However, political uncertainty is neither intractable nor all of one form, as I shall demonstrate, and discernible patterns can differ significantly between one form of uncertainty and another. The different patterns of political uncertainty – randomness is not all uniform – which occur within a system of principles constitute an important topic in this book. The ubiquity of uncertainty provides a valuable opportunity, not an obstacle for political theory.

Finally, political uncertainty is ineradicable, because nothing humanly possible can be done to eliminate it. Uncertainty is inexpungible from politics. At best, "systematic political analysis can reduce some of that uncertainty" (Dahl 1984: 6). Rather than ignoring or avoiding political uncertainty, the study of politics should therefore aim directly toward understanding it. My view is that these properties and others that I analyze in this book must be used constructively, as conceptual building blocks, to obtain some new insights into politics based on its inherent uncertainty, and to help integrate the core areas of general political research (the elements in the intersection of politics in figure 1.1) and increase the accumulation of knowledge in our discipline.

1.1.2 *History and political uncertainty*

The core properties of political uncertainty I have just highlighted – consequentiality, ubiquity, and ineradicability – were known to early political thinkers from both Western and Eastern traditions. Thinkers as dissimilar as Aristotle (in the *Politics*), Sun-Tzu (*The Art of War*), and Niccolò Machiavelli (*The Prince* and *Discourses*) recognized these constitutional features of political life and wrote about them extensively, if not theoretically. Also, since antiquity, these properties have been acknowledged in both contexts of general politics – domestic and international. For example, as described by Machiavelli ([1512] 1965: 897) in one of his *Familiar Letters* to Piero Soderini,

> Certainly anybody wise enough to understand the times and the types of affairs and to adapt himself to them would have always good fortune, or he would protect himself always from bad, and it would come to be true that the wise man would rule the stars and the Fates. But because there never are such wise men, since men in the first place are shortsighted and in the second place cannot command their natures, it follows that Fortune varies and commands men and holds them under her yoke.

Machiavelli's observation clearly covers both domestic and international politics, being a statement about general politics.

Paradoxically, political uncertainty remained an unsolved mystery throughout the Renaissance, in spite of scientific advances in understanding uncertainty through the concept of probability (Bochner 1966). None of the great classical political thinkers prior to the eighteenth century – occidental or oriental – developed a theory of political uncertainty. Political science might have evolved quite differently had Machiavelli studied Girolamo Cardano's *Liber de Ludo Aleæ* (The Book of Games of Chance), the first treatise on mathematical probability (Ore 1953).[4] Or, shortly after, had Thomas Hobbes (a friend of Galileo Galilei) used the mathematical theory of probability and the fledgling theory of social choice to formalize the *Leviathan* problematique – among sovereigns, state of war, and anarchy (Niou and Ordeshook 1990, 1994; Taylor 1987: ch. 7) – perhaps allowing political science to develop ahead of economics, no doubt with intriguing consequences. Many of the formal elements existed, although clearly not all (game theory). Unfortunately, Cardano's seminal work, unlike *The Prince*, was published posthumously in 1661, more than a century after Machiavelli's death, and probably not early enough for Hobbes to learn and apply.

In the Western world, the uncertainty of politics was first studied scientifically during the time of the French Revolution. This was due primarily to the pioneering work of giants such as Marie Jean de Condorcet, Pierre-Simon de Laplace, and Siméon Denis Poisson.[5] The scientific study of

[4] Machiavelli ([1512] 1965: 954) had a clear (if undeveloped) understanding of decision making under uncertainty, as evidenced by the following observation written to ambassador Francesco Vettori, his benefactor, on December 20, 1514:

> When a prince is forced to take one of two courses, he ought to consider among other things where the bad fortune of either of these can bring him. Then always, other things being equal, he ought to take that course which, if in the end it is bad, will be least bitter.

Similarly, in his second letter to Vettori, he notes:

> All wise men, when it is possible for them not to gamble all their property, are glad not to do so, and considering the worst that can come of it, they consider where in the evil before them the smallest evil appears. Because the things of Fortune are all doubtful, they will join willingly that Fortune who, doing the worst she can, will bring the least harsh end.

These and other observations clearly indicate that Machiavelli had at least an intuitive understanding – if not a formal mathematical grasp – of political decision making under uncertainty. Besides outlining the main structure of a decisional problem (the framework of alternatives, states of nature, utilities, and probabilities), both statements also reflect a clear understanding of risk aversion and what would eventually be formulated by Savage (1951) as the minimax regret criterion.

[5] Political uncertainty had been present much earlier, at least as a concept, in the works of Herodotus (*The History*) and Thucydides (*History of the Peloponnesian War*), both from the fifth century BC. However, it was not recognized as a worthwhile theoretical element in political theory until much later. After Machiavelli's reasoned analysis of *Fortuna politica*, the first scientific seminal works were produced during the Enlightment, by de Condorcet (1785), de Laplace (1812), and Poisson (1837, 1853). It was no coincidence that some of these scholars were also pioneers in the development of rational choice theories of politics, an area of the discipline with foundations in political uncertainty.

political uncertainty during the French Revolution was no accident, because the explosion in mass popular participation (Ortega y Gasset 1957) increased political uncertainty to what at the time must have seemed an all-time high, so that an unprecedented number of common people for the first time became involved in the affairs of government – the entire nation, as Napoleon would say. It was Poisson's scientific exchange with Laplace concerning the uncertain behavior of the newly formed popular juries that produced the now famous Poisson distribution.[6]

In the twentieth century, many of the seminal works that deal with aspects of political uncertainty have done so in a fragmented way that has overlooked the powerful unifying role of uncertainty in politics.[7] For example, as I show later in this book, the same basic structure and properties of uncertainty are found in political phenomena as diverse as the implementation of government policies (Landau 1973; Pressman and Wildavsky 1973), the problem of collective action (Olson 1965; Sandler 1992), or the onset and development of conflict.[8] In each case the behavioral outcome of these political processes – whether policy implementation, collective action, war, or any of the others in figure 1.1 – is governed by the same pattern of uncertainty and is therefore explained by the same political principles. Similarly, the probabilistic forces (risk hazards) that govern the onset and termination of wars[9] follow analogous principles to the forces that govern the rise and fall of governmental coalitions (Cioffi-Revilla 1984; King et al. 1990). The specific political structures and forces differ across contexts (domestic and international), but only in details. The general principles they obey are uniform.

For as long as politics has existed – during the past five millennia of human history (Cioffi-Revilla 1996; De Laet 1994), possibly longer – uncertainty has played an important causal role in explaining political behavior, often under the guise of "incomplete information" at the individual or group level (Ferejohn and Kuklinski 1990; McKelvey and Ordeshook 1986, 1987; Niemi and Weisberg 1972). Today, in the post-Cold

[6] Unfortunately, modern classic works in probability (e.g. Feller 1968; Parzen 1960) maintain the mistaken impression that the Poisson model was somehow imported into the social sciences from physics (e.g. where it is used to model radioactive decay). In fact the opposite is true. The Poisson model and many aspects of probability theory are mathematical developments inspired by the investigation of social phenomena, similar to deontic logic, game theory, decision theory, fuzzy sets theory, some aspects of graph theory, and catastrophe theory. Regrettably, I am not aware of any comprehensive survey of these branches of mathematics inspired by human (as opposed to physical) phenomena.

[7] Specifically, I refer to the following classic works: Arrow (1951, 1956), Black (1958), de Pietri-Tonelli (1941, 1943), Deutsch (1966), Downs (1957), Pareto (1897), Richardson (1919, 1952, 1960a, 1960b), von Neumann and Morgenstern ([1947] 1972), and Wright (1942).

[8] See Cioffi-Revilla (1987), Cioffi-Revilla and Dacey (1988), Deutsch (1978: 159), and Wright (1942).

[9] See Cioffi-Revilla (1985a, 1985c, 1989), Richardson (1960a), and Weiss (1963).

War age, uncertainty is viewed as "a prime characteristic of turbulent politics" (Rosenau 1990: 8), and continues to play a central role in the production of "collective goods programs" (Baron 1996). Political uncertainty lies at the very foundations of contemporary positive political theory, providing a basis for standard utilitarian choice theories (Lalman et al. 1993) and others based on different mechanisms (e.g. Beer et al. 1987; Quattrone and Tversky 1988; Stone et al. 1995). Mounting empirical evidence also suggests that political uncertainty, or "lack of structural clarity" (Singer 1989), may also be a significant cause of war in the international system (Burns 1958; McClelland 1968; Midlarsky 1975). Uncertainty is just as critical for understanding political cooperation: "Agreements that are impossible to make under conditions of uncertainty may become feasible when uncertainty has been reduced," and "information-rich institutions that reduce uncertainty may make agreements possible in a future crisis" (Keohane 1984: 246–7). Political uncertainty, along with pressure for compromise, causes interest groups to create bureaucracies "that undermine effectiveness and insulate against democratic control" (Moe and Wilson 1994: 5). Fortunately for the continued growth of political science, uncertainty per se does not place politics outside the realm of systematic inquiry. Rather, it provides an opportunity for developing political theory and advancing our understanding.

1.1.3 *Uncertainty and contemporary political science*

Although uncertainty is widely acknowledged as a defining and perennial feature in most areas of general politics (figure 1.1), much of contemporary political science in fact still uses a "variance" paradigm (Casti 1990; Mohr 1982) that tends to overlook uncertainty. Perhaps this is done in order to maximize parsimony at the expense of realism (Occam's razor), consistent with Dahl's epigraph at the beginning of this chapter.[10] In most standard approaches, uncertainty is not accepted as a hard fact of political life, which the political scientist tries to understand in a systematic fashion.[11] Rather, most extant frameworks often equate randomness (behavior governed by probabilistic causality, which is scientifically knowable) with haphazard behavior (behavior not obeying any systematic scientific laws, which is

[10] Influential works promoting the variance paradigm have been Blalock (1989), Shively (1989), and Tufte (1974).

[11] Interestingly, the roots of this perspective are also to be found in the Enlightment. For example, according to Elster (1993: 45), "Tocqueville argued that in democratic societies, stability requires an effort to banish chance, as much as possible, from the world of politics," while "to Veyne's mind, the greatest danger for authoritarian societies is a universalistic system of social mobility in which promotion is by merit rather than by chance." See note 2 above.

unknowable).[12] This common confusion is lamentable, because it effectively diminishes the objective uncertainty of politics to the status of purely artificial statistical entities, such as error terms, measurement errors, or the scientifically unknowable. Today, even in physics – the "mother of causality in science" – the determinism of the traditional covariational framework has long been replaced by probabilistic causality (Bohm 1957), particularly when dealing with the most elementary phenomena (microfoundations). I believe the conclusion to be drawn from these developments is not that a science of politics is impossible simply because uncertainty is so ubiquitous, consequential, and ineradicable; but rather that our choice is between a rigorous understanding of politics, which must include uncertainty, or no understanding at all. God *does* play dice with politics, but the outcomes are patterned, not haphazard.

Informally, the philosopher of history D. H. Fischer has described probabilistic causality as follows:

> What is a causal explanation? It is an attempt to explain the occurrence of an event by reference to some of those antecedents which rendered its occurrence probable... A historian, and indeed a natural scientist, can never assert that an effect will always happen but only that it will probably happen. The connection between cause and effect is not necessary but probabilistic. (Fischer 1970: 183–4)

Probabilistic causality involves more than this, as I explain in this book. The task for scientists must be to recognize and explain patterns of politics with all its uncertainty. As I show in this book, the uncertainty of politics contains describable, explainable, and insightful patterns that can be understood scientifically. By contrast, haphazard behavior has neither logic nor pattern, and – by definition – is not knowable. An important goal for political science must be to systematically describe and explain the logic and pattern of political uncertainty across social phenomena.

Three research areas of the "divided discipline" of political science (Almond 1990) acknowledge uncertainty. The first, as I mentioned earlier, is in the use of utility and game-theoretic approaches to construct rational choice theories of politics, in which events, probabilities, utilities, acts, and states of nature provide building blocks for explaining politics.[13] The second area that considers uncertainty also focuses on political choice behavior, but from a variety of nonutilitarian perspectives,

[12] This misconception (e.g. Almond and Genco 1977; Singer and Wildavsky 1996: xiv) – that theories must be deterministic to be causal – owes much of its currency to Hempel's (1965) earlier work, in which determinist models were portrayed as the only form of theorizing. I hope to contribute to a better understanding of explanation in politics by using contemporary (post-Hempelian) probabilistic causality.

[13] See, for example, recent overviews by, Brams (1985), Lalman et al. (1993), Morrow (1994), Ordeshook (1986), and Weisberg (1986), based on the earlier pioneering works of Arrow (1951), Black (1958), Downs (1957), and Olson (1965).

including prospect theory (Kahneman and Tversky 1979) and choice mechanisms such as incremental satisfycing (Simon 1955), cognitive balancing (Heider 1958), or priming activation (Anderson 1983).[14] The third is in the use of stochastic approaches to construct probabilistic theories of politics, in which random variables and distribution functions provide building blocks for explaining politics (Casstevens and Casstevens 1989; Cioffi-Revilla 1989; King 1989a; Midlarsky 1981; Schrodt 1985). Studies in these three areas of political uncertainty have significantly but separately advanced our understanding of politics – a contribution that has been noted in some assessments of accumulation of knowledge in political science (Lichbach 1992).

The use of probabilistic causality in understanding uncertainty in some of the core areas of general politics (figure 1.1) has been significant for achieving scientific progress in those areas. For example, the probabilistic study of political coalitions has undergone significant progress using probabilistic causality, as demonstrated by comparing early works (e.g. Blondel 1968) with more recent probabilistic investigations (Cioffi-Revilla 1984; King et al. 1990; Warwick and Easton 1992). Similarly, but in a different area, today we know more than Lewis F. Richardson or Quincy Wright – the first modern scholars to scientifically study war – about conflicts of various magnitudes and their causes, both domestic and international. This has been thanks to numerous probabilistic studies during the past fifty years. Many of these advances in general politics – crossing the traditional sub-disciplinary boundaries of domestic and international politics – have provided valuable premises for the theory presented in this book.

In spite of recorded progress in separate areas of political science using decision-theoretic, game-theoretic, or probabilistic studies, several enduring problems motivate the need for a deeper understanding of political uncertainty that can only be provided by a general unified theory. First, that uncertainty is not simply present in political life, but that it plays a *defining* role in politics, must be more widely recognized and creatively exploited as fertile ground for unifying general core areas of theory and research. This property of political uncertainty also holds considerable promise for improving the design and implementation of policy in the public domain. General principles of political uncertainty must exist or uncertainty could not possibly be so ubiquitous in politics. Probabilistic causality is an epistemology that can protect political theory from extremes

[14] The set of decisional mechanisms involved in nonutilitarian political choice is still incomplete, but it is clearly nonempty. Below (section 1.2) I provide a brief inventory for heuristic purposes only, and later (chapter 7) I examine this multimode problem from a more analytical perspective.

such as nihilism and radical utilitarian reductionism; it should therefore be examined.

Second, game and decision theories of politics are rooted in the uncertain occurrence of events, not just in preferences, whether as decisional acts or as states of nature (Jeffrey 1983; Tsebelis 1989), not the reverse. Thus, without general principles that account directly for the substantive uncertainty of politics, politics is reduced to a system of utilitarian reductionism (Suppes 1984, ch. 8), which offers no explanation for political acts down to their causal roots. For example, pure expected-utility models of political decisions can overlook the consequential fact that probability – the prime measure of uncertainty – is *always* a nonlinear property of political events (von Neumann and Morgenstern [1947] 1972: §3, 8–10), and therefore often is counterintuitive as well.[15] By contrast, utility can be linear, even if in most practical situations utilities are nonlinear. Consequently, the uncertainty of events or outcomes in political decisions, particularly when these are viewed as "equilibrium solutions" (Riker 1990: 176), induces greater complexity and potential instability of equilibria than does their utility. Logically, therefore, the probabilistic foundations of politics must take precedence even over other such basic (microfoundational) phenomena as decisions. The explanation of utilitarian political behavior can be informed by a better understanding of its foundations, including other nonutilitarian causal mechanisms that may account for observed decisional acts. Significantly, as Green and Shapiro (1994: 185) emphasize, "to concede this is not to embrace the position that such phenomena cannot be studied scientifically, only that they [decisions] may be governed by causal mechanisms that are qualitatively different from those governing instrumental behavior." Both utilitarian and nonutilitarian foundations can be enriched by a theory of political uncertainty because strict determinism in political choice is a serious alternative only in extreme situations that – by their very nature – usually lack political interest. As I discuss below (section 1.2), the microfoundations of politics lie deeper than the level of decisions; they lie in the outcomes and events that underlie a decision, as well as in the outcomes and events that are framed within it.[16]

Third, while few would deny that the most consequential political phenomena – reforms, domestic turmoil, elections, coalition behavior, crises, or wars – occur with characteristic (diacritic) uncertainty, thus far political science as a discipline has lacked a general and empirically grounded

[15] Briefly, the strict nonlinearity of the probability of an event derives from the nature of causal conjunction and disjunction, neither one of which produces linear effects on political uncertainty, as I demonstrate in detail in chapter 6.

[16] As summarized by Maoz (1990: 39), "decision making is a process, not an act of choice," so it is necessarily composed of more elementary events and lotteries.

theory for explaining and testing diverse forms of observed political uncertainty, not just the simple Poisson case.[17] As I demonstrate in this book, political uncertainty has many forms and, remarkably, all of them operate within a uniform and elegant system of principles. While some of this uniformity and elegance may be mathematically induced, one cannot help but wonder whether they also arise from deeper, natural patterns that are found in human behavior, just as uniform and elegant principles exist in the physical world. As I show in each chapter, formal properties such as symmetry, duality, and fractal hierarchy are commonly present across levels of analysis in the study of political uncertainty. Paradoxically, therefore, while uncertainty itself may seem an enigmatic phenomenon, the principles of political uncertainty have remarkable clarity and precision.

Finally, contemporary political science, unlike economics, physics, musicology, or theology, does not yet seem to have a monopoly on the systematic investigation of its own subject matter – politics and government are also studied in anthropology, archeology, geography, sociology, economics, philosophy, and history. Nevertheless, a general theory of political uncertainty with principles that were applicable across different domains of political life in time and space – covering diverse political systems, processes, and events – would be useful in the ongoing explorations of related allied fields that look to political science for guidance. This broader interest regards the uncertain evolution of polities in various historical epochs and societies throughout the world – a vast area of systematic investigation that today is proceeding quite rapidly, independent of developments in contemporary political science. This broader interest in the understanding of political uncertainty extends primarily to the following disciplines:

- political history, investigating the causal logic structure and dynamic evolution of long-term political trends, as evidenced by the empirical record of individuals, groups, or institutions;[18]
- political anthropology and archeology, exploring the uncertain rise and decline of political societies and civilizations since the time of their remote origins in antiquity;[19]

[17] The misconception in social science that equates one-on-one the notion of randomness with the Poisson distribution is also common, as illustrated by the following statement based on Richardson's work: "If wars occur at random, one would expect the number of wars beginning each year to conform to the Poisson distribution" (Mansfield 1988: 28). This is a widespread misconception. As I show later in this book (chapter 4), *random* political phenomena are *not* always Poisson distributed (discussed also in Cioffi-Revilla 1985a, 1985b, 1985c; Horvath 1968; Petersen 1987, 1991; Weiss 1963), because randomness has many other interesting forms besides the Poisson case.

[18] See Adams ([1896] 1959), Burns (1960), Dawson (1978), Dray (1960), Floud (1973), Kennedy (1987), Mandelbaum (1942), Quigley (1961), Roberts (1993), Shirer (1960), Teggart (1942, [1925] 1977).

[19] See Binford (1965), Carneiro (1970), Culbert (1973), Flannery (1972), Marcus (1992), Renfrew (1979, 1984), Service (1975), Upham (1990), Willey (1991), Wright (1977).

- political sociology, examining the same uncertain political processes from a broader and more contemporary social perspective;[20]
- political economy, one of the founding social sciences that first recognized the significance of political uncertainty.[21]

These allied disciplines explore important aspects of the uncertain evolution of groups, states, empires, and other polities, but these investigations proceed without much assistance from contemporary political science. Results in these allied fields should also help inform the development of political theory. Thus, reliable insights on the multiple origins (pleogenesis) of the state as a stable form of political system (Carneiro 1970; Eisenstadt 1985; Roberts 1993) and its developmental evolutionary stages (Service 1975; Willey 1991), or findings on the uncertain pattern of rise and fall of states (Culbert 1973; Kennedy 1987; Olson 1982; Renfrew 1979), or inferences on the nature of the collective action problems that are involved in all of the events above (Arrow 1951; Coleman 1973; Olson 1965; Sandler 1992) represent developments that obviously should not be ignored by political science. Conversely, these other allied disciplines should not ignore fundamental developments in political science. A general theory of politics founded on uncertainty could help provide a language for interdisciplinary dialog and further theoretical growth.

1.2 Areas of political uncertainty

How is political uncertainty manifested? What unites and separates its different manifestations? Do types of uncertainty in areas of politics suggest guidelines for theory building? Are some types of political uncertainty more common, and, if so, why? Political uncertainty comes in too many idiosyncratic varieties to specify in full detail, nor is it necessary to do so. However, to begin systematizing this puzzle, it is useful to identify several kinds of uncertainty that occur across areas of political science. Later (section 1.3) I shall use the inventory which follows to develop a more formal typology.

Uncertainty in political probabilities. Uncertainty occurs explicitly in the following important political probabilities: the "probability of winning an election" (Brams 1985), the "probability of integration" (Deutsch 1978), the "probability of policy implementation" (Morgan and Henrion 1990; Pressman and Wildavsky 1973), the "probability of domes-

[20] See Blalock (1989), Chase-Dunn and Hall (1996), Coleman (1973), Davies (1962), Eisenstadt (1985, [1963] 1993), Parsons (1969), Skocpol and Somers (1980), Sorokin (1937).

[21] See Arrow (1951, 1956), de Condorcet (1785), de Pietri-Tonelli (1941, 1943), Granger (1956), Olson (1965, 1982), Sandler (1992), Schelling (1978), Schofield (1975).

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