

Models with Meaning:  
Reimagining the Science of Politics

Prospectus

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# Project Background

## The Argument

The use of models has come to dominate much of the scientific study of politics. Political scientists use models—formal and informal, statistical and qualitative—to investigate and illuminate causal mechanisms, generate comparative statics, and understand the conditions under which certain outcomes are expected to occur. While the use of models in political science has grown dramatically, our understanding of the role or function that models play in the scientific enterprise has not kept pace.

Throughout much of the discipline's history, theoretical models and data analytical models were separate. Theoretical modelling sometimes informed data analysis and vice versa, but with few exceptions, the field was divided into theorists and empiricists. As models in political science became more prevalent, the uses to which we put those models shifted significantly. Today, the emphasis is on using models to generate *testable* predictions that serve as hypotheses for subsequent data analysis, the results of which are often interpreted as tests of the model. The field has created a hierarchy of models where those that are “tested” are valued more highly than those that are not tied to a regression analysis.

While much ink has been spilled arguing for this test-the-model approach to the study of political science, little attention has been paid to justifying and rationalizing the method. On the rare occasions that justification has been attempted, the results have been maddeningly vague. Why test predictions from a deductive, and thus truth-preserving, system? What can be learned from such a test? If a prediction is not confirmed, are assumptions already known to be false to blame? These questions are never addressed in a satisfactory way.

Lack of a suitable justification for model testing is not the only reason to revisit the role of models in political science. The emphasis on model testing has led to a distortion of both the modelling process and the art of data analysis. Preferring models that predict well has led the field to devalue the other important contributions that models can make to understanding the political world. The emphasis on using data analysis as a means for testing models ignores the role data analysis can play in producing empirical

generalizations that often serve as a spur to further modelling efforts.

Rethinking the use of models in political science is of critical importance, as a generation of scholars is being trained to think about science in an outdated and inadequate manner. The success of the Empirical Implications of Theoretical Models (EITM) project has highlighted the fact that while political scientists are using models more than ever before, we are still thinking in old ways. The goal of this book is to put the discipline's understanding of the role that models play in political science research on a firmer foundation. To that end, we address both theoretical models and statistical models, as well as how to integrate the two in a justifiable manner.

The book proposes reimagining the way political scientists perceive, utilize, and assess models. The main argument of the book is that models should be seen as objects and thus neither true nor false. We argue that models should be evaluated in the same fashion as mechanical models are evaluated in the physical sciences—good models are useful for particular purposes.

The book consists of two parts. The first part establishes that no social scientific endeavor is “philosophy-free” and characterizes the “science” in the current state of political science. We then turn to our perspective on how to think about political science as a model-based enterprise. The second part of the book focuses on theoretical and statistical models in separate chapters, tracing the implications of our model-centric approach and working through numerous examples. The final substantive chapter is devoted to providing a framework for the integration of theoretical and statistical models.

## **Intended Readership**

This book will appeal to undergraduates, graduate students, and faculty. The primary student audience comprises those taking “scope and methods” -type graduate and advanced undergraduate courses in political science and economics. The book will also appeal to faculty members of all backgrounds, especially those who use models, whether formal or informal, in their research. The timeliness of the topic, given the popularity of the NSF-supported EITM program, will increase the audience for the book. We believe, for instance, that advanced graduate students attending the yearly ETIM workshops will find the book useful. In addition, our audience will be widened by the book's contribution to the ongoing discussion regarding research methods taking

place in books such as King, Keohane, and Verba's *Designing Social Inquiry* (Princeton 1994) and Brady and Collier's *Rethinking Social Inquiry* (Rowman & Littlefield 2004), as well as the 2004 symposium in *Perspectives on Politics*.

## Similar Books

Morton's *Methods & Models* (Cambridge 1999) is the book to which our manuscript is likely to be compared. Our book differs from Morton's in three important ways. First, we place the "fundamentals of empirical evaluation" in historical context and demonstrate that, contrary to popular belief, these techniques are not "philosophy-free." Second, we look at the role that theoretical and statistical models play in political science rather than focusing solely on formal models. Third, we argue for a more unified approach to the use of models in political science that goes beyond training graduate students in "political science as it is currently practiced" (p. 293).

This book may also be usefully compared to *Designing Social Inquiry (D.S.I.)* in the sense that the first part of *D.S.I.* lays out a philosophically coherent approach to social scientific research. Whereas *Rethinking Social Inquiry* serves as a counterpoint to the second half of *D.S.I.*, our book will serve as a counterpoint to the first half of *D.S.I.* We argue for a radically different take on the social scientific endeavor, one that highlights the centrality of models.

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# Chapter Summaries

## Chapter 1: Introduction

The introductory chapter argues that the way political scientists think about models has become untenable and that a new approach is required. In direct contrast with much of the discipline's history, models are now valued by many only to the extent that they generate testable hypotheses, which are subsequently validated in regression-type equations. We argue that this practice distorts both the modelling process and the art of data analysis.

In constructing a new model-based approach to the study of political science, we draw on recent developments in the philosophy of science. Many political scientists believe that philosophy has nothing to teach the discipline and should play no role in graduate training, but this is a misreading of the discipline's history. The current practice in political science is not simply an application of logic; it is a direct implication of 50-year-old philosophy of science. We show that one of the earliest and most influential modelers in political science, William Riker, drew explicitly on the philosophy of science of his day, and we do the same.

In place of current practice, we offer a model-based approach. The key is to think of models as objects and thus neither true nor false. The implications of this simple change are profound. In the chapters to follow, we define what a model is, trace the implications of our account for both theoretical models and statistical models, and finally describe how our view of models helps political scientists integrate theoretical and statistical models in a coherent and justifiable fashion.

## Chapter 2: The Science in Political Science

The goal of this chapter is to present a snapshot of where political science is today in terms of its understanding of the roles and uses of models and to describe how political scientists arrived at this point. To do this, we trace the development of "positive" political science from its roots in logical positivism through the work of William Riker to the modern EITM project. The argument is sketched below.

Scientific theories, according to the logical positivists, comprise an abstract logical calculus and a set of rules, known as correspondence rules, that assign an empirical content to the calculus. Theory testing for logical positivists consists of deducing an implication from the logical calculus and testing it. This method is known as hypothetico-deductivism (H-D).

It happens that the mathematical models used by social scientists are also in the form of a logical calculus. Over time, models assumed the place that theories had held in the logical positivist programme. This usurpation had two negative consequences. First, social scientists assumed that models should be tested in the same way that the logical positivists claimed theories should be tested. Second, social scientists confused the terms “theory” and “model,” and this confusion has yet to be sorted out.

The connection between the logical positivists and political science is found in the writings of William Riker, a pioneer in the use of rational choice theory in the study of politics. Riker, citing the leading logical positivists (Nagel and Hempel, among others), argues for an explicitly “positivistic” or axiomatic view of science. To explain an event, according to Riker, is to “subsume it under a covering law that, in turn, is encased in a [deductive] theory.” The idea of a covering law comes from Hempel and Oppenheim’s “deductive-nomological” model of explanation, which was the first complete version of hypothetico-deductivism.

We provide dozens of modern examples that demonstrate that H-D is considered the “gold standard” by many of the discipline’s leading scholars. We detail the many deficiencies of H-D and demonstrate that learning about a model is logically impossible under H-D. This discussion sets the stage for chapter 3.

### **Chapter 3: What Is a Model?**

In this chapter, we lay out a coherent approach to thinking about models, how models are used, and how we should assess models. Our argument rests on an analogy borrowed from the semantic view of theories. Maps are models. Maps are not reality, nor are they isomorphic to reality. Rather, they are representations of reality. Furthermore, maps are physical objects, not linguistic entities. It therefore does not make sense to ask whether maps are true or false any more than it makes sense to ask if other physical objects

— tea kettles, toy airplanes, or gas grills — are true or false.

Given the above, the question to ask of a map is not whether it is true or false, but whether the map is similar to the world. The question to ask is whether the model is similar enough to the world to be useful for a specific purpose. A map of a subway line may have little similarity to the geography of a city, and yet be similar enough to the rapid transit system to make it a necessary appendage for all commuters. That is, they are *purpose relative*.

If theories *were* linguistic entities, it would make sense to ask whether they are true or false, just as any statement can be true or false. What we argue is that political scientists should think of models more like representational objects and less like linguistic entities. That is, we argue that models in political science should be viewed as maps rather than statements, and we should be asking of our models whether they are similar enough to the world *to be used for specific purposes*.

## Chapter 4: Theoretical Models

Chapter 4 traces the implications of the argument put forth in the previous chapter for theoretical models. Given that we have argued that models should be assessed for their usefulness for a specific purpose, it is necessary to detail the purposes to which a model can be put and how we can judge whether or not a model is useful. At the most basic level, models can serve in any one (or more) of five different roles: foundational (provide insights into a general class of problems), structural (organize empirical generalizations or known facts), generative (produce non-obvious directions for further research), explicative (explore causal mechanisms), and predictive (forecast events or outcomes).

For each of the uses outlined above, we provide concrete examples drawn from the literature, many of which take on new meaning viewed through our lens. These include Downs's spatial model, Arrow's Theorem, Baron and Ferejohn's legislative bargaining model, Achen's voting model, Romer and Rosenthal's budgeting model, Knight's judicial review models, and Lewis-Beck and Rice's work on presidential election outcomes.

Model assessment begins with asking whether or not the model achieves its stated purpose. Models that generate a significant number of interesting statements or counterfactuals are successful, as are models that are routinely

used as building blocks for further inquiry. At the same time, it is quite possible to construct models that generate uninteresting, vapid, or narrow results. Models that are useful should survive regardless of their ability to predict, and models that are not useful should simply die from neglect, again, regardless of the ability to predict.

## **Chapter 5: Statistical Models**

Changing how political scientists view models has implications for statistical analysis as well as theoretical work. The chapter begins with a discussion of how the hypothetico-deductive nature of most political science research prevents statistical theory confirmation. The problem is that two inferences must be made. The first is between the data and the hypothesis being tested, and the second is between the hypothesis being tested and the theory from from the hypothesis was deduced. We show that this two-level inference problem cannot be overcome regardless of the inferential approach—classical or Bayesian—one takes.

Having established that H-D is as much of a problem for statistical models as it is for theoretical models, we turn to the different uses to which political scientists can put statistical models. These uses include structural modelling (the analysis of mechanisms), causal modelling (determining the effect of a cause), forecasting (predicting an event or the frequency of events), and description (an accessible understanding of the data set at hand). As in the previous chapter, we provide extensive examples drawn from the literature. We use these examples to demonstrate the use and evaluation of the four different model types listed above.

## **Chapter 6: Integrating Models and Data**

In the penultimate chapter, we provide guidelines for researchers interested in combining theoretical models and statistical models. Far from providing a “cookbook” approach to social science research, we instead provide a general framework for integrating models and data. We discuss the conditions under which integration is a useful activity, and more importantly, the conditions under which it is not. For example, a theoretical model designed to generalize an existing set of models is not more useful when paired with a statistical

model. Where integration is sensible, we provide practical advice on the best ways to proceed. Our prescriptions are tied specifically to the types of models the researcher wishes to integrate. Finally, we offer specific strategies for evaluating the successful integration of theoretical and statistical models, which is in keeping with our focus on the usefulness criterion.

## **Chapter 7: Conclusion**

The concluding chapter performs two tasks. First, we summarize our model-centric approach to the study of politics and reiterate why it makes sense for political scientists to embrace this approach and move away from a focus on “model testing”: viewing models as useful for a particular purpose allows a wider range of evidence to be considered and frees empirical investigation from its current devotion to statistical significance. Second, we draw out the implications of our argument for the training of future scholars. We argue, for instance, that graduate training programs should take a unified approach to understanding and using models that includes formal theory and methods courses. Reimagining political science is possible, and this book shows the way forward.