Review of Clarke and Primo's *A Model Discipline: Political Science and The Logic of Representations*[1]

Jonathan Woon
University of Pittsburgh

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> "If it disagrees with experiment, it is wrong. In that simple statement is the key to science." --Richard Feynman[2]

Is political science really science? We hear this question from physicists, chemists, and even computer scientists. We also hear it from politicians, the media, and the general public, who frequently challenge the scientific legitimacy of our discipline. Formulating a coherent answer provides us a means not only to respond to our discipline's critics (at least on a principled, intellectual level), but also to potentially reshape and improve the practice of political science itself.

One common understanding of scientific knowledge is that it develops from proposing and testing theories. That is, science is defined chiefly by its commitment to subject explanations and hypotheses to empirical tests. This is the view of science summarized by Richard Feynman in the epigraph. Against this conventional wisdom, Clarke and Primo argue in *A Model Discipline* that political scientists should adopt the position that the central feature of science is instead its use of models. In their view, testing theoretical models is also unnecessary and even illogical. Their book is a forceful, extended argument in support of these claims.

While the book is not aimed directly at experimentalists—indeed, they explicitly avoid any extended discussion of how experimentation relates to their model-based view—and is perhaps most obviously of interest to experimentalists in the game theoretic tradition, I expect that experimentalists of all stripes will be interested in much of what Clarke and Primo have to say. Their work will surely be incorporated into first-year graduate scope and methods or research design syllabi and will influence the way that new generations of political scientists think about their research. I also expect that their book will generate substantial discussion as scholars react to their provocative thesis and this dialogue plays out, directly and indirectly, in the pages of our discipline's leading journals.

Clarke and Primo set out to articulate a clear framework for thinking about what models are and for understanding the many roles that they play. On this front, they are entirely successful. Their mantra is that "Models are seen as objects, thus neither true nor false, and are judged by their usefulness for a particular purpose" (p. 1).

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[1] Published in *The Experimental Political Scientist*, Volume 3, Issue 2.
[2] A brief video can be found on YouTube at http://www.youtube.com/watch?v=b240PGCMwV0.

Their classification scheme divides models into theoretical and empirical varieties. The purposes of theoretical models (discussed in chapter 4) are to provide foundations, to organize known facts, to explore mechanisms, or to predict (that is, to generate testable implications). The purposes of empirical models (discussed in chapter 5) are to predict, to measure, to characterize, or to test theories. While the book-length argument builds on their *Perspectives on Politics* article (Clarke and Primo 2007), there is also good deal of new material (notably, the chapter 5 on empirical models and chapter 6 on explanation); their stance against conventional theory testing also intensifies.

Not content with enhancing our understanding of science by providing a thorough definition of what a model is and a useful typology for the variety of intended purposes, Clarke and Primo embark on a more ambitious, radical mission: to break the "spell that theoretical model testing holds over the discipline" (p. 181). In this way, they stake out an alternative methodological position to the EITM movement's response to Green and Shapiro's *Pathologies of Rational Choice*. Where the EITM movement embraced the charge to test the implications of theoretical models, Clarke and Primo instead contend that doing so is mostly unnecessary and, furthermore, that it makes no sense at all.

The entire book can thus be seen as a sustained effort to undermine the central place that theory-testing has in the way that political scientists approach their research. In chapter 2, they draw from a variety of prominent publications throughout political science to show that the dominant view of science within the discipline is indeed a form of Hypothetico-Deductivism (H-D): propose a theory, deduce hypotheses, and test the hypotheses with data. They discuss the many ways in which H-D is flawed, not just to show that H-D lacks a legitimate claim as the universal foundation for science, but to discredit it entirely as a valid model of the scientific process. In chapter 3, they discuss the analogy of a model as a map and elaborate the key characteristics of models, drawing heavily on developments in the philosophy of science (and the semantic view of theories) to support their contention that models should be treated as objects and are neither true nor false. In chapter 4, they argue that most theoretical models should be evaluated not in terms of their empirical verisimilitude but in terms of the number and importance of the insights they generate. In chapter 5, in discussing the "illogic" of theory-testing, they stress that this is the purpose for which empirical models are *least* suited because "pairing a theoretical model with an empirical model, regardless of the method of inference, cannot overcome the problems generated by H-D" (p. 117)—doing so amounts to committing the logical fallacy of affirming the consequent and therefore cannot be justified as a logical foundation for scientific practice.

Clarke and Primo are entirely right about the flaws of H-D. It is indisputable that it fails to provide a universal foundation for scientific inquiry, either in its verificationist form (due to the problem of induction) or its naïve falsificationist form (due to the problem of auxiliary hypotheses, as embodied in the Duhem-Quine Thesis). Consequently, slavish adherence to H-D as *the* model of science along with

any insistence, in journals and elsewhere, that all good research must adhere to this formula unduly limits what we can discover and understand about the political world. Progress comes in many forms: the identification of empirical regularities may come from the investigation of casual hunches or it may come from subsequent experimental analyses that probe why the data failed to support a strong theoretical hypothesis, new insights may be generated from sparse theoretical models or complex computational models that appear far removed from reality, and new measures or statistical methods may provide new ways of interpreting old data. Science is a big tent, and Clarke and Primo rightly emphasize the necessity of bringing models to bear on each of these purposes.

But their case against theory testing is overstated. Some form of H-D remains a *useful model* of science even if it is, like all models, only partially accurate. Like the five-paragraph essay, it is a useful way to teach students about important features of scientific inquiry and it provides a useful structure for many kinds of research activities. The problem occurs when this useful model is anointed as the one, true model.

The basic goal of theory testing also remains justified in their framework, provided that the nature of theory testing is properly understood. If we accept their view that models are neither true nor false, have limited accuracy, and are purpose-relative, then of course it makes no sense to "test" a model to determine whether it is "true" or "false." Clarke and Primo's insistence that this is what is normally meant by "theory testing" is therefore a bit puzzling. But if, in their framework, a model is intended to have limited accuracy, it is natural to ask: *how accurate is it for its intended purpose?* In other words, theory testing is intended not to establish whether a model is true or false, but the degree to which it *corresponds* to the features of the real world necessary to explain it.

Theory testing for the purposes of assessing this correspondence is necessary because of our ignorance about the world. Such ignorance is absent in the case of their favorite subway map analogy. The subway map does not need to be tested because its makers *already know* that it is an accurate representation of the order of subway stops and where different lines meet. But what if this is not known? The more typical case is one where the modeler has limited or partial information. Suppose instead that you are making a subway map and remember the names of only a few stops, but neither their relation to one another nor the stops where different lines meet. You make your best guess as to what the subway map should look like. But you have no way of knowing whether your map is accurate (for its intended purpose) unless you check it against real-world experience (or another map). As you "test" your map, you learn the respects in which your map was accurate and gather new information to determine the ways in which your map needs to be revised. So too with models or theories, which are best guesses about the relevant features of the social and political world that are needed to explain a particular phenomenon, but because they are constructed with partial information must be checked against observation and experiment.

The "theory first, data second" approach just described is one way to develop a theory, but the lack of information with which to construct (even partially) accurate models in the first place suggests that a "data first, theory second" approach can be useful as well. This is essentially what Clarke and Primo advocate in chapter 6. They argue that empirical models can and should be used for characterization and measurement; such models allow us to make better sense of available data and to see a clearer picture of reality, but in and of themselves cannot provide explanations. For Clarke and Primo, the only sensible way to join theoretical and empirical models is to use theoretical models to provide explanations for empirical findings, either in the form of a unifying framework or in explicating a causal mechanism. Here, they explicitly challenge experimentalists to not be content with identifying causal effects.

But no matter how many empirical regularities we might establish and no matter how well a theoretical model seems to provide an explanation, our remaining ingorance still implies an important role for theory testing. Theoretical models must necessarily posit assumptions that cannot be known a priori to be accurate. For example, in game theoretic or rational choice models we cannot completely know whether preferences in a model correspond to agents' preferences in the real world, and we cannot completely know whether real world agents make decisions in the ways prescribed or approximated by such models. Because these unobserved features are often critical to the results of theoretical analyses and because their degree of accuracy remains uncertain, it is necessary to check both assumptions and implications against observation or experiment—that is, to test them.

The "theory first" and "data first" approaches are not incompatible. Choosing between them is unnecessary, as both are vital parts of the scientific research process. We need empirical models to interpret increasingly complex data and to establish empirical regularities, thereby increasing our knowledge of what the world looks like. We can then explain these regularities with theoretical models, but a substantial amount of work must be done to explore and develop the theoretical machinery before it is sufficiently useful to apply it to a specific phenomenon. We must still check theories against new data. Testing the empirical implications of theoretical models will lead to the discovery of new regularities that may or may not fit previous theoretical models. This constant interplay between theory and data is what game theorist Roger Myerson refers to as a "*modeling dialogue*…a process in which theorists and empiricists work together interactively on the difficult task of finding tractable models that capture and clarify the important aspects of real situations" (1992, p. 64, emphasis original). I do not know whether anything resembling the notion of a modeling dialogue is endorsed by philosophers of science, but it seems like an appropriate middle ground (embraced by at least a few political scientists, e.g., Powell 1999, Slantchev 2012) upon which to base an understanding of the relationship between theory and data.

On the whole, Clarke and Primo's call to broaden what political scientists consider "good work" or what we consider to be "scientific" will resonate clearly with a wide variety of scholars. *A Model Discipline* provides an expansive framework for thinking about the role of models and how we should evaluate them. It makes a compelling case that models are invaluable tools for scientific inquiry and that theoretical models need not be tested to be useful. Even though experimentation does not play directly into their discussion, it would be intriguing to think of an experiment as a kind of model and to consider how this experiment-as-model would fit in their framework. The book raises important epistemological issues regarding the foundations of knowledge and challenges political scientists to think critically about how such foundations shape our work, whether that work is experimental, observational, methodological, or theoretical.

References

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