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Chapter 1

Introduction

In this book, we explore the relationship between the quantitative and qualitative research traditions in the social sciences, with particular emphasis on political science and sociology. We do so by identifying various ways in which the traditions differ. They contrast across numerous areas of methodology, ranging from type of research question, to mode of data analysis, to method of inference. We suggest that these differences are systematically and coherently related to one another such that it is meaningful to speak of distinct quantitative and qualitative research paradigms.

We treat the quantitative and qualitative traditions as alternative cultures. Each has its own values, beliefs, and norms. Each is associated with distinctive research procedures and practices. Communication within a given culture tends to be fluid and productive. Communication across cultures, however, tends to be difficult and marked by misunderstanding. When scholars from one tradition offer their insights to members of the other tradition, the advice is often viewed as unhelpful and inappropriate. The dissonance between the alternative cultures is seen with the miscommunication, skepticism, and frustration that sometimes mark encounters between quantitative and qualitative researchers. At its core, we suggest, the quantitative–qualitative disputation in the social sciences is really a clash of cultures.

Like all cultures, the quantitative and qualitative ones are not monolithic blocks (see Sewell (2005) for a good discussion of the concept of "culture"). They are loosely integrated traditions, and they contain internal contradictions and contestation. The particular orientations and practices that compose these cultures have changed over time, and they continue to evolve today. The two cultures are not hermetically sealed from one another

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but rather are permeable and permit boundary crossing. Nevertheless, they are *relatively* coherent systems of meaning and practice. They feature many readily identifiable values, beliefs, norms, and procedures.

By emphasizing differences between qualitative and quantitative research, this book stands in contrast to King, Keohane, and Verba's work, *Designing Social Inquiry: Scientific Inference in Qualitative Research*. They famously argue that "the differences between the quantitative and qualitative traditions are only stylistic and are methodologically and substantively unimportant" (1994, 4). They believe that the two traditions share a single logic of inference, one that can be largely summarized in terms of the norms of statistical analysis. The differences between the two traditions that they identify concern surface traits, especially the use of numbers versus words.

We reject the assumption that a single logic of inference founded on statistical norms guides both quantitative and qualitative research. Nor do we believe that the quantitative-qualitative distinction revolves around the use of numbers versus words. Instead, we see differences in basic orientations to research, such as whether one mainly uses within-case analysis to make inferences about individual cases (as qualitative researchers do) or whether one mainly uses cross-case analysis to make inferences about populations (as quantitative researchers do). We even suggest that the two traditions are best understood as drawing on alternative mathematical foundations: quantitative research is grounded in inferential statistics (i.e., probability and statistical theory), whereas qualitative research is (often implicitly) rooted in logic and set theory. Viewing the traditions in light of these contrasting mathematical foundations helps to make sense of many differences that we discuss in this book.

In pointing out basic divergences, our goal is not to drive a wedge between the quantitative and qualitative research paradigms. To the contrary, we seek to facilitate communication and cooperation between scholars associated with the different paradigms. We believe that mutual understanding must be founded upon recognition and appreciation of differences, including an understanding of contrasting strengths and weaknesses. We advocate boundary crossing and mixed-method research when questions require analysts to pursue goals characteristic to both the qualitative and quantitative paradigms. At the same time, we respect and do not view as inherently inferior research that stays within its own paradigm. There is a place for quantitative, qualitative, and mixed-method research in the social sciences.

One lesson that grows out of this book is that asking whether quantitative or qualitative research is superior to the other is not a useful question. King, Keohane, and Verba (1994, 5–6) also state that "neither quantitative nor qualitative research is superior to the other." However, they arrive

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at this conclusion only because they believe qualitative methods must be used as a last resort when statistical analysis is not possible.[1] By contrast, we believe that quantitative and qualitative techniques are appropriate for different research tasks and are designed to achieve different research goals. The selection of quantitative versus qualitative techniques is not a matter of the data that happen to be available. Rather, for some research goals, quantitative methods are more appropriate than qualitative techniques, and qualitative methods are more appropriate than quantitative methods for other research questions. Depending on the task, of course, it may well be the case that the analyst must draw on *both* kinds of techniques to achieve his or her goal. Mixed-method research that combines quantitative and qualitative techniques is essential for many complex research projects whose goals require analysts to draw on the orientations and characteristic strengths of both traditions.

Like some anthropologists who study other cultures, we seek to make sense of research practices while maintaining a kind of neutrality about them. Our goals are mainly descriptive, not primarily normative or prescriptive. Certainly, the methods of the two traditions are not beyond criticism. However, we believe that the critique and reformulation of methods works best *within* a given tradition. Thus, statistical methodologists are the scholars most qualified to improve statistical methods, whereas qualitative methodologists are the scholars best positioned to improve qualitative methods. We find that many existing "cross-cultural" criticisms, such as critiques of quantitative research by qualitative scholars, are not appropriate because they ignore the basic goals and purposes of research in that tradition. What appears to be problematic through one set of glasses may make good sense through the lenses of the other tradition.

In telling a tale of these two cultures, we often end up considering how lesser-known and implicit qualitative assumptions and practices differ from well-known and carefully codified quantitative ones. This approach is a by-product of the fact that quantitative methods, when compared to qualitative methods, are more explicitly and systematically developed in the social sciences. Quantitative methods are better known, and the quantitative culture is, no doubt, the more dominant of the two cultures within most social science fields. As such we devote more space to a discussion of qualitative methods. Yet the approach throughout remains clarifying what is distinctive about *both* traditions while avoiding invidious comparisons.

[1] As they put it, "Since many subjects of interest to social scientists cannot be meaningfully formulated in ways that permit statistical testing of hypotheses with quantitative data, we do not wish to encourage the exclusive use of quantitative techniques" (King, Keohane, and Verba 1994, 6).

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Why Two Cultures?

King, Keohane, and Verba suggest that there is a single logic of inference—one basic culture—that characterizes all social science, both quantitative and qualitative. An alternative, "many cultures" view might hold that the quantitative and qualitative traditions are heterogeneous groups with many variants and subcultures within each. Indeed, each paradigm—like any culture—features big divisions as well as smaller ones. For example, historically within the statistical paradigm, one big division was between the classical, frequentist school and the Bayesian approach to statistical analysis (e.g., see Freedman 2010 and Jackman 2009). Other smaller divisions—over issues such as the utility of fixed effect models or the number of independent variables that should be included in a statistical model—exist among scholars who may agree on larger issues such as the frequentist versus Bayesian debate.

Likewise, the qualitative paradigm includes many divisions. Perhaps the biggest split concerns the differences between scholars who work broadly within the behavioral tradition and who are centrally concerned with causal inference versus scholars associated with various interpretive approaches. These two big tents each have their own subdivisions. For example, qualitative scholars who embrace the goal of causal inference may disagree on the relative importance of specific tools, such as counterfactual analysis or Qualitative Comparative Analysis (QCA). Likewise, within the interpretive camp, there are differences between scholars who embrace interpretive analysis à la Clifford Geertz (1973) and scholars who advocate critical theory and poststructural approaches.

Our two cultures approach shares certain similarities with King, Keohane, and Verba's one culture approach, especially in that we focus on research that is centrally oriented toward causal inference and generalization. The methods and techniques that we discuss are all intended to be used to make valid scientific inferences. The employment of scientific methods for the generation of valid causal inferences, above all else, unites the two research traditions discussed in this book.

One consequence of our focus on causal inference is that important currents within the qualitative paradigm drop out of the analysis. In particular, interpretive approaches are not featured in our two cultures argument. These approaches are usually less centrally concerned with causal analysis; they focus more heavily on other research goals, such as elucidating the meaning of behavior or critiquing the use of power. The interpretive tradition has its own leading norms and practices, which differ in basic ways from the quantitative and qualitative paradigms that we study in this book. One could certainly write another book focusing on the ways in which the interpretive

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culture contrasts with the "causal inference" cultures that we discuss. Such a book would bring to light fundamental clashes over epistemology and ontology that exist within parts of the social sciences. In this book, however, we focus on scholars who agree on many basic issues of epistemology and ontology, including the centrality of causal analysis for understanding the social world.[2]

There are various reasons why it makes sense to focus on these two traditions of research. For one thing, the qualitative–quantitative distinction is built into nearly everyone's vocabulary in the social sciences, and it serves as a common point of reference for distinguishing different kinds of work. Nearly all scholars speak of qualitative versus quantitative research, though they may not understand that contrast in the same way. Even scholars, such as ourselves, who feel that the labels "quantitative" and "qualitative" are quite inadequate for capturing the most salient differences between the two traditions still feel compelled to use this terminology.

Furthermore, social scientists have organized themselves—formally and informally—into quantitative and qualitative research communities. In political science, there are two methodology sections, the Section on Political Methodology, which represents quantitative methodology, and the newer Section on Qualitative and Multi-Method Research. In sociology, the Section on Methodology stands for mainly quantitative methods, whereas the kinds of qualitative methods that we discuss are associated with the Section on Comparative and Historical Sociology. Leading training institutes reflect the two culture division as well: the Interuniversity Consortium for Political and Social Research (ICPSR) provides almost exclusively quantitative training, whereas the Institute for Qualitative and Multi-Method Research (IQMR) focuses on qualitative and mixed-method research.

Our goal in this book is not to turn quantitative researchers into qualitative researchers, or vice versa. However, we do seek to increase the number of scholars who understand the norms and practices—and their rationales—of both cultures of research. We believe that overcoming the quantitative-qualitative division in the social sciences is significantly a matter of better understanding the methodological differences between these two traditions along with the reasons why those differences exist.

[2] Our decision to not treat interpretive approaches in this book should not be taken as evidence that we see no place for these approaches in the social sciences. In fact, our two cultures argument is, broadly speaking, an exercise in description and interpretation. We seek to elucidate the practices and associated meanings of two relatively coherent cultures of research. Thus, while interpretive analysts will not find their tradition of research represented in the qualitative culture that we describe, they nonetheless will find many of the tools of their tradition put to use in our analysis.

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Characterizing and Comparing the Two Cultures

In discussing the quantitative and qualitative traditions, we draw on various data sources and focus on certain kinds of practices and not others. In this section, we briefly describe our approach to characterizing and comparing the two cultures.

Types of Data

Our characterizations of research practices derive from three kinds of data. First, we rely on the literature concerning quantitative and qualitative methodology. Methodologists often do an excellent job of making explicit the research techniques used in a given tradition and the rationale behind these techniques. For the quantitative paradigm, we make much use of textbooks written by prominent scholars in the fields of statistics, econometrics, and quantitative social science. Our presentation draws heavily on literature concerning the Neyman-Rubin-Holland model and the associated "potential outcomes" framework (e.g., Angrist and Pischke 2009, Berk 2004, Freedman 2010, and Morgan and Winship 2007). We also reference the literature on experimental research in the social sciences when relevant. For the qualitative paradigm, our discussion is grounded in the "classic cannon" of work associated with scholars such as Giovanni Sartori, Alexander George, and David Collier. In addition, we utilize many insights from the work of Charles Ragin. At the end of each individual chapter, we recommend books and articles that one might read to explore further the differences discussed in the chapter.

Second, we use exemplary quantitative and qualitative studies to illustrate the distinctions that we discuss in the individual chapters. These studies are not only useful as examples, but also as sources of insight about characteristic practices in the two cultures. Some of these exemplars engage topics that are important to both research cultures, such as the study of democracy. Looking at the same topic as treated in exemplary studies from each culture allows us to illustrate more vividly the different kinds of questions and methods that animate the two cultures. At the same time, however, one of our key points is that some topics are more easily addressed in one culture than the other. Hence, some of our examples do not extend across both cultures.

Third, we also sampled and coded a large number of research articles from leading journals in political science and sociology. The items coded and the results are summarized in the appendix. This large-N sample was intended to be representative of good work—as defined by appearance in major journals in political science and sociology. The sample provides a further basis for generalizing about leading research practices. For example, when we make assertions such as the claim that quantitative researchers

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often include several control variables in their statistical models, it is based on results from our survey.

Explicit and Implicit Practices

Our discussion focuses on the dominant methodological practices in the quantitative and qualitative paradigms. In general, when discussing quantitative research, we focus on *explicit* practices that follow well-established advice from the methodological literature. Quantitative research methods and procedures are often clearly specified, and quantitative researchers often quite explicitly follow these well-formulated methodological ideas.

At many points, nevertheless, we discuss assumptions and procedures in the quantitative tradition that are usually implicit. The comparison of quantitative research to qualitative research calls attention to underlying norms and practices in both traditions that otherwise might go unnoticed. For example, by considering the asymmetry assumptions of many qualitative methods, the extent to which most quantitative methods implicitly assume symmetric relationships becomes more visible. Systematic comparison of the paradigms helps bring to light research practices that are often taken for granted.

Our treatment of qualitative research focuses more heavily on a set of *implicit* procedures and techniques. In general, qualitative methods are used far less explicitly when compared to quantitative methods. At this stage, in fact, the implicit use of methods could be seen as a cultural characteristic of qualitative research. To describe this research tradition, we must reconstruct the procedures that qualitative researchers use when doing their work. Our reconstruction draws on a broad reading of qualitative studies, including an effort at systematically coding qualitative research articles. In addition, the practices that we describe are consistent with other methodological texts that have worked to make explicit and codify qualitative research practices (e.g., Brady and Collier 2010; George and Bennett 2005; Ragin 1987). Nevertheless, because qualitative methods are often used unsystematically, certain characterizations of this tradition will inevitably be controversial. In the text, we try to indicate areas where our description of dominant practices in qualitative research might be contested.

Typical Practices, Best Practices, and Possible Practices

For any research tradition, there may be a tension between typical practices and so-called best practices (e.g., as identified by leading methodologists). Within the social sciences, the identification of a "best practice" is usually quite contested. Methodologists within a given tradition debate the pros and cons of particular research procedures. These debates point to the presence

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of different subcultures within qualitative and quantitative methodology. For example, within the field of quantitative methodology, scholars who advocate experiments hold serious reservations about most work that attempts to make causal inferences using observational data.

In this book, we do not weigh in on these methodological controversies about what constitutes best practice. Instead, given our interest in describing what researchers are actually doing, we focus on typical research practices—defined as published work appearing in influential outlets—in the quantitative and qualitative traditions. The practices that we examine are standard tools for conducting social science analysis. They are widely though not universally regarded as acceptable and appropriate for making descriptive and causal inferences. Indeed, from the point of view of the larger scholarly community, these typical practices are "good practices" in that the work that uses them is influential (in the positive sense) and routinely appears in the very top peer-reviewed journals and in books published by the most respected presses. Our analysis thus focuses on those practices that scholars often carry out when producing what is regarded by the overall scholarly community as the very best work.

In discussing differences in practices across the two cultures, we do not deny that it may be possible for quantitative researchers to mimic qualitative practices and vice versa. However, we are concerned here with real practices, rather than what might be called "possible practices." For example, the Neyman-Rubin-Holland model of statistical research might be reconfigured to address issues that are salient in qualitative research, such as the analysis of necessary and sufficient conditions. Yet studying necessary and sufficient conditions is not a natural thing to do in the quantitative culture and it is virtually never done in practice. Likewise, mathematical modes of set-theoretic analysis, which are associated with the qualitative paradigm, might be used to analyze average causal effects in a population. But no researcher in the social sciences of whom we are aware has used these methods for that purpose. Our point is simply that certain sets of tools make it natural to carry out certain kinds of practices and not others. While one might conceive ways of extending the tools of one culture to do what is easily accomplished in the other culture, these extensions are unnatural and usually purely hypothetical.

Characterizing the practices used in highly regarded research is more straightforward for the quantitative paradigm because its methods are laid out rather explicitly in prominent textbooks. Applied researchers learn their methods from these textbooks, and often work openly to follow their rules as closely as possible. Of course, textbooks do not always agree with each other and change over time. Nevertheless, they provide a basis for many shared norms and practices in the quantitative tradition.

The situation is more fluid on the qualitative side. While it is easy to talk about cookbook statistics, we have never heard anyone use the

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expression "cookbook qualitative analysis." Despite the existence of many qualitative methods (text)books, there is no single, core set of techniques that students can expect to learn in their qualitative methods classes. Part of the reason why is the division within qualitative research between scholars who are centrally concerned with causal inference versus scholars who use interpretive methodologies. It is also the case that the implicit use of methods in qualitative research makes the field far less standardized than the quantitative paradigm.

Nevertheless, if we focus on the causal inference school of qualitative research, a set of implicit but quite common practices can be identified and discussed. These practices are found in the work of many prominent qualitative scholars and described in the influential methodological works on qualitative research, such as Brady and Collier (2010), George and Bennett (2005), Gerring (2007), and Ragin (1987).

Our hope is that by examining typical practices as they appear in highly respected journals and books, scholars may develop new ideas for doing better research. This could happen in different ways. One possibility is that scholars of a given tradition may discover certain ideas from the other tradition that can help inform practices within their own tradition. For instance, the qualitative approach to concept formation might offer fresh insights to quantitative researchers about how to enhance measurement validity. Conversely, qualitative researchers may benefit by drawing on ideas from the extensive statistical literature on measurement error when making their own descriptive inferences. These observations suggest the possibility of cross-cultural learning, a topic to which we return at various points in this book.

Another possibility is that scholars may be surprised that a given practice is common within their tradition because it does not accord with their view of best practices. For example, quantitative methodologists who advocate the Neyman-Rubin-Holland model may be surprised to learn the limited extent to which this model influences social science research as actually practiced. On the qualitative side, advocates of medium-N QCA work may find it interesting to learn that within-case analysis remains the central basis for causal inference in most qualitative research. We believe that endorsing, criticizing, and improving prevailing research practices requires having a good understanding of those practices. This book provides a basis for developing this understanding.

What Is Distinctive about Qualitative Research?

Because qualitative methods are often used implicitly, we wish to signal up front two of the main kinds of tools that we believe characterize this tradition

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and that set it apart from quantitative research. The first are techniques of *within-case analysis*, such as process tracing, emphasized in many leading works on qualitative methods in political science, including perhaps most notably Alexander L. George and Andrew Bennett's *Case Studies and Theory Development in the Social Sciences* and Henry E. Brady and David Collier's edited book, *Rethinking Social Inquiry: Diverse Tools, Shared Standards*. The second set of tools is logic and set theory, which informs nearly all major qualitative techniques (including within-case analysis) and is often associated with the work of Charles Ragin (2000; 2008).

Within-Case Analysis

One common way of distinguishing quantitative versus qualitative research is to focus on the size of the N. It is natural to associate "large-N" studies with statistical research and "small-N" studies with qualitative research. In their discussion of qualitative research, King, Keohane, and Verba (1994) devote much attention to the "small-N problem" of qualitative research, or the difficulty of making inferences in the absence of enough cases to use conventional statistical methods. This approach follows a long line of research that thinks about qualitative methodology in terms of a degrees of freedom problem (Lijphart 1971; Campbell 1975).

Yet some studies with a relatively large N are regarded as qualitative, and other studies with a fairly small N use mainstream statistical methods (see Collier, Brady, and Seawright 2010, 178–79, for examples). This fact suggests that while a small N is correlated with qualitative research, it does not *define* such research. Far more important in defining qualitative research is the use of within-case analysis. Within-case analysis requires broad knowledge of specific cases, and thus its usage helps to explain why most qualitative studies have a small N. Qualitative scholars may select a small N because their central method of inference—within-case analysis—requires a kind of case-oriented analysis that is difficult to achieve with a large N.

If one focuses on within-case analysis as a core trait of qualitative research, the idea of linking qualitative research to a small-N problem tends to fall out of the discussion. It becomes clear that qualitative research embodies its own approach to causal analysis. Within-case analysis involves the use of specific pieces of data or information to make inferences about the individual case. These within-case observations may be "smoking guns" that decisively support or undermine a given theory. In this context, it is not helpful to think about qualitative methodology in terms of a degrees of freedom problem.

In contrast to qualitative research, statistical methods are virtually by definition tools of cross-case analysis. We can see this with the experimental

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method, which is often held up as the gold standard for causal inference in the quantitative paradigm. An experiment involves contrasting subjects who receive a treatment with those who receive the control. Causal inference is fundamentally built around this cross-case comparison. One is not trying to explain, for example, what happens to specific individuals who receive the treatment. The method is not designed to tell us whether the treatment caused the outcome for any particular subject. Although observational analyses differ from experiments in many important ways (e.g., research design), they share with experiments a fundamentally cross-case approach to causal inference.

Logic and Set Theory

When qualitative scholars formulate their theories verbally, they quite naturally use the language of logic. We refer to this as the "Monsieur Jourdain"[3] nature of the relationship between qualitative scholarship and logic. Qualitative researchers speak the language of logic, but often are not completely aware of that fact. To systematically describe qualitative research practices, however, it is necessary to make explicit and formalize this implicit use of logic.

Ideas concerning necessary conditions and sufficient conditions are at the core of qualitative research practices. These kinds of conditions are implicitly used in the formulation of countless hypotheses in the qualitative tradition. They are central components of qualitative methods of concept formation, qualitative approaches to case selection, and nearly all qualitative methods of hypothesis testing. The qualitative methods of hypothesis testing that are built around necessary and sufficient conditions include Mill's methods of agreement and difference, major process tracing tests such as hoop tests and smoking gun tests, and all modes of QCA. Our view is that qualitative research and methodology cannot be fully codified and understood without taking into consideration ideas of necessity and sufficiency.

A long list of terms directly or indirectly indicates that the researcher is formulating hypotheses using the resources of logic. To express the causal idea that X is necessary for Y, scholars use terms and expressions such as "only if," "is essential, indispensable, requisite, necessary for," "blocks, vetos, prevents," "is sine qua non of," and "enables, permits, allows." Some of these expressions are quite explicit and direct about using logic to express the nature of the causal relationship: "Y only if X." Others are less explicit though still clear: "X is requisite for Y" or "Not X prevents Y."

[3] Moliere's M. Jourdain was very impressed to learn from his poetry teacher that he spoke in prose.

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Analogously, various terms suggest that the scholar understands X to be *sufficient* for Y. In this case, the scholar uses words and expressions such as "ensures, guarantees," "is always followed by," "inevitably leads to," and "yields, generates, produces." Again, some of these terms more directly suggest a sufficiency relationship (e.g., "X is always followed by Y") than others ("X yields Y").

Once one is sensitized to the use of the natural language of logic, one sees it everywhere in the social science literature. It is completely unexceptional for qualitative researchers (or any researcher, for that matter) to formulate a verbal theory using one or more of the expressions listed above. We have come across literally hundreds of examples of hypotheses about necessary conditions or sufficient conditions.[4] These hypotheses are not incidental to the scholarly works in question; they are, instead, at the heart of the claims being put forward (for 150 examples of necessary condition hypotheses, see Goertz 2003).

The use of logic and set theory extends well beyond the formulation of hypotheses. To define a concept using the classical approach of qualitative methods associated with Giovanni Sartori (1970), one works to construct a list of conditions that are individually necessary and jointly sufficient for membership in the concept. Qualitative scholars in the tradition of Sartori have "naturally" adopted logic as a framework to think about issues of conceptualization.[5] Likewise, when one uses Mill's method of agreement to "eliminate" a hypothesis, one is implicitly assuming that the hypothesis posits a necessary condition. Even major process tracing tests—such as "hoop tests" and "smoking gun tests"—are predicated on ideas of necessity and sufficiency, as we shall see.

The ways in which procedures and methods in qualitative research draw on logic will be discussed throughout the book. In fact, since mathematical logic and its set theory cousin are not well known in the social sciences, we offer a short introduction to them in the prelude of this book. For now, we wish to emphasize that logic and ideas of necessity and sufficiency are not only tools used in QCA techniques developed by Charles Ragin. Rather, they are the resources that qualitative scholars have implicitly been using for decades in many aspects of their research.

[4] This list includes famous comparative sociologists such as Skocpol (1979, 154), Moore (1966, 418), and Rueschemeyer, Stephens, and Stephens (1992, 270) as well as the best known comparativists from political science such as O'Donnell and Schmitter (1986, 65), Linz and Stepan (1996, 61), and Levi (1988, 144). In international relations, nearly all leading scholars (implicitly) develop these kinds of hypotheses, including (neo)realists such as Waltz (1979, 121; see Levy and Thompson (2010) for an extended discussion), liberal institutionalists such as Keohane (1980, 137) and Young and Osherenko (1993), and social constructivists such as Wendt (1992, 396) and Finnemore (1996, 158).

[5] Of course, Sartori himself was quite aware of the logical foundations of his approach.

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Conclusion

By the end of this volume, we hope that the reader will be dissatisfied with the terms "quantitative" and "qualitative." We will have discussed a large number of important differences between the two paradigms, but they are not identified particularly well by these terms, especially if those terms are understood to mean numbers versus words.

In the conclusion, we summarize many of the contrasts made in the book. We offer checklists with a total of about 25 differences between the two cultures. Although some differences such as within-case versus cross-case analysis and statistics versus logic are at the center of our argument, we do not argue that any single contrast drives all others. Instead, our conclusion is that each culture is made up of many different norms and practices that all work together relatively coherently.

Looking ahead, there are different ways to read this book. Although we have tried to group the chapters into coherent parts, it is not necessary to read the chapters in any particular order. Each chapter is intended to stand on its own as a separate and complete essay. Thus, readers can pick and choose topics of interest and skip around the book without difficulty. The mathematical prelude provides a selective introduction to logic and set theory for readers without a background in methods that use ideas of necessary and sufficient conditions. Already with this prelude we shall consider how the two cultures see and interpret the same data in quite different—though equally legitimate—ways.

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