Annu. Rev. Sociol. 2004. 30:81–101
doi: 10.1146/annurev.soc.30.012703.110507

First published online as a Review in Advance on February 10, 2004

COMPARATIVE-HISTORICAL METHODOLOGY

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Key Words necessary causes, sufficient causes, temporal processes, concepts, measurement

■ **Abstract** The last decade featured the emergence of a significant and growing literature concerning comparative-historical methods. This literature offers methodological tools for causal and descriptive inference that go beyond the techniques currently available in mainstream statistical analysis. In terms of causal inference, new procedures exist for testing hypotheses about necessary and sufficient causes, and these procedures address the skepticism that mainstream methodologists may hold about necessary and sufficient causation. Likewise, new techniques are available for analyzing hypotheses that refer to complex temporal processes, including path-dependent sequences. In the area of descriptive inference, the comparative-historical literature offers important tools for concept analysis and for achieving measurement validity. Given these contributions, comparative-historical methods merit a central place within the general field of social science methodology.

INTRODUCTION

Recent years have seen a surge of publications concerning the methods used in comparative-historical analysis.[1] These works reflect a growing self-consciousness about research design among comparative-historical analysts, and they address a wide range of issues concerning descriptive and causal inference that are of general importance to the social sciences. Although these studies have not yet had a large impact in the field of methodology, which is oriented toward statistical analysis,[2] I argue that their insights deserve a central place within social science methodology.

[1]Comparative-historical analysis is a field of research characterized by the use of systematic comparison and the analysis of processes over time to explain large-scale outcomes such as revolutions, political regimes, and welfare states. It can be distinguished from other approaches within historical sociology, such as rational choice analysis and interpretive analysis (Mahoney & Rueschemeyer 2003a). Here, I do not consider the methods (e.g., game theory, ethnography) associated with these alternative strands of historical sociology.
[2]Statistical methods dominate the methodology section of the American Sociological Association, the required courses on methodology in leading graduate programs, and the leading methodological journals in the social sciences.

This argument is developed over three sections. The first two sections consider methods of causal inference, focusing respectively on tools for analyzing necessary and sufficient causes and tools for the study of temporal processes. The third section is concerned with descriptive inference, exploring techniques of conceptual innovation and tools for achieving measurement validity. In all these discussions, the emphasis is on the *distinctive* contributions of comparative-historical methods—that is, contributions that go beyond what mainstream statistical methods have to offer.[3] The article closes with a call for assigning comparative-historical methodology a more central place in general social science methodology.

TOOLS FOR STUDYING NECESSARY AND SUFFICIENT CAUSATION

Hypotheses about necessary and sufficient causes—including probabilistic necessary and sufficient causes—are commonplace in nearly all domains of research. However, to evaluate such hypotheses, researchers cannot rely on mainstream statistical tools. Standard regression frameworks will incorrectly estimate causal effects when confronted with these kinds of causes (see Braumoeller & Goertz 2000, Ragin 2000). By contrast, comparative-historical methodology offers tools well adapted to the analysis of necessary and sufficient causes.

Overcoming Skepticism

Although many statistical researchers may concede that they lack sophisticated tools for identifying necessary and sufficient causes, they likely will argue that necessary and sufficient causes are not relevant to the social sciences, and thus that this deficiency is not a problem. The belief that necessary and sufficient causes are irrelevant to the social sciences is common among methodologists. It is therefore useful to discuss these causes in relationship to skeptical concerns about them.

An initial objection is that necessary and sufficient causes do not exist. On reflection, however, one realizes that many examples of these causes can be identified for any given outcome. For example, oxygen and human beings are necessary causes of a revolution; likewise, a GNP per capita of $100,000 and an advanced industrial economy are sufficient causes of a high level of economic development. The problem with these examples, of course, is that they refer to trivial necessary causes and tautological sufficient causes. Hypothetical examples like these lead some methodologists to believe that scholars cannot identify nontrivial necessary causes and nontautological sufficient causes. In fact, however, there are excellent *empirical* criteria for distinguishing trivial from nontrivial necessary causes and tautological from nontautological sufficient causes.

[3]Following Brady & Collier (2004), I understand mainstream statistical methods as being strongly oriented toward regression analysis and econometric refinements on regression.

Trivial necessary causes are those in which the cause is present in all cases, irrespective of the value on the dependent variable (Dion 1998, Braumoeller & Goertz 2000).[4] For example, the existence of human beings is trivially necessary for a revolution, because this cause is present in *all* cases of revolution and non-revolution alike. Indeed, the "trivialness" of a necessary cause can be empirically measured by assessing the degree to which the necessary cause is present among the case population: Trivialness occurs when a necessary cause is almost always present in the population. Likewise, the relevance of a necessary cause can be empirically measured in light of the degree to which the dependent variable is present among all cases: Irrelevance occurs when the dependent variable is almost always absent in the population. Goertz (2003a) offers straightforward techniques for carrying out these assessments.

With a *tautological sufficient cause*, the analyst identifies a set of factors that are contained within the very definition of the outcome being considered. When this happens, there is no temporal separation between the cause and outcome (or the outcome may actually occur *before* the cause). For instance, the argument that large-scale industrialization is a sufficient cause of economic development is tautological because there is no clear definitional distinction or temporal separation between the occurrence of industrialization and economic development (or the outcome of economic development may occur before full-scale industrialization is present). Hence, one can identify tautological sufficient causes by inquiring about their temporal location vis-à-vis outcomes. Furthermore, as with necessary causes, one can assess the trivialness and relevance of sufficient causes by evaluating the degree to which the sufficient cause and the dependent variable are present in the population. In this case, trivialness occurs when the sufficient cause is almost always absent, and irrelevance arises when the outcome is almost always present (see Goertz 2003a).

Even if necessary and sufficient causes can be nontrivial, nontautological, and highly relevant, skeptics argue that important hypotheses about these causes are quite rare. Yet, Goertz (2003b) proposes that one will find important hypotheses about these causes in any major area of research, a claim he backs up by citing 150 examples of such hypotheses, including many formulated by cross-national statistical researchers. In comparative-historical analysis, scholars also have formulated many of these propositions, ten of which are listed in Table 1.

When confronted with the prevalence of examples like these, skeptics may then turn to another common criticism: necessary and sufficient causes rely on a deterministic logic that is simply inappropriate for the social sciences (Lieberson 1991, Goldthorpe 1997). For example, critics might note that a single instance of measurement error can lead one to invalid conclusions about necessary and

[4]The formulation of this sentence assumes that variables are measured dichotomously. However, one need not make this assumption. For example, with continuous measurement, one can hypothesize that a particular value (or range of values) on an independent variable is necessary or sufficient for a particular value (or range of values) on a dependent variable.

TABLE 1 Ten examples of hypotheses about necessary and sufficient causes

Amsden (1992): A relatively equal distribution of income is necessary for successful late industrialization.

Downing (1992): A low level of domestic resource mobilization for warfare is sufficient for democracy in early-modern Europe.

Goldhagen (1997): Virulent antisemitism is sufficient to produce a willingness to kill Jews.

Hicks et al. (1995): Working-class mobilization is necessary for the creation of an extensive welfare state.

Mahoney (2003b): Extensive Spanish colonialism is usually sufficient for social underdevelopment.

Moore (1966): A relatively strong bourgeoisie is necessary for a revolution leading to democracy.

Rueschemeyer et al. (1992): State consolidation is necessary for political democracy.

Ragin (2000): Political liberalization, economic hardship, and either investment dependence or government inactivism are almost always sufficient to generate severe IMF protest when a country faces an austerity program.

Skocpol (1979): The combination of state breakdown and peasant revolt is sufficient for social revolution in agrarian-bureaucratic societies.

Waldner (1999): A low level of elite conflict is necessary for a developmental state in the Third World.

sufficient causes, given that these causes assume a relationship that is invariant for certain values on the independent variable.[5]

Comparative-historical methodology offers two solutions to these concerns. One strategy is to analyze necessary and sufficient causes in a probabilistic fashion—that is, to evaluate causes that are necessary or sufficient at some quantitative benchmark (e.g., necessary or sufficient 90% of the time). Scholars who are convinced that necessary and sufficient causation is inherently deterministic will reject this move toward probabilistic analysis. Yet, empirically speaking, it is clearly useful to know if some factor X (or some value Z on variable X) is necessary or sufficient for genocide, revolution, or economic development 90% of the time (or perhaps even 50% of the time). It is unclear why one would dismiss the accumulation of knowledge about these kinds of probabilistic causes on any substantive or policy grounds.

A second probabilistic strategy is designed for studies that measure variables continuously rather than dichotomously. This strategy assumes that a cause can be

[5]Necessary causes assume that the absence of a particular value (or range of values) on an independent variable will always be associated with the absence of a particular value (or range of values) on a dependent variable; sufficient causes assume that the presence of a particular value (or range of values) on an independent variable will always be associated with the presence of a particular value (or range of values) on a dependent variable.

considered necessary or sufficient if all cases are consistent with this interpretation when variables are adjusted to allow for a small amount of measurement error. For example, imagine a study in which 19 out of 20 cases are consistent with the interpretation of (nontrivial) causal necessity, and the one case that fails the test would also be consistent if either the independent or dependent variable were slightly recoded. A possible approach is to consider the evidence as consistent with the interpretation of causal necessity, given that the score on the disconfirming case needs to be adjusted only a small amount to meet this standard. Ragin (2000) has developed suggestive guidelines for making such adjustments in the context of fuzzy-set analysis.

A final concern might center on statistical significance, which is a major criterion for assessing the "importance" of independent variables in quantitative research. Fortunately, techniques have been developed for generating precise coefficients that specify levels of significance with (deterministic or probabilistic) necessary and sufficient causes. Very much like mainstream quantitative research, these techniques compare the observed proportion supporting the interpretation of causal necessity or sufficiency against the null hypothesis that this observed proportion is a product of chance (see Ragin 2000). Unlike mainstream quantitative research, however, a small to medium number of cases will often be enough to achieve standard levels of statistical significance when analyzing necessary and sufficient causes.[6] Hence, comparative-historical analysts who develop hypotheses about necessary and sufficient causes with a medium *N* often can be as confident about the significance of their findings as quantitative researchers who analyze many more cases.

By way of concluding this discussion, Table 2 lists seven erroneous beliefs that are commonly held about necessary and sufficient causation. These beliefs do not reflect a sophisticated understanding of necessary and sufficient causation, and they should not be used as a basis for arguing against this approach to causal analysis. Journal editors in particular must view very dubiously referee reports that use one or more of these reproaches in reviewing comparative-historical work, even if the referees are respected statistical methodologists.

Specific Methods for Analyzing Necessary and Sufficient Causes

Which is the best method for testing necessary and sufficient causation depends in part on how one chooses to represent necessary and sufficient causes. Philosophers and many others use a dichotomous logic in which *X* is a necessary cause of *Y* when the following statement is true: "*Y* only if *X*." Likewise, for a sufficient

[6]Using Bayesian assumptions, for example, Dion (1998) shows that only five cases may be enough to yield 95% confidence about necessary causes. Using a simple binomial probability test, Ragin (2000, pp. 113–15) shows that if one works with "usually necessary" or "usually sufficient" causes, seven consistent cases are enough to meet this level of significance. Braumoeller & Goertz (2000) offer many examples of case-oriented studies that pass such significance tests.

TABLE 2 Seven erroneous beliefs about necessary and sufficient causes

Belief 1: Necessary and sufficient causes do not exist.
Belief 2: All necessary and sufficient causes are trivial, tautological, or irrelevant.
Belief 3: Social scientists do not formulate interesting hypotheses about necessary and sufficient causes.
Belief 4: Necessary and sufficient causes are deterministic and inherently inconsistent with probabilistic analysis.
Belief 5: Necessary and sufficient causes cannot be measured continuously.
Belief 6: Methods do not exist for testing hypotheses about necessary and sufficient causes.
Belief 7: It is impossible to test for statistical significance with necessary and sufficient causes.

cause the following statement applies: "If *X*, then *Y*." Yet, these kinds of causes can also be represented using set theory (Most & Starr 2003), fuzzy-set theory (Ragin 2000), and calculus (Goertz 2003c). Depending on the approach, causes and outcomes need not be measured as dichotomous categories; rather, one can also use continuous variables.

When variables are measured categorically in comparative-historical analysis, perhaps the most widely used method is "typological theory" (George & Bennett 2005). Typological theory involves the construction of typologies whose cells represent different values on independent and dependent variables. Different theoretical types are systematically matched to determine whether cases follow patterns of correspondence consistent with necessary or sufficient causation. This method relies on a logic similar to Mill's (1843/1974) methods of agreement and difference, as well as Przeworski & Tuene's (1970) most similar and most different systems designs. For example, parallel to the method of agreement, the analyst using typological theory may conclude that a given type is not necessary for an outcome if the type is both present and absent among a group of cases that all exhibit the outcome of interest. Likewise, parallel to the method of difference, the analyst may conclude that a type is not sufficient for an outcome if the type is present in both cases where the outcome is present and cases where the outcome is absent.

Typological theory shares some of the limitations associated with Mill's methods (see George & Bennett 2005, Mahoney 2003a). At the same time, however, typological theory is not designed to be a blind methodological apparatus; rather, the technique is intended to be used in light of one's theoretical and substantive knowledge of actual cases. Furthermore, typological theory is generally used in conjunction with other methods, especially process analysis (discussed below), that greatly compensate for its limitations.

There are numerous examples of works in comparative-historical analysis that implicitly or explicitly employ typological theory. Books published since 1990 include the studies of political regimes by Downing (1992), Luebbert (1991), Mahoney (2001), and Yashar (1997); the major works on revolutions by Goldstone

(1991), Goodwin (2001), and Wickham-Crowley (1992); the important studies of party and electoral system dynamics by Collier & Collier (1991) and Jones Loung (2002); and various other studies focused on themes such as state formation, social provision, and racial domination (see Ertman 1997, Orloff 1993, and Marx 1998 respectively). All these books offer sophisticated typologies that designate cases as similar or different across theoretical dimensions. These dimensions then are treated as values on variables and matched to assess whether cases follow patterns of correspondence consistent with necessary and sufficient causation.

Other methods entail more formal apparatuses for evaluating necessary and sufficient causes. Perhaps the best known of these is Boolean algebra, which Ragin (1987) introduced into the field. Boolean algebra is especially appropriate for the analysis of *combinations* of variables that are *sufficient* for the occurrence of an outcome. Because several different combinations of factors may each be causally sufficient, this method allows for multiple paths to the same outcome. In addition, unlike some regression analyses, this approach recognizes that a given value on one variable may itself exert opposite effects depending on the other variable values with which it is combined. Thus, the dichotomous variable *X* may need to be present in one causal combination to produce a given outcome, whereas *X* may need to be absent in another causal combination to produce the same outcome.

More recently, Ragin (2000) has introduced fuzzy sets as a means of continuously coding variables according to the degree to which they correspond to qualitative categories of interest. This fuzzy-set measurement is highly appropriate for the analysis of necessary and sufficient causation, including under probabilistic assumptions in which different degrees of necessary or sufficient causation are considered. To employ the technique, the analyst must measure all variables as fuzzy sets and then assess the relationship between their values. With a *necessary* cause, fuzzy-membership scores on the *outcome* will be less than or equal to fuzzy-membership scores on the *cause*. By contrast, with a *sufficient* cause, fuzzy-membership scores on the *cause* will be less than or equal to fuzzy-membership scores on the *outcome*. To incorporate considerations of probabilistic causation, the researcher might argue that if no case's score on the outcome (or cause) exceeds its score on the cause (or outcome) by more than a small portion of a fuzzy-membership unit, then the pattern is consistent with the interpretation of causal necessity (or sufficiency). Likewise, the probabilistic benchmarks and significance tests mentioned above can be applied when using fuzzy measures of variables. Although the procedures involved become especially complicated when *combinations* of variables are considered using probabilistic criteria, a free software package that performs the operations is available (Ragin & Drass 2002).

Although many comparative-historical researchers prefer the flexibility of typological theory, a fairly impressive range of studies have used more formal techniques for testing hypotheses about necessary and sufficient causes. Examples from major social science journals include Amenta's (1996) study of New Deal social spending, Berg-Schlosser & DeMeur's (1994) analysis of democracy in interwar Europe, the comparative studies by Hicks (1994) and Huber et al. (1993)

on the welfare state, Griffin et al.'s (1991) study of trade union growth and decline, Mahoney's (2003b) work on long-run development in Latin America, and Wickham-Crowley's (1991) study of guerrillas and revolutions.

To conclude, a whole class of methodologies now exists for testing hypotheses about necessary and sufficient causes. The importance of these methodologies depends in part on how commonly probabilistic or deterministic necessary and sufficient causes are found in the social world. In turn, the answer to this question depends on analysts actually using the available methodologies to test the many hypotheses that posit necessary and sufficient causes.

TOOLS FOR STUDYING TEMPORAL PROCESSES

Causation is fundamentally a matter of sequence; all scholars who seek to infer causation will do best if overtime data are available (Rueschemeyer & Stephens 1997, p. 57). Yet, much statistical research is forced to present "snap-shot" regressions that measure variables at a single point in time and remove them from their broader temporal context. To be sure, statistical methodologists have advanced powerful new techniques for the analysis of temporal processes in recent years. Nevertheless, given data limitations, empirical work in the leading journals only occasionally employs these techniques.

By contrast, comparative-historical analysis is inherently a field in which researchers marshal a great deal of overtime data to infer causation. In fact, a common view is that the analysis of processes over time is the central basis for causal inference in comparative-historical research (Brady & Collier 2004, Rueschemeyer & Stephens 1997). Even so, however, the specific tools that researchers in this field use to analyze temporal processes are not well known in the general field of methodology.

Process Analysis

Comparative-historical research is defined in part by the analysis of sequences of events that occur within cases. Informally, analysts have long recognized that this kind of "process analysis" facilitates causal inference when only a small number of cases are selected. The contribution of recent methodological work has been to help these analysts more formally understand how process analysis achieves this end.

Process analysis generates leverage in part by allowing researchers to examine the specific mechanisms through which an independent variable exerts an effect on a dependent variable (George & Bennett 2005). Under this approach, the analyst starts with an observed association and then explores whether the association reflects causation by looking for mechanisms that link cause and effect in particular cases. For example, if one hypothesizes that a high level of economic development is almost always sufficient for the maintenance of democracy (see Przeworski et al. 2000), then process analysis can be used to explore the linkages through

which high levels of economic development generate democratic stability. If clear linkages cannot be discovered, doubt is cast upon the idea that the relationship is causal.

This form of process analysis is currently one of the most powerful techniques for overcoming problems of selectivity and omitted variable bias that plague nearly all social research. These problems arise because analysts cannot know for certain whether the associations they discover are causal or simply the spurious product of an unknown antecedent variable (Lieberson 1985). However, if analysts can point to specific linking mechanisms that connect cause and effect, they are in a much better position to assert that the relationship is causal. For example, in research on smoking and lung cancer, the ability of investigators to supplement statistical data with information on the generative processes through which the carcinogens in cigarette smoke affect human tissues was critical to the claim for a causal linkage (Freedman 1997).

Although statistical researchers do have sophisticated tools for analyzing intervening variables, many scholars believe that uncovering causal mechanisms is inherently a theoretical practice that requires qualitative data evaluation rather than statistical reasoning (see George & Bennett 2005, Goldthorpe 2000, Hedström & Swedberg 1998). The issue is partly that causal mechanisms may refer to posited entities that cannot be directly observed, making statistical measurement problematic. Moreover, the identification of causal mechanisms may require analyzing data that embody dynamic relations and unfolding processes in a way that does not lend itself to efficient quantification or statistical inference. Thus, when confronted with a statistical association, what scholars need to infer causation is not another statistical association, but rather a theoretically-informed discussion of the generative processes that produce the association in the first place. Goldthorpe nicely summarizes this argument, asserting that the identification of causal mechanisms does not "reflect statistical thinking. . .[but rather] must be added to any statistical criteria before an argument for causation can convincingly be made" (Goldthorpe 2000, p. 149).

The use of process analysis to explore intervening processes has led comparative-historical researchers to elaborate, modify, and occasionally reject the findings of statistical research. One important example is Rueschemeyer et al.'s (1992) study of democratization, which begins with the statistical correlation between economic development and democracy. The authors elaborate on this correlation by drawing on detailed evidence from within cases to show that economic development affects democracy by tipping the balance of power in favor of class actors (e.g., the working class) that tend to have a strong interest in promoting democracy. Likewise, scholarship on the "democratic peace" (i.e., the hypothesis that democracies do not go to war with one another) has benefited from an interactive research program in which researchers move back and forth between statistical analysis and comparative case studies (Bennett & George 1998).

In other comparative-historical studies, process analysis is used to discredit an inference derived from statistical research. For example, although regression

studies of the effect of colonialism on economic prosperity suggest that the identity of the colonizing nation (e.g., Britain, Spain) is inconsequential, comparative-historical research that examines processes over time argues that the effects of colonialism vary greatly across different colonizers (e.g., Mahoney et al. 2003). More commonly, process analysis serves to modify—not reject—statistical findings. Sometimes these studies better specify the context within which a statistical relationship can be expected to operate. For example, O'Donnell's (1973) famous analysis of authoritarianism in Latin America suggests that economic development will not be associated with democracy among Latin American countries seeking to move toward heavy industrialization. Other studies better specify what statistical studies can and cannot explain. For example, Skocpol's (1992) investigation of the early U.S. welfare state suggests that statistical studies are helpful in accounting for raw levels of social spending but often are much less effective at explaining the timing and content of social policy.

Finally, beyond using process analysis to assess intervening sequences, comparative-historical researchers employ this mode of analysis to test the implications of hypotheses developed through cross-case comparisons. In effect, they ask themselves, "If my cross-case hypothesis is indeed true, what other evidence should I find at the within-case level?" This "other evidence" has additional implications for the theory, thereby greatly increasing the number of cases in what may have initially been conceived of as a small-*N* study (Campbell 1975). For example, Skocpol's (1979) early work uses process analysis to assess the hypothesis that ideologically motivated vanguard movements are necessary for social revolutions in agrarian-bureaucratic societies. In effect, she asks, "If these movements are necessary for social revolution, what evidence should be present within my cases?" She argues that one should observe vanguard movements actually helping to create or substantially maintain the political crises surrounding social revolutions. Yet, in fact, she finds that these movements are extremely marginal to the central politics of revolutions, emerging on the scene very late to take advantage of situations they did not create. Hence, she rejects the hypothesis that ideologically motivated vanguards are necessary for social revolution.

To conclude, although process analysis is not often discussed in mainstream methodological circles, it represents an extremely powerful tool for hypothesis testing in comparative-historical analysis. It dramatically increases the probability that a given hypothesis will be falsified. And when combined with cross-case comparison, it can greatly strengthen one's confidence that an observed association reflects causation.

Sequence and Duration Arguments

Social scientists often formulate "thick theories" (Coppedge 1999) defined by complex arguments about sequence and duration. For example, in the field of comparative-historical analysis, researchers commonly argue that a given variable may have different—even opposite—effects, depending on its timing or duration.

Yet mainstream social science methods are not well-suited for the analysis of these kinds of temporal arguments (Abbott 2001, Aminzade 1992, Hall 2003). Rather, in part because of data limitations, conventional statistical methods are normally used to test only "thin theories"—i.e., relatively simple theories that do not show a nuanced sensitivity to time or place. Hence, researchers often must turn to comparative-historical methods to assess the most interesting theories in the social sciences.

Sequence arguments assume that the temporal location of events affects their impact on outcomes of interest. Tilly puts it as follows: "*When* things happen within a sequence affects *how* they happen" (1984, p. 14; see also Abbott 2001). Comparative-historical analysts often place great explanatory importance on early events within a sequence, arguing that these events decisively shape subsequent causal trajectories. Analysts may be especially interested in early events that are characterized by relative "openness" or "contingency."[7] These events are intriguing because they show how final outcomes depend on the occurrence of distant historical events that were not expected to occur.

A significant literature in economics, political science, and sociology has sought to codify the various tools of analysis used to study these "path-dependent" sequences (Arthur 1994, David 1985, Goldstone 1998, North 1990, Pierson 2000a,b; Mahoney 2000; see also Clemens & Cook 1999, Collier & Collier 1991, Thelen 2003). Much of this work focuses on initial outcomes during critical juncture periods. In "self-reinforcing" sequences, these initial outcomes trigger positive feedback or increasing returns, such that the outcome is reinforced over time, making it difficult or impossible to reverse direction. For example, this approach characterizes Roy's (1997) study of the endurance of the large industrial corporation in the United States, where the ability of an economic elite to reinforce its power sustained path dependence.

Analysts are also often interested in "reactive sequences," whereby an initial outcome triggers a chain of temporally ordered and causally connected events that lead to a final outcome of interest. These sequences are characterized by tight causal linkages that are not easily disrupted, such that *A* leads to *B*, which leads to *C*, which leads to *D*, and so on until one arrives at *Z*, or the logical termination point of the sequence. For instance, Isaac et al. (1994) use this logic to link the death of Martin Luther King, Jr. with the expansion of race-based poor relief in the United States.

Although path-dependent sequences raise important theoretical issues, they also demand the use of specific methods, making their analysis a potential source of methodological innovation. First, by exploring the issue of critical junctures and turning points, analysts have greatly advanced the use of counterfactual analysis for hypothesis testing in the social sciences (e.g., Fearon 1991, 1996; Tetlock &

[7]Contingency can be defined as "the inability of theory to predict or explain, either deterministically or probabilistically, the occurrence of a specific outcome" (Mahoney 2000, p. 513).

Belkin 1996). Path-dependent researchers use counterfactual analysis in evaluating the argument that the selection of a particular event from a menu of possible events has a decisive long-run impact. The counterfactual assumption is that if an alternative event had been selected at this early stage, the sequence would have unfolded in a radically different manner. To evaluate counterfactual claims like these, methodologists have developed explicit criteria, including clarity, logical consistency, historical consistency, theoretical consistency, and projectability (see Tetlock & Belkin 1996).

Second, the concern with path dependence has led comparative-historical methodologists to explore new techniques for analyzing complex nonlinear patterns. One example is the debate over whether historical narrative can map the causal structures suggested by chaos theory (e.g., Glass & Mackey 1988, Reisch 1991, Shermer 1995). This debate speaks to more general work on the use of narrative for the analysis of causal processes, including Abbott's (2001) narrative positivism, Griffin's (1993) event-structure analysis, Sewell's (1996) causal narrative, and Stryker's (1996) strategic narrative. Between them, these contributions offer new ways for codifying complex narrative structures, including ideas for inferring causation by comparing narratives across cases. The discussions also provide tools for incorporating notions of necessary and sufficient causation as central building blocks in narrative. For example, Griffin's (1993) event-structure analysis explicitly treats each event in a narrative as necessary for subsequent events.

Looking beyond path-dependent arguments, the comparative-historical literature presents fresh ideas for the study of duration and conjuncture (e.g., Aminzade 1992, Pierson 2003, Zuckerman 1997). With duration arguments, scholars explore the causes and consequences of the length of a given process or variable (Aminzade 1992, p. 459). For example, Collier & Collier (1991) examine how the duration of labor incorporation periods shapes party system dynamics in Latin America. Likewise, Tilly's (1990) analysis of state making is centrally concerned with explaining the pace at which modern states were formed in Europe. Within the framework of duration arguments, a "conjunctural" analysis considers specifically the intersection point of two or more separately determined sequences. For example, in Moore's (1966) classic study, one major sequence involves a series of events leading to the development of commercial agriculture. Another major sequence of events involves the development of political crises that challenge agrarian-bureaucratic states. In Moore's framework, the relative timing of the intersection of these two sequences can have an important effect on the specific modernization route that a country follows.

As a final note, it is worth emphasizing again that analysts outside of the field of comparative-historical analysis have their own tools for studying temporal processes. However, these analysts can use these tools only insofar as they formulate temporal hypotheses and have access to data to test them. The fact that comparative-historical analysts trace their variables over time makes them especially likely to notice temporal effects and then actually study them in their substantive research (see Lieberman 2001).

TOOLS FOR DESCRIPTIVE INFERENCE

Although descriptive inference receives second billing next to causal inference in contemporary social science, it is still regarded by all social scientists as a fundamental component of research. In statistical research, analysts use well-known techniques for summarizing the characteristics of large populations from samples. Less widely recognized, comparative-historical researchers draw on their own distinctive tools for concept analysis and measurement.

Concept Analysis

It is striking that most methodology courses in the social sciences do not include a section on concept analysis. After all, social science knowledge is built around concepts, and the introduction of new ideas into the field often takes place through the creation of new concepts. Indeed, it is impossible to conduct research—or even conceive of a research topic—without concepts (Gerring 2001, p. 35).

Comparative-historical analysis has been a leading site for both the development of new concepts and the creation of new methodologies regarding the use of concepts. In terms of conceptual innovation, comparative-historical researchers have offered leading definitions for many of the most important social science concepts. An incomplete list would include authoritarianism, capitalism, corporatism, democracy, development, feudalism, ideology, informal economy, liberalism, nationalism, revolution, socialism, and the welfare state. In conjunction with typological analysis, comparative-historical researchers also have formulated many important conceptual distinctions, including types of regimes (e.g., democratic, authoritarian, totalitarian), revolutions (e.g., political, social, anticolonial), states (strong, weak, predatory, developmental), and welfare systems (Christian, liberal, social-democratic), to name only a few.

The close examination of cases in comparative-historical research stimulates this conceptual development. Because analysts study cases in great detail, they almost inevitably match background understandings of concepts with fine-grained evidence from their cases. After many rounds of iteration, this process can lead to new conceptual understandings and perhaps the formation of entirely new concepts. Furthermore, because comparative-historical researchers usually do not begin with predefined cases, they must develop their own answer to the question, "What is this a case of?" In answering, they may define new conceptual categories or revisit received understandings of existing categories in light of new evidence (Ragin 2000).

Perhaps because conceptual innovations are so prominent in this field, comparative-historical methodologists have been at the forefront of a small but growing literature on methods of concept analysis. The starting point for much of this literature is Sartori's (1970, 1984) work, which explores concept formation through "checklist" definitions that treat conceptual attributes as individually necessary and jointly sufficient for conceptual membership (see also Ogden & Richards

1923/1989). Drawing on the idea of a taxonomical hierarchy, Sartori famously proposed that there is an inverse relationship between a concept's intension (i.e., number of defining attributes) and its extension (i.e., number of cases to which it refers). For example, democracy might be defined by (*a*) free and fair elections, (*b*) universal suffrage, and (*c*) broad civil and political liberties. If one removed universal suffrage from the definition, the number of cases of democracy would be expanded. By contrast, if one added the criterion of socioeconomic equality, the number of cases would be diminished. This inverse relationship provides important insights for avoiding "conceptual stretching" and for situating concepts within their broader semantic fields.

More recently, Collier and collaborators (Collier & Mahon 1993; Collier & Levitsky 1997) have productively drawn on ideas developed in cognitive science and linguistic philosophy to explore alternative approaches to concepts (see also Lakoff 1987). One example is Wittgenstein's (1953) idea of family resemblance, which assumes that no single attribute is shared by members of a category, though the members resemble one another on at least some attributes. For instance, Hicks et al. (1995) code a country as a "welfare state" if it adopts at least three of four classic welfare programs: (*a*) old age pensions; (*b*) health insurance; (*c*) workman's compensation; and (*d*) unemployment compensation. In this framework, no single condition is necessary for a welfare state, the presence of any three conditions is sufficient for a welfare state, and thus all welfare states will share at least two conditions. To logically analyze these kinds of family resemblance concepts, ideas of necessary and sufficient conditions are essential.[8]

Other approaches to concept formation include techniques for analyzing "radial categories" and the use of a "min-max strategy." With radial categories, the meaning of a category is anchored in a central example that serves as a best case, or prototype, of the category (Lakoff 1987, Collier & Mahon 1993). This central example acts like a gestalt to which other cases can be compared. For example, when determining whether cases in the contemporary Third World are social revolutions, scholars may use the French or Russian Revolution as a prototype, and then assess the degree to which the characteristics of the Third World cases overlap with the prototypical example. Researchers may also use "ideal types" in this fashion; that is, they compare real cases to an idealized central example that serves as a best or perfect instance of the type in question. Although this central example may not exist empirically,[9] cases that are closer to it represent better instances of the category.

A min-max strategy to concept formation combines this specific usage of ideal type with what is known as a minimal definition (Gerring 2003). Whereas ideal

[8]As a general rule, I propose that researchers use the language of necessary *condition* and sufficient *condition* for descriptive inference; by contrast, for causal inference, I propose that they use necessary *cause* and sufficient *cause*.

[9]Weber (1905/1949, p. 90) defined ideal types as logical constructs that do not necessarily exist in reality.

types normally view a category in light of all major attributes associated with the category, a minimal definition incorporates only those attributes that are shared by all cases of the category.[10] The min-max strategy therefore defines a concept in light of both its minimal definition and its ideal-typical definition. For example, the minimal definition of "culture" might include the characteristics ideational/symbolic, patterned, and shared. The ideal-typical definition, however, would include many more characteristics, such as enduring, coherent, differentiated, and holistic (Gerring 2003). The min-max approach thus seeks to deal with our most contested and challenging concepts by simultaneously offering concise and comprehensive definitional options.

Methodologists have also been interested in developing solid criteria for evaluating concepts. Gerring (2001) in particular suggests that the "goodness" of a concept can be evaluated along eight dimensions: coherence, operationalization, validity, field utility, resonance, contextual range, parsimony, and analytic/empirical utility. These dimensions usefully highlight many of the trade-offs that researchers face when formulating concepts. For example, achieving operationalization forces researchers to make sure that their conceptual definitions correctly identify the right phenomena in the world. Yet, pursuing this goal might come at the expense of resonance, which involves striving to develop conceptual definitions that make intuitive sense. When scholars associated with a given research tradition favor one dimension at the expense of several others, they run the risk of formulating concepts that are on balance impoverished.

Measurement Validity

Measurement consists of two basic procedures: (*a*) operationalization, or the process of developing indicators with which to measure a concept; and (*b*) scoring cases, or the process of applying indicators to the cases being analyzed (Adcock & Collier 2001). Measurement validity depends on analysts avoiding error for both of these procedures. Although comparative-historical researchers do not always use numerical coefficients when measuring concepts, their close examination of cases nevertheless affords distinct advantages for achieving measurement validity (see Adcock & Collier 2001, Ragin 2000).

First, researchers can easily move back and forth between conceptual definitions, indicators, and scores for cases in many rounds of iteration. Operational definitions and indicators can be refined in light of initial efforts to score cases; likewise, conclusions about the inadequacy of indicators can lead scholars to revisit the very definition of the concept being measured. For example, Skocpol (1979) did not simply assume a definition of social revolution, develop operational attributes, and then mechanically apply them to cases. Rather, she worked in part inductively, moving from her knowledge of actual cases to operational indicators and a formal

[10]A minimal strategy cannot be applied to family resemblance categories because no single trait is shared by all members of these categories.

definition. No doubt many initial operational definitions were thrown out when she discovered that they generated case scorings that were not appropriate. Others proved useful, though perhaps had to be modified to consider particular cases. This process of iterated matching is almost inevitable in comparative-historical research.

Second, with respect to the key procedure of scoring cases, comparative-historical researchers can assess the meaning of indicators across diverse contexts. For example, one common indicator of democracy concerns the extent of the suffrage. Yet, across different time periods, a given level of suffrage may mean different things. For instance, some scholars believe that the absence of female suffrage has different implications for democracy today than it did in the late nineteenth century. Or, to use an example from the comparative-historical literature on social provision, the debate over whether the United States was a welfare laggard depends in part on how one interprets the meaning of veteran's benefits and support for mothers and children (Skocpol 1992, Adcock & Collier 2001).

The fact that indicators can have different meanings across contexts suggests the importance of using context-specific indicators (Przeworski & Tuene 1970; see also Adcock & Collier 2001). In the comparative-historical literature, for example, one solution to the problem of measuring democracy mentioned above has been to operationalize the concept in light of the norms governing a given historical period (e.g., Collier 1999). Under this approach, a case in which women cannot vote may be considered a democracy in the late nineteenth century but not a democracy in the late twentieth century. Or, in the comparative study of labor politics, Locke & Thelen (1995) show that global pressures to decentralize capital-labor bargaining arrangements mean very different things in Sweden, the United States, and Germany. System-specific measures are required to accommodate these diverse meanings and to avoid inappropriately categorizing the three nations as similar with respect to globally-induced decentralization.

To summarize, leading methodological textbook discussions of descriptive inference often focus on statistical sampling procedures and measurement narrowly defined as operationalization. This discussion of comparative-historical analysis suggests that methodologists should broaden their understanding of descriptive inference to include concept analysis and measurement issues pertaining to the ways in which empirical data are used to code cases and modify indicators and operational definitions in the course of research. This broader understanding of descriptive inference could enrich all research, whether qualitative or quantitative.

CONCLUSION

Comparative-historical analysis is appreciated for its contributions to substantive knowledge generation in the social sciences (Mahoney & Rueschemeyer 2003a). However, the methods employed in this literature have not had a large impact in the general field of methodology, with two unfortunate effects. First, comparative-historical methods are not widely taught in graduate school, and researchers often

are not formally trained to use them. As a result, even some of the best work in the field does not show a high level of methodological self-consciousness, and almost all work could be improved by greater methodological explicitness. Second, because many statistical researchers have not been exposed to comparative-historical methods, they lack the background for understanding and evaluating this work. In addition, the advice they do offer to comparative-historical analysts is sometimes not appropriate.

The remedy to these problems involves assigning comparative-historical methodology a more important place within methodological circles. A first step is for statistical researchers to recognize that quantitative analysis is not the only or necessarily the best way to generate valid causal and descriptive inferences; in fact, for many research questions, one can and will do better with comparative-historical methods. If this point could be recognized, one might realistically hope for a more balanced approach to methodology within the social sciences. For example, more top graduate programs might require a qualitative methods course in which comparative-historical methods have a leading place. Likewise, more departments might actively seek applicants trained in comparative-historical methodology for openings in the field of methodology. And methodological journals and associations now dominated by statisticians would surely find more room for comparative-historical methodologists. In the meantime, though, this article has sought to encourage statistical methodologists who are skeptical about the contributions of comparative-historical methods to rethink this skepticism or formulate more sustainable arguments to justify the skepticism.

ACKNOWLEDGMENTS

For helpful comments on a previous draft, I thank Matthias vom Hau, Celso Villegas, and an anonymous reviewer. This work is supported by the National Science Foundation under grant No. 0093754.

The *Annual Review of Sociology* is online at http://soc.annualreviews.org

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Annual Review of Sociology
Volume 30, 2004

CONTENTS