

Observations of Social Processes and Their Formal Representations

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Distinctions between quantitative and qualitative social science misrepresent the actual choices confronting analysts of observations concerning social processes. Analysts regularly (if not always self-consciously) choose between adopting and avoiding formal representations of social processes. Despite widespread prejudices to the contrary, formalisms are available and helpful for all sorts of social scientific evidence, including those commonly labeled as qualitative. Available formalisms vary in two important regards: (1) from direct to analogical representation of the evidence at hand; and (2) from numerical to topological correspondence between formalism and evidence. Adoption of formalisms facilitates the identification of erroneous arguments, hence the correction of analytic errors and the production of more adequate explanations.

Social scientific journals like to advertise their catholicity (or their tolerance) by listing a wide variety of scholars as members of their editorial boards. More years ago than I care to recall, the journals *Theory and Society* and *Social Science Research* recruited me to their editorial boards. Somehow neither one ever got around to firing me. As a consequence, I still regularly review papers submitted to the two journals and at least scan every issue. No chance of confusing one with the other: select an article from *Theory and Society* at random, and you have almost no chance of encountering a table, a mathematical formula, or a graphic representation of data. Choose an article from *Social Science Research*, on the other hand, with great assurance that you will encounter numbers, graphs, and/or tables. Two different versions of social science seem to be in play.

Yet the enticing comparison leads easily to a false conclusion. Sociologists would spend less time ventilating uselessly if no one had ever invented the vivid but misleading conceptual and institutional division between *qualitative* and *quantitative* research. Of course, a reader of sociological journals will find some of them (like *Social Science Research*) filling their pages with numbers and others (like *Theory and Society*) depending almost entirely on verbal distinctions. Clearly, styles of reporting sociological research differ considerably from one segment of the discipline to another. Indeed, if the qualitative-quantitative division applied only to style of presentation, it would do little harm, especially if its users recognized it as a continuum rather than as a dichotomy.

The distinction becomes much more slippery, however, if applied to research methods. Even when it eventually produces numbers, after all, the bulk of sociological research involves making nonquantitative observations before any quantitative transformation or analysis of the evidence. For all their final quantitative form, interview-based surveys begin not with numbers but with conversations between interviewers and respondents. Even demographers who start their work with published vital statistics are actually drawing their evidence from previously written registrations of individual births, deaths, and marriages, each one described in its particularity.

Although this article's references include a wide variety of publications explicitly adopting formalisms in the study of social processes, the essay itself falls far short of a comprehensive survey of formalisms in social science. It neither reviews previous claims for and against the qualitative-quantitative division nor covers the full range of available social scientific formalisms. Drawing mainly on my own long, varied, but still highly selective experience in social research, I argue here the following:

- Dichotomization of social scientific research methods and subjects into qualitative and quantitative does more harm than good.
- Such a division misrepresents the actual choices facing social researchers.
- It also obscures a genuine, consequential choice between using and avoiding formalisms in the transformation and analysis of evidence on social processes.
- Formalisms are available and useful for the analysis of all sorts of social scientific evidence, including the evidence commonly gathered in fields that participants often call qualitative.
- Formalisms have two signal advantages for social research: first, when well chosen they discipline an inquiry from the outset; second, they make it easier to discover that an otherwise plausible formulation actually is mistaken and therefore easier to improve on previous knowledge.
- Every social scientist therefore will benefit from serious exposure to formalisms, even if they play a minor part in the practitioner's own research and writing.

If these points are correct, they imply that graduate education in social science should regularly include serious exposure to the use of formalisms in the analysis of evidence concerning social processes.

It certainly makes no sense to divide social phenomena at large into inherently, irreducibly qualitative or quantitative; no such distinction exists in nature (Podolny 2003; Katz 2002, 2001; White 2002; Darrow 2001; Mahoney 2000, 1999; Ragin 2000; Desrosières 1998; Munck 1998; Tufte 1997; Ragin and Becker 1992). What is more, the qualitative-quantitative divide obscures a contrast of great importance for the integrity of social research, between (1) employing rigorous, theoretically informed formalisms for confrontation with the evidence at hand; and (2) interpreting the evidence directly without the discipline of formalisms. In the hope of dispelling confusion induced by the quantitative-qualitative distinction, this brief article focuses on the place of formalisms in social research.

By formalism I mean an explicit representation of a set of elements and of relations among them. Formalisms that matter here represent elements of social processes and relations among those elements. Relations may consist of cause and effect, but they also may involve proximity, simultaneity, connection, or similarity. Familiar examples in social science include probability-based statistical models, network analyses, grammars, other rigorous treatments of conversation, time-budgets, identification of sequences, measurement models, collective biography, life tables, analysis of games, formal recasting of narratives, simulations, mathematical models, spatial mapping, and straightforward tabular comparisons, so long as those comparisons are theoretically motivated.

Such representations count as formalisms when investigators adopt or create them in logical independence of their observations of social processes and then make rigorous comparisons between the representations and the observations. Thus, a demographer constructs a life table for the population at hand and compares it with

the Coale-Demeny South model on the expectation that its pattern of mortality over lifetimes will more greatly resemble those of Italy and Spain than those of Sweden and Norway (Coale and Demeny 1966); a political scientist sets up a game to represent choices faced by members of linguistic minorities in newly independent countries (Laitin 1998); or a sociologist uses network models to specify the argument that greater connection among persons prior to some crucial, risky collective action promotes participation in that action (Diani and McAdam 2003; Fernandez and McAdam 1988).

In social research, formalisms sometimes figure in the initial disciplining of the evidence, as when coders translate responses of interviewees into standardized categories. They often help in reordering data, as when researchers cluster multiple responses into indicators of more general orientations such as radicalism or optimism. At times they serve for the examination of bias in the selection of respondents, sources, or information. They play central parts in hypothesis testing, as investigators work out the logic of one explanation or another, and then determine whether the evidence matches that logic.

A common prejudice, to be sure, divides the social world into phenomena that are suitable for quantification (population distributions, social mobility, etc.) and those that are irreducibly qualitative: conversation, narratives, biography, ethnography, and history often serve as examples. Formalisms clearly can and do apply, however, to these phenomena as well (see, e.g., Sawyer 2003; Maynard 2003; Murmann 2003; Kosto 2001; Mohr 2000, 1998; Wengraf 2000; Collier 1999; Steinberg 1999; Fitch 1998; Franzosi 1998a, 1998b; Kalb 1997; Roy 1997; Markoff 1996; Stinchcombe 1996; van Leeuwen and Maas 1996; White 1995; Aminzade 1993; Bearman 1993; Steinmetz 1993; Voss 1993). Although researchers frequently discard or modify formalisms in response to inadequate or surprising matches, the self-conscious employment of formalisms disciplines the encounter of argument and evidence.

How so? Most social researchers learn more from being wrong than from being right—provided they then recognize that they were wrong, see why they were wrong, and go on to improve their arguments. Post hoc interpretation of data minimizes the opportunity to recognize contradictions between argument and evidence, while adoption of formalisms increases that opportunity. Formalisms blindly followed induce blindness. Intelligently adopted, however, they improve vision. Being obliged to spell out the argument, to check its logical implications, and to examine whether the evidence conforms to the argument promotes both visual acuity and intellectual responsibility.

My claim rests on the assumption that, within limits, researchers can learn the truth about social processes. At a minimum, they can distinguish between totally inadequate and less inadequate representations of social processes, thus opening the way to increasingly reliable knowledge. If you think, on the contrary, that social processes are intrinsically chaotic and/or that investigators have no way of comparing the adequacy of competing accounts, you will necessarily reject my advocacy of formalisms as a delusion and a waste of energy. In that case, you will have to figure out your own alternative justification for doing social science at all. At this point, I assume that any remaining readers cling to the possibility of verification and falsification.

Let me repeat: I claim nothing like full familiarity with the research methods and formalisms currently employed in social science. Over a checkered career, I have assembled and analyzed data on urban residential areas (e.g., Tilly 1961), conducted sample surveys (e.g., Tilly 1965), recast Census data into analytical comparisons (e.g., Tilly 1968), combined criminal and other administrative statistics with newspaper reports in analyses of the changing geography of crime and violence

(e.g., Lodhi and Tilly 1973), synthesized strike data with a wide variety of evidence on changes in industrial and social organization (e.g., Shorter and Tilly 1974), constructed collective biographies (e.g., Lees and Tilly 1974), produced geographic analyses of urban change and contentious events (e.g., Schweitzer and Tilly 1982), carried on simple demographic analyses (e.g., Tilly 1984), and conducted formal network analyses (e.g., Tilly 1997a).

Straddling fields often separated as quantitative and qualitative, I often have had to write on historiography, on quantification in history, and on methodological problems in the study of political processes (e.g., Tilly 2002a, 2001a, 2001b, 1997b). But I can only claim to have made a substantial methodological contribution to social science in one area: with regard to the invention, improvement, and analysis of event catalogs for different sorts of political processes, especially conflict processes (for reviews of event catalogs, see Franzosi 2004, 1995; Tilly 2002b, 1995; Beissinger 2001; Olzak 1992, 1989; Rucht, Koopmans, and Neidhardt 1998; White 1995).

Nevertheless, my varied research experience provides some ground for reflection on formalisms. Take the case of historical research, which some analysts treat as quintessentially interpretive, hence inaccessible to formalisms. That characterization of historical research rests on a double misunderstanding: identification of historical research entirely with the collection of evidence, and identification of historical analysis with the writing of narratives. As a historian, of course I have done plenty of both. I have spent years in European and American archives, carefully reading and copying out such sources as administrative correspondence. Formalisms appear only fleetingly in that phase of the research, and mainly in the form of schemas employed by the authors of the texts. I also have written my share of historical narratives, telling sequential stories in an effort to show that relations among their elements parallel—or, for that matter, fail to parallel—those in a general argument, my own or someone else's. No one should take this essay as a polemic against slogging archival work and synthetic narrative.

Let us assume, then, that good historical work always includes respectful collection of evidence and often culminates in synthetic narratives. Formalisms play their parts in the space between the initial collection of archival material and the final production of narratives. In my own historical research, formalisms figure prominently from early in the ordering of evidence to late in its analysis; they range from estimates of selectivity in the sources to tabular analysis, block modeling, and standard statistical treatments (see, e.g., Tilly 1995:393–405). As it happens, many other historians rush from sources to reasoned narratives without pausing to employ formalisms, or even to reflect very self-consciously on the logical structure of their arguments, hence on what the evidence should show if their arguments are correct. Precisely at that point lies the difference between social scientific and conventional forms of history (Tilly 2001c, 1987, 1985, 1981; Monkkonen 1994; Landes and Tilly 1971).

History joins with social science when its organizing arguments become explicit, falsifiable, and theoretically informed. Formalisms cement the junction. Relevant formalisms range across demographic accounting formulas, sequence analyses, models of discourse, economic models, mathematical models, network analyses, statistical treatment of the evidence, and much more (e.g., Franzosi 2004; Gould 2003, 1995; Büthe 2002; Kaufman 2002; Roehner and Syme 2002; Abbott 2001; Hoffman, Postel-Vinay, and Rosenthal 2000; Bearman, Faris, and Moody 1999, Shapiro and Markoff 1998; Mohr and Franzosi 1997; Padgett and Ansell 1993). Good formalisms make explicit the analyst's claims about relations among the elements under observation. They thereby make those claims available to falsification and modification as a result of comparison with the evidence.

Speaking more generally, available formalisms vary in roughly the way described by Figure 1. In one dimension, we observe variation in how closely the structure of the formal representation corresponds to the structure of the available evidence. In the other, we observe variation in the extent to which the formalism relies on numbers, as distinguished from its reliance on topological relations among its elements. (Purists including my son-in-law, the algebraic geometer, point out that a more precise description would run from standard metrics to topologies without metrics, but the approximation will do.) These are of course continua: vertically from creation of mathematical models in precise mimicry of the data structure to formation of analogical schemes facilitating recognition that ideal and observed patterns resemble each other, horizontally from employing precise numerical representations to identifying spatial relations among the elements.

The catchall “schematics” appears in the topological-analogical corner of the diagram to situate diagrams and flow charts in which connecting lines, arrows, and/or spatial contiguity represent proximity, simultaneity, similarity, or cause-effect relations. (Figure 1 itself presents an elementary schematic, including weak claims about similarities and principles of variation.) Spatial maps appear in the upper right-hand corner to capture their direct representation of the elements’ distribution in topological, not numerical, space, as when country-by-country maps show us worldwide variations in the extent of poverty, inequality, or Internet access. Simulation nestles in the lower left-hand corner because (despite the existence of mechanical and even theatrical simulations), on the whole, social scientific practitioners of simulation work with numerical approximations of the processes they are trying to reproduce and are satisfied if they can produce recognizable analogies to those processes.

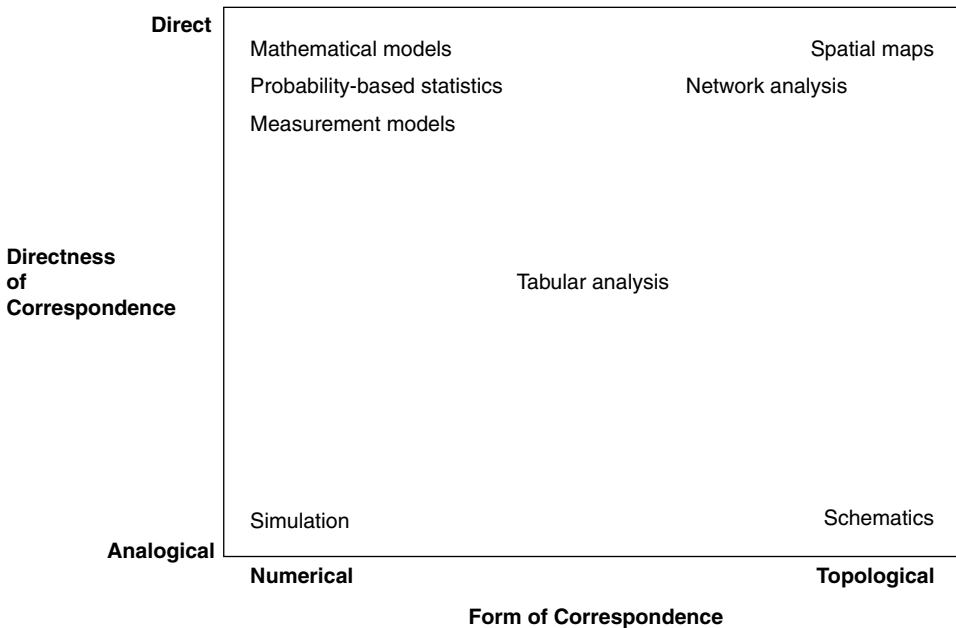


Figure 1. A rough typology of formal representations in social science.

Tabular analysis occupies the diagram's center. From the simple yes-no/yes-no truth table to the multidimensional array by period, category, and/or place, the venerable table provides a visible, vigorous version of formal representation. It almost always depends on a radical reduction of the data's complexity—hence its vertical placement between “direct” and “analogical.” It also generally substitutes nominal or ordinal for cardinal measurement, even where individual observations fall into interval scales—hence its location halfway between numerical and topological correspondence to the original evidence. Some tabular presentations—for example, those of the Census—hide the theory that goes implicitly into their construction (see, e.g., Kertzer and Arel 2002; Curtis 2001). But those tables that investigators create themselves almost compel them to make arguments in the form “the more X, the more Y”; “if X, not Y”; “X plus Y is a necessary condition for Z”; and the like. In short, tabular analysis illustrates the use of formalisms in its elementary version.

My placement of analytic modes in the space surely will bother some practitioners, such as those users of simulation who make precise comparisons between their models' outputs and some parallel set of empirical observations. But in general the diagram makes this crucial point: formalisms vary greatly in structure, style, and logical underpinnings. To apply formalisms in social science does not mean conforming to a single dominant understanding of how the world works. On the contrary, the choice among formalisms commits their users to substantially different theoretical and meta-theoretical understandings. That is not their vice but their virtue. To adopt formalisms in the course of social scientific work means making the adoption of arguments explicit, serious, and consequential. It means increasing the chance of discovering that you were wrong and, therefore, of learning something new.

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