Causal Explanation in the Social Sciences

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What is involved in giving an explanation of a social phenomenon? I maintain that an important class of social explanations are *causal* explanations: to explain an outcome, we attempt to identify the causal circumstances that brought it about.[1] Why do sharecropping regimes tend to agricultural stagnation? Why did Prussia defeat France so easily in 1870? Why do ethnic conflicts sometimes turn violent? Why are some political regimes more prone to official corruption than others? In each case we are asking for an account of the causal circumstances that bring about the phenomenon in question.[2] Here I focus on three questions: What is involved in offering a causal explanation in the social sciences? What is implied by regarding the social world as a causal order? And what methods of inquiry and inference are available to social scientists on the basis of which they may arrive at hypotheses about causal relations among social phenomena?

METAPHYSICS OF SOCIAL CAUSATION

Meaning of Causal Assertion

Before we can usefully engage in a discussion of causal explanation, we need to have some idea of what we are looking for: what is required of a causal analysis of a state of affairs? I assume that in looking for a causal explanation of a particular outcome P we are presuming that there is some set of properties, conditions, and events which occurred prior to P and which, as a consequence of the causal powers of these factors, brought P into being. But what precisely do we mean when we say that an antecedent condition is a cause of an observed outcome? Is a cause a sufficient condition? Is it a necessary condition? Is it merely a circumstance that influences the probability of the effect? John Mackie's analysis of the logic of causal ascription represents a good point of departure. Mackie attempts to capture ordinary assumptions about causes as necessary and/or sufficient conditions in terms of a set of antecedent conditions which satisfy certain substantive relations. The concept of an INUS condition is the centerpiece of John

Mackie's analysis of causation. It is an "insufficient but necessary part of a condition which is itself unnecessary but sufficient for the result" (Mackie 1976, 62). Schematically, suppose A & B cause F and A & C & D cause F, and no other set of conditions cause F. Here A is a necessary condition for F. A & B are jointly sufficient conditions for F. And neither conjunct is necessary for the occurrence of F.

I suggest that this analysis can best be understood in terms of a causal diagram (Figure 1). To say that A is a cause of B is to say that A is a necessary component of one causal pathway leading to B. Notice, however, that discerning causal relations among conditions in the context of a complex causal diagram can be difficult in the extreme. There may be alternative pathways, and, more radically, there may be probabilistic causation. This implies that identifying a single condition as a cause of a given outcome is difficult; even if it is true that A is a cause of B, it will not in general be the case that A is always present when B occurs (necessary condition) or that whenever A occurs, B does as well (sufficient condition).
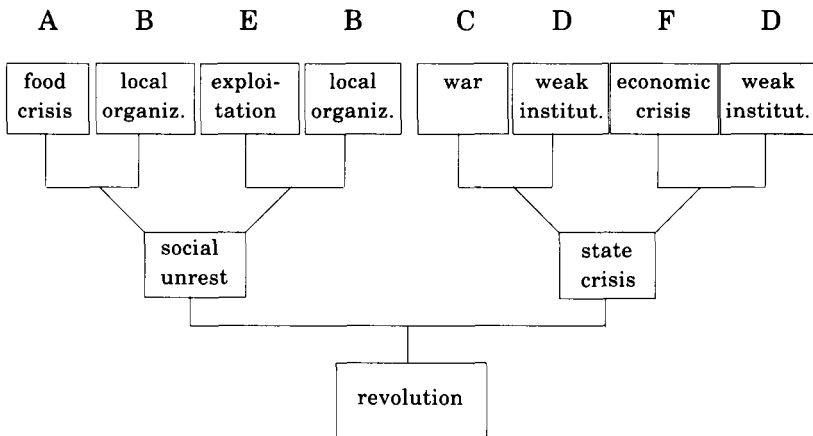
A	B	E	B	C	D	F	D
food crisis	local organiz.	exploitation	local organiz.	war	weak institut.	economic crisis	weak institut.

social unrest

state crisis

revolution

Figure 1. Causal diagram for revolution.

This causal structure can be represented as a complex truth functional law:

1   ((AvE)&B)&((CvF)&D) ⇒ R

This expression can be simplified:

2   B&D & [(AvE)&(CvF)] ⇒ R

So far we have spoken as though causal relations are deterministic. However, many instances of social causation (and perhaps natural causation as well), exercise their causal influence in a merely probabilistic way. Administration of penicillin raises the probability of recovery from pneumonia in 10 days. State crisis makes successful revolution more likely. A well-administered police force makes riots less likely. And so forth. Here, then, we can generalize Mackie's account in order to introduce probabilistic causal connections. A given set of conditions may be said to be causally relevant to the occurrence of O just in case these conditions jointly suffice to alter the probability of occurrence of O from the background incidence of O.[3] Figure 2 below incorporates probabilistic causation into the framework of a causal diagram.
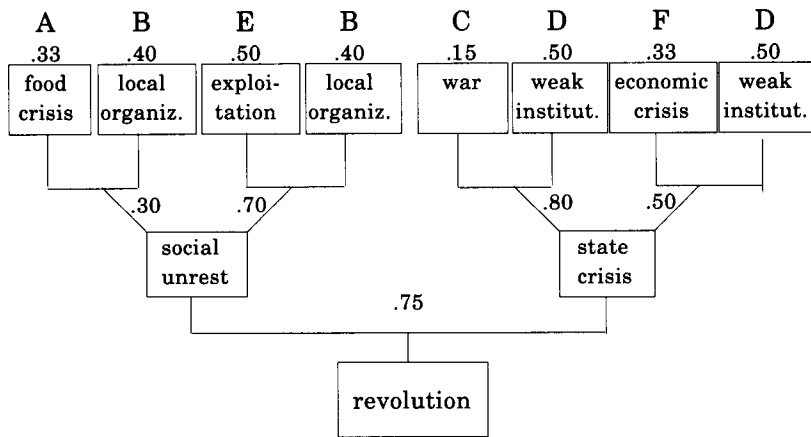

Figure 2. Probabilistic causal diagram for revolution.

We may say that a full causal analysis of a given phenomenon is constituted by an account that identifies all conditions causally relevant to the phenomenon, along with an estimate of their conditional probabilities if the causal relations in question are not deterministic. These are best represented by a causal diagram that represents a set of mechanisms and pathways through which a distant set of conditions leads to the occurrence of the effect. (See Figure 1 for an example of a causal diagram for the occurrence of revolution.) A causal diagram is ordered from top to bottom: factors higher up in the diagram are causally (and therefore temporally) prior to factors lying below them in the tree. Thus, the existence of

local organization is a necessary condition—a cause—of social unrest in the diagram presented here.

Links in a causal diagram are components of the causal process leading from distant factors to the effect. These can be either deterministic—whenever a normal pane of glass is hit by a normal cannonball, the glass shatters—or probabilistic—whenever a pneumonia patient is treated with penicillin her probability of recovery within 10 days increases.

Note that a causal diagram, if true, represents a hypothesis about the causal powers and causal linkages among generic social phenomena. A causal diagram does not have the logical structure of a narrative; instead, it represents a hypothesis implying a large number of counterfactual assertions as well. A narrative, by contrast, identifies one particular causal chain leading up to the outcome in question.

What we are looking for, then, in a causal explanation is a causal diagram representing the underlying causal relations that link antecedent conditions to the observed outcome. The causal diagram represents a hypothesis about the system of conditions that are causally linked with a given type of outcome. It may be a very short diagram, if we are prepared to settle for the proximate cause and its mechanism; or it may be a complex and multilayered diagram, if we are concerned to show how a set of independent distant circumstances lead to the effect. The diagram needs to be accompanied by an account of the nature of the mechanisms represented by each link in the diagram; how is it that food crisis in the presence of local organization leads to social unrest (or a greater probability of social unrest)? And finally, if some or all of the links in the diagram are probabilistic, then we need to have an estimate of the pure conditional probability of that link.

Causal Mechanisms

This account is silent so far on the nature of the link between cause and effect. I maintain that the central idea of causal ascription is the idea of a causal mechanism (Little 1991): to assert that A causes B is to assert that A in the context of typical causal fields brings about B through a specific mechanism (or increases the probability of the occurrence of B). This may be called "causal realism," since it rests on the assumption that there are real causal powers underlying causal relations. This approach places central focus on the idea of a causal mechanism: to identify a causal relation between two kinds of events or conditions, we need to identify the typical causal mechanisms through which the first kind brings about the second kind.

This account serves to analyze singular causal ascriptions—"a floating iceberg caused the sinking of the Titanic." Can the account be extended to serve as a basis for interpret-

ing general causal claims as well—"hyperinflation causes political instability"? It can, along the following lines. To assert that A's are causes of B's is to assert that there is a typical causal mechanism through which events of type A lead to events of type B. Here, however, we must note that there are rarely single sufficient conditions for social outcomes; instead, causes work in the context of causal fields. So to say that revolutions are causally influenced by food crisis, weak states, and local organization, is to say that there are real causal linkages from these conditions to the occurrence of revolution in specific instances.

Microfoundations for Causal Explanations

This account places the notion of a real causal mechanism at the center of our analysis of causation. What can we say about the mechanisms that mediate social causation? I argue for a microfoundational approach to social causation: the causal properties of social entities—institutions, organizations, states, economies, and the like—derive from the structured circumstances of agency of the individuals who make up those entities (Little 1989). The microfoundations thesis holds that an assertion of an explanatory relationship at the social level (causal, functional, structural) must be supplemented by two things: knowledge about what it is about the local circumstances of the typical individual that leads him to act in such a way as to bring about this relationship; and knowledge of the aggregative processes that lead from individual actions of that sort to an explanatory social relationship of this sort.[4] The mechanisms through which social causation is mediated turn on the structured circumstances of choice of intentional agents, and nothing else. (This is not equivalent to methodological individualism or reductionism because it admits that social arrangements affect individual action. For it is entirely possible that a microfoundational account of the determinants of individual action may include reference to social relations, structures, etc. The latter are grounded in facts about individuals; but it is not part of the microfoundations thesis to insist that the explanation should supply the details of such a grounding.) This means that social science research that sheds light on the individual-level mechanisms through which social phenomena emerge have a foundational place within the social sciences: rational choice theory, theory of institutions and organizations, public choice theory, analytical Marxism, or, perhaps, social psychology. What these fields have in common is a commitment to providing microfoundations for social explanations.

If this view is correct, then there is no such thing as autonomous social causation; there are no social causal mechanisms that do not supervene upon the structured choices and behavior of individuals.

Agent and Structure

Note that there are two directions of influence between individuals and institutions within the context of the microfoundations framework. Given that a set of institutions exists (embodied, to be sure, in facts about existing individuals) individuals' behavior will be influenced in one way rather than another. (That is, individuals with the same cognitive and affective characteristics will behave differently in the two institutional contexts.) Thus, institutions have effects on individual behavior. At the same time, the institutions themselves are determined by facts about existing individuals: the beliefs that individuals have about what the rules of the institution are, the probable consequences of noncompliance, the possibility of evading or manipulating procedures of the institution for one's own advantage; intentions and purposes; habits and presuppositions; and normative and affective attitudes relating to the institution: loyalty, fear, etc. (The institution may also be embodied concretely in buildings, written histories, codes of procedures, and the like; but these forms of embodiment too become causally operative only through their influence on individuals' actions and states of mind.) Social causation, then, is an iterative process: the current states of individuals constitute the characteristics of current institutions and social relations; and these structural and institutional facts in turn influence the future states of individuals' beliefs, preferences, and worldviews.

Here, then, we can come to a conclusion. Social entities exercise causal powers through their capacity to affect the choices and behavior of the individuals who make up these entities, and through no other mechanism. Consider, for example, Robert Klitgaard's treatment of efforts to reduce corruption within the Philippine Bureau of Internal Revenue (Klitgaard 1988). The key to these reforms was implementation of better means of collecting information about corruption. This innovation had a substantial effect on the probability of detection of corrupt officials, which in turn had the effect of deterring corrupt practices. This institutional arrangement has the causal power to reduce corruption because it creates a set of incentives and powers in individuals which lead to anticorruption behavior.

Lowering the prime interest rate has the causal capacity to reduce the rate of inflation. Why is this? Because rational investors lower their rate of investment in the face of lower interest rates; demand for producer goods falls; incomes for workers remain steady; and demand for goods remains flat. So prices tend to stay constant. This story accounts for the causal powers of the intervention in terms of the incentives created and strategies available to the relevant agents.

36

The conclusion of this line of thought is that institutions have effects on individual behavior (incentives, constraints, indoctrination, preference formation), which in turn produce aggregate social outcomes. Some social regularities follow immediately from these effects—e.g., increasing the tariff on imported running shoes leads to an increase in consumption of domestic running shoes. (This regularity derives from the fact that consumers are price-sensitive; so increasing the cost of imports leads to a shift in typical consumer behavior.) (Naturally, we need another story to tell to indicate how institutions are embodied in the current beliefs, preferences, and behavior of existing individuals.)

Causal Properties of Social Entities

So far we have focused on the role that social entities and events play in causal histories. We can also ask, however, whether social entities have causal properties: enduring causal dispositions to bring about certain types of outcomes. Gold has specific causal powers and properties—a melting point, an alloy potential, an electrical conductivity, and so forth. Do social entities likewise have distinctive causal properties? Is it the case that the liberal state, the grain riot, the labor union, or the conservative populist party have distinctive and real causal properties?

What is it to attribute a causal power to an entity? It is to assert that the entity has a dispositional capacity to bring about specific types of outcomes in a range of causal fields. To have a causal power is to have a capacity to produce a certain kind of outcome in the presence of appropriate antecedent conditions. (A similar conception of the meaning of causal claims is applied to the physical sciences in Cartwright 1989. See also Morrison 1995 and Humphreys 1995 for discussions of Cartwright's theory.) Sulphuric acid has the causal power of dissolving metals on contact; the Gulf Stream has the causal power of stimulating hurricanes; and—perhaps—a national labor market has the causal power of stimulating migration from low-wage areas to high-wage areas.

What, then, can we say about the causal powers of social entities? Do social entities have causal properties? Does a given state, labor organization, bank, or political party have causal powers? And do types of social entities have common causal properties? That is, do states, labor organizations, banks, or political parties have common causal powers? Consider the causal powers of the U.S. government with respect to U.S. economic activity. Various agencies have instruments of action that produce changes in economic activity. The economic variables of interest include the inflation rate, the rate of employment, and the growth rate. Changes in money supply,

changes in federal spending, and changes in interest rates are all actions that government agencies can undertake that have effects on economic activity. Do these constitute causal powers in the sense described above? They do, but this judgment is attenuated by the fact that the relation between cause and effect is often highly contextual in the case of social causation. In some contexts lowering the interest rate may stimulate growth while dampening inflation; in other contexts it leaves both growth and inflation unchanged. This implies that an adequate causal analysis of particular outcomes will not take the causal properties of the Fed as basic, but will rather involve a large number of causal factors (including the Fed's actions) which jointly produce given outcomes.

Second, we can say a great deal about the metaphysics of social causal powers. The discussion of microfoundations above gives the clue; the causal properties of a social entity consist in the structures that it embodies that affect the actions of individuals (through incentives, opportunities, powers, information). I assert that certain social entities have causal relevance—e.g., centralized bureaucratic states have greater capacity to collect revenues from the periphery than decentralized feudal states (Mann). What this capacity consists in, however, is not merely the observed regularity that corresponds to it. And it is not some mysterious social force inhering in the social entity itself. It is, rather, the specific features of these states in virtue of which the agents of the state have both the interest and the means to effectively extract revenues from actors distant from them.

Consider an example. Transport systems have the causal capacity to influence patterns of settlement; settlements arise and grow at hubs of the transport system. Why is this so? It is not a brute fact, representing a bare correlation of the two factors. Instead, it is the understandable result of a fuller description of the way that commerce and settlement interact. Agents have an interest in settling in places where they can market and gain income. The transport system is the structure through which economic activity flows. Proximity to the transport system is economically desirable for agents: they can expect rising density of demand for their services and supply of the things they need. So when a new transport possibility emerges—extension of a rail line, steamer traffic farther up a river, or a new shipping technique that permits cheap transportation to offshore islands—we can expect a new pattern of settlement to emerge as well. This is an instance of a microfoundational explanation.[5]

We can say also that certain institutions have specific causal powers with respect to given social outcomes as a consequence of the common constitution and circumstances of individuals. The Fed has the causal power to dampen inflation,

in that it can tighten the money supply; this creates an individual disincentive to purchase; this leads to reduced demand for goods; and this lessens the upward pressure on prices. This causal power is entirely derivative, however, upon facts about typical consumers. The Fed has the power to alter the environment of choice for consumers; the result of this new environment is a pattern of consumption in which demand is shifted downward.

The upshot, then, is this. Social entities possess causal powers, but only in a weak and derivative sense: they possess characteristics that affect individuals' behavior in simple, widespread ways. Given features of the common constitution and circumstances of individuals, such alterations at the social level produce regularities of behavior at the individual level that eventuate in new social circumstances. S1 $\Rightarrow$ {structured environment of individual choice} $\Rightarrow$ S2. Theda Skocpol's causal analysis of the state and revolution, then, does legitimately attribute causal powers to the state. But these causal powers derive entirely from the ways in which the institutions of the state assign incentives, powers, and opportunities to various individuals.

EXPLANATORY DESIDERATA

Singular and Generic Causal Assertions

So far we have focused on the metaphysics of social causation: what constitutes a causal relation, what sorts of mechanisms exist to convey social causation, and how do social entities possess causal powers. Let us turn now to the epistemic side of the equation: the problem of defining the criteria of a good explanation based on causal ascriptions.

To start, notice that we can ask causal questions at two extremes of specificity and generality. We can ask why the Nicaraguan Revolution occurred—that is, what was the chain of circumstances that led to the successful seizure of power by the Sandinistas? This is to invite a specific historical narrative, supported by claims about causal powers of various circumstances. And we can ask why twentieth century revolutionary movements succeeded in some circumstances and failed in others—that is, we can ask for an account of the common factors that influence the course of revolution in the twentieth century. In the first instance we are looking to put forward a causal hypothesis; in the latter we are seeking an explanation.

I will put it forward as a methodological maxim that a causal assertion is explanatory only if it identifies a causal process that recurs across a family of cases. A historical narrative is an answer to the first sort of question; such a narrative

may or may not have implications for more general causal questions. A true causal story is not always explanatory.

Much inquiry in the social sciences has to do with singular causal processes (historical outcomes): individual revolutions, specific experiences of modernization and development, specific histories of collective action. Charles Tilly's career-long treatment of the collective political behavior of the French political action, and attempts to identify the historical occurrences that gave this tradition its specificity (Tilly 1986). To what extent is such an analysis explanatory, rather than merely true? The account is explanatory if it identifies influences that commonly exert causal power in a variety of contexts, not merely the case of the French in 1848. And a case study that invokes or suggests no implications for other cases, falls short of being explanatory.

I maintain, then, that good causal explanation requires at least two things. First, the explanation needs to provide a causal analysis that identifies some of the conditions that contributed to the occurrence of the explanandum. That is, the explanation needs to provide (part of) a causal diagram. And second, the account must invoke causal relations that attach to the type, not the token.

Are There Non-Causal Explanations of Social Phenomena?

I am inclined to argue that all explanations of social phenomena are importantly causal explanations. The central paradigm of a causal explanation is one in which we provide an account of the conditions that produced the outcome. But there are explanatory schemes that invoke causal processes in a more indirect way; I would still call these causal explanations. Several instances include equilibrium explanations, side-constraint/filtering/evolutionary explanations, functional explanations, and interpretive explanations.

An equilibrium explanation explains a phenomenon by showing that it is the equilibrium state of a set of forces or actors (Schelling 1978). Why is the price of wheat $1.00 per bushel? Because this is the equilibrium state at which the quantity elicited from producers at that price equals the quantity demanded by consumers at that price. And what accounts for a stable price at this level is a very simple theory of the causal processes that go into play when the price deviates from its equilibrium: a higher price leads to lower demand, excess capacity, and competitive bidding downward of price by producers. The stability of the equilibrium, then, depends on the causal systems within which the variable is situated.

Evolutionary and filtering explanations have a different structure. Suppose we ask why all incoming students at a given college have SAT scores above 1200. The correct expla-

nation may be that the admissions office filters applicants with lower scores. If we ask why all piglets at six months are 12 inches long or longer, the correct explanation may be that piglets of lesser stature starve by six months. And if we ask why firms make an efficient allocation of capital resources, the correct answer may be that grossly inefficient allocations lead to bankruptcy. Each of these is a filtering explanation. Crucially, however, it is plain that each of these explanations is a causal explanation. But instead of focusing on the factors that bring the condition into place, we look for the feedback system that restores equilibrium or the set of causal variables that filter out certain outcomes.

A perhaps more difficult set of cases of purportedly noncausal explanations in the social sciences fall in the area of the explanation of action and significance. Why do producers increase production when the price for the commodity rises? Because they are rational agents aiming to maximize income. Is this a causal explanation? I conceive of rationality as a property of agents in analogy with electrical charge as a property of matter; it is a characteristic that defines the basic disposition of the "atom" of the causal system. Plainly, individual rationality is more variable than the fundamental properties of physical matter; but there is no more fundamental level at which individual behavior is determined or guided. The cause of a given pattern of settlement is the structure of the transport system and the rational choices made by large numbers of individuals.

Finally, what about significance explanations, such as one finds in interpretation theory? Here the situation is more complex. It must be admitted that the sentence "Balinese people conceive of personal identity in terms X, Y, Z" can play an explanatory role, and that it is not directly causal. It has rather to do with the significance that a given set of people attribute to aspects of their world or culture. However, I would wish to regard statements like these as comparable in status to the thesis that farmers are rational. This establishes a basic characteristic about farmers that guides their choices and actions; it then becomes the basis of causal explanations of social phenomena. Why is Navajo population so widely distributed across the Southwest? Because Navajo culture regards privacy as an important value, and individuals choose to locate their habitations in respect to this value. The causal factor, then, is the cultural adherence to the value of privacy; the consequence is the pattern of habitation.

Relationship to the Covering Law Model
Philosophical discussions of scientific explanation are normally couched in the context of the covering law model: to explain a phenomenon is to put forward a (deductive or induc-

tive) argument which takes one or more general laws as premise and the phenomenon to be explained as conclusion. This approach makes law-like generalizations central to scientific explanation. My account has focused instead on causal powers and capacities, with only gingerly reference to law-like generalizations.[6] This is chiefly true because I am dubious about the availability of strong law-like generalizations among social phenomena; I do not believe that there are social laws analogous to laws of nature that could provide a basis for explanation of social phenomena. (For extended argument to this effect, see Little 1993.) Instead, I believe that social regularities are best explained on the basis of microfoundational accounts of the causal processes that underlie social phenomena. These processes provide the metaphysical and epistemic basis for our understanding of social phenomena and regularities. It is thus causal capacities rather than law-like regularities that are at the center of social explanation, on my account. (The resonance of this view with Nancy Cartwright's important work on scientific explanation will be apparent.)

This perspective notwithstanding, it is certainly true that any causal explanation can be expressed as a covering law explanation. Suppose that we explain the weak revenue extraction capacities of feudal states as the consequence of the infeudation of political power in such states. The microfoundational explanation goes along these lines: feudal states are characterized by a parceling out of political power from the sovereign to multiple layers of lords. This results in a decentralized decision-making process in which substantial local autonomy is inherent. Sovereigns have an interest in collecting revenues from their dominions, and lords have an interest in retaining control of the wealth within their purview. Because power is fragmented, the sovereign is in a weak position to demand revenues from the lords. Therefore, feudal states have weak revenue extraction capacity.

This is a microfoundational causal explanation of an observed characteristic of a certain kind of political regime. Now that we have arrived at the explanation, we can put it in the form of a covering law explanation:

(1) Rational sovereigns wish to maximize revenues.
(2) The feudal state divides political power over an extended hierarchy of lords.
(3) Sovereigns in a feudal system have little direct political power over lords.
(4) Lords wish to retain their wealth.

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(5) Feudal states have weak revenue collection systems.

The premises of this argument are all generalizations about various things—the rationality and preferences of actors and the structure of a given political regime. The conclusion follows deductively from these premises.

My account is thus fully compatible with the covering law model of explanation. My point is simply that it is not the "laws" that are doing the explanatory work here; it is rather the specific mechanisms and institutional arrangements that the social scientist has uncovered which constitute the basis of explanation. The covering law model serves only a formal function; it provides a perspicuous way of representing the findings of the explanatory inquiry.

METHODS OF CAUSAL INQUIRY

Let us turn now to an examination of some of the central methods through which social scientists probe causal relations among social phenomena.

Process-Tracing: Case Study Method
Why did the Chinese Revolution occur in the time and place that it did? What factors in Chinese society and the international environment combined to make successful revolution inevitable or probable in the 1940s? This is a singular causal question. It focuses on a singular historical event (comprised, of course, of vast numbers of regional, local, and individual events; conveyed by institutions, organizations, movements; constrained by demographics and slow economic change; stimulated by party, war, and Japanese brutality ...) and asks what the causes of the event were. How does a political scientist or historian attempt to answer such a question? This question invokes appeal to the case study method. The researcher needs to acquaint him/herself with a fine-grained knowledge of the historical circumstances of the Chinese Revolution. This means knowledge of a great many things—

- Agrarian conditions
- Background of the CCP and its association with Soviet Communism
- The disposition and circumstances of Japanese aggression in the 1930s
- The politics of the warlord period and Nationalist government
- Demographic and economic circumstances
- CCP strategies and tactics
- Economic and political forces on China from the international environment

But knowledge of a great deal of historical detail about China does not by itself lead the researcher to a causal analysis. Rather, the researcher must engage in an analysis that we may call "process-tracing": he/she needs to begin to offer hypotheses about the causal relations among the factors that emerge from the case study. Take peasant economic distress, for example. In order for a revolution to take place, there must be a basis for mobilizing mass support for the revolutionary movement. What would induce citizens to support a call for uprising? It is natural to suppose that exploitation and poverty would motivate people toward insurrection: when people are hungry, they may be more drawn to extreme measures, and when they judge that an unjust social or economic regime underlies their hunger, their motivation may be even greater. But now the researcher can attempt to evaluate this hypothesis. Knowing a great deal about the process of revolution across China, he/she can ask questions like these:

• Was mobilization most conspicuous in regions of the greatest distress?
• Was mobilization greatest in the most exploitative regions?
• Were there regions where mobilization was conspicuous but where peasant circumstances were fairly prosperous?
• Were there mobilization successes in regions where there was little exploitation?

If we find that the answers to such questions are not the expected ones—that is, we find that the revolutionary movement was successful in a regional pattern that does not correspond to intensity of poverty or exploitation—then we have to reconsider our hypothesis: either poverty and exploitation are not causal factors in the occurrence of revolution at all, or these factors interact with other causal factors in unforeseen ways, or there are multiple causal pathways to revolution, some of which do not involve intensity of poverty.

On the other hand, it may be that our researchers turn out more favorably for the hypothesis: we examine mobilization successes in a number of areas and find:

• That there was substantial poverty;
• Mobilization was supported by the poorest;
• Mobilization propaganda was directed at poverty and the sources of poverty;
• The first policies enacted after the seizure of power were directed toward this group.

Results like these would make a strong case for the causal importance of poverty and deprivation in the etiology of mobilization success.

Suppose, finally, that the results are more complex than either story: deprivation is present in most but not all cases of successful mobilization; and there are areas of intense deprivation in which no successful mobilization occurs. Here the researcher can ask a new series of causal questions: are there other factors that appear to play a facilitating or inhibiting role in the occurrence of mobilization? For example, does a strong state organization in a given area have the effect of inhibiting underclass mobilization—does this factor appear to explain the counterexample? And are those other prominent bases of mobilization besides exploitation and poverty that explain the instances of mobilization that do not correspond to these factors?

These sorts of inquiries constitute the method of "process-tracing." The researcher examines specific conjunctions of factors and outcomes, and attempts to draw causal analysis and inference in these particular cases. And in most cases we can understand this approach as an effort to uncover the microfoundations of the phenomenon in question.

Comparative Methods and Causal Analysis

The preceding discussion corresponds to the logic of the case study method; it is designed to discern singular causal linkages. But it was argued above that explanation begins at the point at which we are able to discover counterfactual relations among classes of social phenomena. On the assumption that there are such relations, how can a social scientist probe the available evidence in order to discover such relations? How may we investigate the causal relations that obtain among a set of conditions and events?

The leading answer to this question involves the comparative methods, formulated with logical clarity by John Stuart Mill. Mill formulated the methods of difference and similarity as a basis for probing causal relations in the human sciences. This method directs us to examine a number of different settings for the primary variables (A–F) and see whether we can identify necessary and jointly sufficient conditions for the occurrence of revolution. (Each setting of the variables constitutes a case.) This approach makes two central assumptions:

- **Exceptionless causation:** causes work through exceptionless regularities.
- **Causal closure:** we have identified the complete causal field; all causally relevant variables are considered.

These assumptions guarantee *causal consistency*: if a complete setting of the dependent variables is once associated with the effect, then this setting will always be associated with the effect. There are two ways a causal system might fail to be caus-

ally consistent: causes might be probabilistic (so that a causal setting sometimes fails to produce the effect), or the causal field might be incomplete (so that the effect sometimes appears in settings that are not causal settings). The first assumption guarantees that if some conjunction of properties is sometimes sufficient to produce an outcome, then it is always sufficient to produce that outcome. The second assumption guarantees that if the effect is present, it has been produced by the conjunction of properties present in the setting, not some causal factor external to the field. These assumptions are highly unrealistic, but they are unavoidable for the application of Mill's methods. It is simply impossible to apply a comparative method without making them. What the following will show, however, is that even if we make these highly charitable assumptions, causal reasoning in comparative research is much more problematic than usually admitted.

A Comparative Study

Let us begin, then, with a comparative study of revolution based on these variables. Table 1 represents a hypothetical comparative study of revolution along the lines of Theda Skocpol's research (Skocpol 1979). Here I assume that the researcher has identified a set of cases in which revolution occurs and a set of cases in which it does not; he or she has then determined the status of all variables (A–H) for each case. The values of the dependent variables (G, H, and R) are generated on the basis of the causal diagram of Figure 1; but the researcher is presumed to be ignorant of the real underlying causal relations. Each line of the table, then, represents the result of the researcher's examination of a single case.

	A food crisis	B local organiz.	C war	D weak institut.	E exploi- tation	F economic crisis	G social unrest	H state crisis	R revolution
Cuba	0	1	0	1	1	1	1	1	1
France	1	1	0	1	1	1	1	1	1
Russia	0	1	1	1	1	1	1	1	1
China	1	1	1	1	1	1	1	1	1
England	0	0	1	0	1	1	0	0	0
Italy	0	0	1	1	1	1	0	1	0
Sweden	1	1	0	0	0	1	1	0	0

Table 1. Comparative study of revolution.

If we inspect the cases looking for necessary and/or sufficient conditions for the occurrence of revolution, we will notice various facts:

(1) Social unrest and state crisis (G and H) appear to be necessary for R. Neither is sufficient, since each occurs singly in cases in which revolution does not occur (Italy and Sweden). But these two variables appear to be jointly sufficient for the occurrence of R.

(2) We cannot tell anything about the role of economic crisis, since it occurs in every case. It may be necessary; it cannot be sufficient.

(3) Food crisis and war cannot be necessary conditions for revolution, since there are cases in which revolution occurs but one or the other of these conditions is absent (Cuba, France, Russia). We do not know, however, whether this is a minimal sufficient condition.

(4) Local organization, weak institutions, exploitation, and economic crisis are jointly sufficient for revolution, since these conditions by themselves lead to revolution in one case (Cuba), and are present in each of the other cases in which revolution occurs.

Is it possible to systematize this analysis at all? It is, since we can express all the information about causal relations presented by this study in the form of a complex truth functional sentence. (This is a formulation of the causal relations in terms of the INUS conditions that govern these factors.) Revolution occurs in conjunction with certain combinations of the variables but not others. So we can express the causal law represented by the study as a set of jointly sufficient conditions. Consider, then, the expression we get from considering only the four positives in Table 1 (Cuba, France, China, Russia):

$$\{ABCDEF \ v \ AB{\sim}CDEF \ v \ {\sim}ABCDEF \ v \ {\sim}AB{\sim}CDEF\} \Rightarrow R$$

We notice that several factors are in common among each disjunct, so these can be pulled out of the expression:

$$BDEF \ \& \ \{AC \ v \ A{\sim}C \ v \ {\sim}AC \ v \ {\sim}A{\sim}C\} \Rightarrow R$$

Thus, B, D, E, and F appear to be necessary conditions for the occurrence of revolution. The expression in braces is a tautology, so we may simplify:

$$BDEF \Rightarrow R$$

That is: local organization, weak institutions, exploitation, and economic crisis are sufficient to produce revolution—a correct conclusion given the underlying causal process.

What this data misses, however, is that there are other combinations of conditions that will produce revolution:

$$BDAF \Rightarrow R$$
$$BDAC \Rightarrow R$$
$$BDEC \Rightarrow R$$

So this method permits us to discover some of the sufficient conditions for the occurrence of revolution; it does not permit us to conclude that any condition is a necessary condition; and it is not guaranteed to eliminate conditions that are unnecessary for the outcome.

In short: the data provided in Table 1 is consistent with the causal diagram. But it is not sufficient to permit the researcher to infer the complete underlying causal structure. Rather, it would be necessary to arrive at a hypothesis about the causal relations among these conditions; and such a hypothesis most naturally emerges from a substantive theory of the causal mechanisms that are at work in the social phenomena under consideration. And to discern the other possible causal pathways it would be necessary to identify more cases in which different settings of the variables lead to revolution or no revolution.

Mill's Methods Generalized

The chief limitation of the preceding study is its incompleteness. However, if we assume exceptionless causal regularities and causal closure, then there is a research strategy available that permits complete information.[7] There are six independent variables here; this produces a truth table of 64 logically possible combinations (Table 2).

	A	B	C	D	E	F	AvE	AvE&B	CvF	CvF&D	Rev
China	T	T	T	T	T	T	T	T	T	T	T
	T	T	T	T	T	F	T	T	T	T	T
	T	T	T	T	F	T	T	T	T	T	T
	T	T	T	T	F	F	T	T	T	T	T
	T	T	T	F	T	T	T	T	T	F	F
	T	T	T	F	T	F	T	T	T	F	F
	T	T	T	F	F	T	T	T	T	F	F
	T	T	T	F	F	F	T	T	T	F	F
France	T	T	F	T	T	T	T	T	T	T	T
	T	T	F	T	T	F	T	T	F	F	F
	T	T	F	T	F	T	T	T	T	T	T
	T	T	F	T	F	F	T	T	F	F	F
	T	T	F	F	T	T	T	T	T	F	F
	T	T	F	F	T	F	T	T	F	F	F
Sweden	T	T	F	F	F	T	T	T	T	F	F
	T	T	F	F	F	F	T	T	F	F	F
	T	F	T	T	T	T	T	F	T	T	F
	T	F	T	T	T	F	T	F	T	T	F
	T	F	T	T	F	T	T	F	T	T	F

48

	A	B	C	D	E	F	AvE	AvE&B	CvF	CvF&D	Rev
	T	F	T	T	F	F	T	F	T	T	F
	T	F	T	F	T	T	T	F	T	F	F
	T	F	T	F	T	F	T	F	T	F	F
	T	F	T	F	F	T	T	F	T	F	F
	T	F	T	F	F	F	T	F	T	F	F
	T	F	F	T	T	T	T	F	T	T	F
	T	F	F	T	T	F	T	F	F	F	F
	T	F	F	T	F	T	T	F	T	T	F
	T	F	F	T	F	F	T	F	F	F	F
	T	F	F	F	T	T	T	F	T	F	F
	T	F	F	F	T	F	T	F	F	F	F
	T	F	F	F	F	T	T	F	T	F	F
	T	F	F	F	F	F	T	F	F	F	F
Russia	F	T	T	T	T	T	T	T	T	T	T
	F	T	T	T	T	F	T	T	T	T	T
	F	T	T	T	F	T	F	F	T	T	F
	F	T	T	T	F	F	F	F	T	T	F
	F	T	T	F	T	T	T	T	T	F	F
	F	T	T	F	T	F	T	T	T	F	F
	F	T	T	F	F	T	F	F	T	F	F
	F	T	T	F	F	F	F	F	T	F	F
Cuba	F	T	F	T	T	T	T	T	T	T	T
	F	T	F	T	T	F	T	T	F	F	F
	F	T	F	T	F	T	F	F	T	T	F
	F	T	F	T	F	F	F	F	F	F	F
	F	T	F	F	T	T	T	T	T	F	F
	F	T	F	F	T	F	T	T	F	F	F
	F	T	F	F	F	T	F	F	T	F	F
	F	T	F	F	F	F	F	F	F	F	F
Italy	F	F	T	T	T	T	T	F	T	T	F
	F	F	T	T	T	F	T	F	T	T	F
	F	F	T	T	F	T	F	F	T	T	F
	F	F	T	T	F	F	F	F	T	T	F
England	F	F	T	F	T	T	T	F	T	F	F
	F	F	T	F	T	F	T	F	T	F	F
	F	F	T	F	F	T	F	F	T	F	F
	F	F	T	F	F	F	F	F	T	F	F
	F	F	F	T	T	T	T	F	T	T	F
	F	F	F	T	T	F	T	F	F	F	F
	F	F	F	T	F	T	F	F	T	T	F
	F	F	F	T	F	F	F	F	F	F	F
	F	F	F	F	T	T	T	F	T	F	F
	F	F	F	F	T	F	T	F	F	F	F
	F	F	F	F	F	T	F	F	T	F	F
	F	F	F	F	F	F	F	F	F	F	F

Table 2. All possible states of the world with respect to variables A–F

Some of these combinations may be excluded as logically possible, but naturally or socially impossible. For each remaining possibility find a case that instantiates it; then see whether there was a revolution or not. (We may construe the truth table as an exhaustive list of possible worlds: all possible states of the world with respect to the independent variables.) This will give us a list of conjunctive conditions, each of which is sufficient to cause revolution. In the case of the model under discussion, that sentence is:

3   {ABCDEF v ABCDE~F v ABCD~EF v ABCD~E~F v
     AB~CDEF v AB~CD~EF v ~ABCDEF v ~ABCDE~F v
     ~AB~CDEF} ⇒ R
4   BD & {ACEF v ACE~F v AC~EF v AC~E~F v A~CEF v
     A~C~EF v ~ACEF v ~ACE~F v ~A~CEF} ⇒ R

We can identify necessary conditions if there are any (as there are in this case—B and D), since these will occur in each disjunct. Each of the disjuncts in Expression 3 is sufficient for the production of R—though the complexity and redundancy of the expression makes this somewhat uninteresting. Expression 4 could with ingenuity be simplified to Expression 2 above, since the two are logically equivalent; but the simplification does not jump out at one.

So: if the causal relations in question were exceptionless and if we could find a case for each logically and socially possible world, then we would be able to come up with a truth-functional statement that captures the causal relations among the factors. This expression might or might not be simplified to a comprehensible causal hypothesis. The challenge for social research is to find cases that instantiate each combination of conditions, and then see whether R is present or not.

This truth-table method in a sense represents a complete method of causal analysis for comparative research. However, for actual comparative work it is clear that it will not be possible to find cases for every logically and socially possible world; this implies, however, that we will not be able to provide an exhaustive statement of the causal regularities. We would have cases corresponding only to a small subset of possible settings of the variables.

Observations From the Analysis

Several observations emerge from this consideration of comparative research.

(1)   Any actual comparative project will consider a number of cases that is substantially smaller than the total (though finite) number of possible states of the world with respect to the causal field. This means that conclusions will be

less than exhaustive, and there may be causal relations among the selected conditions that are not identified.

(2) A given causal field (list of potentially relevant causal variables) cannot be known to be complete; there may be other variables that are causally relevant but not present. This means that there may be causal inconsistencies in the study (e.g., cases with the same setting of the variables but different outcomes for the dependent variable).

(3) The assumption of exceptionless causal regularities is plainly unjustified. But this means that Mill's methods and their generalization here cannot be applied; we cannot infer from the presence of a set of factors and the absence of R, that those factors do not cause R. Instead, this may simply be one of the infrequent times in which the general causal regularity fails to materialize.

(4) Given the large number of different combinations of variables (settings) that produce distinct outcomes and pathways, we may be somewhat skeptical about comparative studies that consider only a small number of cases; it is perhaps reasonable to worry that these cases will have only captured a few out of a large number of pathways and give a misleadingly simple idea of the causal processes at work.

(5) Finally, and most importantly: these limitations demonstrate that purely inductive study of cases cannot suffice to fully identify causal relations. Rather, it is necessary to put forward hypotheses about the underlying causal relations.

These hypotheses can be tested through comparative study (examination of specific cases with questionable settings of variables), but they cannot be deduced from the data. The data underdetermines the causal hypotheses. Where do such hypotheses come from? This is the function of social theory: rational choice theory, theory of organizations, theories of mobilization, theories of collective action, theories of institutional change, etc. All these theories represent empirically supported descriptions of processes of social causation; so when we look at the phenomena of a case, we may recognize instances of causal mechanisms at work. This is the deductive side of social science explanation. The data of the case studies represent a few data points to which our causal theories must conform, rather than a CAT-scan of social causation that we need only trace over mechanically.

Probabilistic Causation

The assumptions required for Mill's methods and its generalization are excessively demanding: exceptionless causal regularities and complete causal fields. The world seems to

present us with numerous examples of causal relations that are probabilistic rather than exceptionless; and we are rarely in a position to be able to specify with confidence a complete list of factors that are causally relevant to a given kind of outcome. We now relax the first assumption by allowing probabilistic causal relations. Under these relaxed conditions Mill's methods are no longer available. We still have the same six independent variables; but now instead of exceptionless causal laws we have the circumstance that some combinations of conditions have the effect of changing the antecedent probability of the occurrence of revolution (upwards typically).

I have incorporated probabilistic causation into this model in a somewhat more realistic way by assigning probabilities to each of the independent variables (A–F). This in turn permits us to calculate a probability of occurrence for each line of the truth table. Secondly, I have assigned probabilities to each of the causal links specified in the model. None of the regularities is now conceived to be exceptionless; rather, I assign a probability to the occurrence of the result given the occurrence of the antecedent conditions (a conditional probability). Here we have causal relations that may be represented in the following form:

$$(A\&B) = [p] \Rightarrow Q,$$

where [p] represents the probability of Q's occurring given the occurrence of A&B. (Thus, p is the conditional probability of Q given A&B: Prob (Q/AB).)

Figure 2 illustrates this set of assumptions. Probabilities of the independent variables are represented by decimal fractions above each factor. Conditional probabilities of outcomes given antecedent conditions are represented by decimal fractions attached to each causal link in the diagram. These assumptions define an infinite set of possible worlds, with these characteristics:

(1)   Each world state appears in proportion to its overall probability (determined by the product of the probabilities of the states of each of the independent variables);

(2)   Each world state is associated with revolution in proportion to the net probability of the particular causal links that produce revolution in that case.

Note, however, that there is a combinatorial explosion here. Most worlds will not lead to revolution; and there are a large number of pathways that do, corresponding to different settings of the six primary variables.[8]

In the case of probabilistic causal relations we have no choice but to expand the number of cases dramatically and

employ statistical methods to attempt to discern causal relations. If the world is actually structured in the way represented by the causal diagram, a large enough number of cases will display significant statistical regularities. The simple inference is this: the causal diagram implies that the conditional probabilities of the outcome will differ, depending on the setting of the antecedent variables. Cases with food crisis, local organization, and exploitation ought to show a sixteen percent (16%) incidence of revolution; cases with war, weak institutions, and economic crisis ought to show a thirty percent (30%) incidence. Only seven percent (7%) of world states, however, satisfy the first set of conditions, and only two percent (2%) satisfy the second set. So, in order to have enough cases to provide a statistically significant estimate of the conditional probabilities of revolution given various combinations of antecedent conditions, we would have to canvas a huge number of "world states"—or data set involving hundreds of cases.

However, given data limitations, it appears dubious that there are analytical techniques that permit us to infer the underlying causal relations without putting forward hypotheses about possible mechanisms. In spite of the fact that the causal properties of the system are entirely expressed in the data set, we could only arrive at the causal diagram through the formulation of hypotheses about the possible relations among factors. These hypotheses can be evaluated through the data available in the data set, but they cannot be deduced from the set. These data serve to constrain causal hypotheses. But they do not suffice to replace such hypotheses. The researcher still needs to consider hypothetical causal chains, which can then be tested against new evidence.

THE ROLE OF
SOCIAL THEORY

The central conclusion of this discussion is that the empirical procedures commonly used to probe causation in the social sciences (Mill's methods and its generalizations, and various tests of statistical association) almost always underdetermine the true causal story for a given ensemble of phenomena. Therefore, it is necessary to put forward hypotheses of causal mechanisms whose implications for experimental methods can then be tested. This brings us back to the topic of causal realism: the goal of causal analysis is to identify the causal mechanisms that link cause and effect. The upshot of the analysis provided here provides another compelling reason for adhering to causal realism, however; it is only on the basis of hypotheses about underlying causal mechanisms that social scientists will be able to use empirical evidence to establish

causal connections. This, in turn, brings us to a better understanding of the role of social theory in social research; for it is a central function of social science theory to offer empirically justified accounts of a wide range of potential social mechanisms. Causal realism thus demands social theory—collective action theory, theory of bureaucracies and institutions, class conflict theory, economic geography, rational choice theory, theory of social-property regimes, etc.—since we need to have an analysis of the causal powers of the various factors in order to account for the links in the causal diagram.

This observation, in turn, sheds light on Theda Skocpol's method in *Social Revolutions* (1979). The analysis above suggested that her study depended on too few cases. But, in fact, her method really consists of two parts; it is not exclusively comparativist. First, she is unmistakably pursuing a comparative study of revolution, based on a small number of cases. But second, she is canvassing widely within social science theory to arrive at theories of particular causal links—e.g., between war and state stability, or between intra-elite conflict and state stability. These theories are not inherently based on comparative study. The result is that Skocpol is able to reconstruct the causal pathways represented by various cases, because she knows something about the causal powers of the various factors. Social theory thus provides a source of hypotheses about causal mechanisms that can then be probed and evaluated using a comparative methodology.

NOTES

[1]   I will address the more difficult question—whether *all* social explanations are causal explanations—below.

[2]   Useful recent collections on the philosophy of scientific explanation include Kitcher and Salmon, eds. (1989), Knowles, ed. (1990), and Ruben, ed. (1993).

[3]   See Wesley Salmon's analysis of causal relevance for a detailed treatment of probabilistic causation (Salmon 1984).

[4]   We may refer to explanations of this type as "aggregative explanations." Thomas Schelling's *Micromotives and Macrobehavior* (1978) provides a developed treatment and numerous examples of this model of social explanation.

[5]   Similar examples of arguments about the logic of power relations in pre-modern societies may be found in Mann (1986).

[6]   David-Hillel Ruben's "Singular Explanation and the Social Sciences" (Ruben, 1990) provides a capable summary account of current attempts to understand social science explanation in terms of the covering law model. Railton (1989) notes the shift in the 1980s to a treatment of explanation that places more weight on the metaphysical underpinnings of scientific explanation.

[7]   The following converges with Charles Ragin's "Boolean treatment" of comparative methodology (Ragin 1987). I find his discussion more obscure than it needs to be, however.

[8] To relax the assumption of causal closure it would be necessary to add one additional alternative path to the diagram—representing the fact that revolution may result from different causes altogether—and then assign a probability to this pathway. This would mean that revolution will sometimes occur even when each of the independent variables is absent. If this probability is low relative to the probability of revolution produced by the independent variables, it should still be possible to discern the causal relations among those variables and revolution.

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