

The implications of complex realism for researching causality in complex systems.

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Defining complex systems

‘ ... a simple system is one to which a notion of state can be assigned once and for all, or more generally, one in which Aristotelian causal categories can be independently segregated from one another. Any system for which such a description cannot be provided I will call complex. Thus, in a complex system, the causal categories become intertwined in such a way that no dualistic language of state plus dynamic laws can completely describe it. Complex systems must then process mathematical images different from, and irreducible to, the generalized dynamic systems which have been considered universal.’ (Rosen 1987 324)

That which needs to be understood

- ▶ ‘Human systems and their baseline bio-physical environment are ... complex and dynamic; changing and reproducing through time and across space. Each element of a change is the cause and effect of other processes, and as such cannot be measured using a baseline state and a subsequent movement away from that state (as in a closed system).’ (Lemon and Seaton 1999 13)
- ▶ ‘Investigations into the complexity of coevolving complex adaptive systems from this perspective have to deal with two major issues; the fact that coevolution is essentially a process and can only be understood longitudinally and the fact that complexity and agents’ representation of complexity are similar things. These issues have practical consequences for empirical research.’ (Gerrits 2008 24)

Structure

- ▶ ‘Most of us agree that individuals exist and that they have causal powers that enable them to bring about change and to transcend social expectations. The critical realists believe that this also holds true for society and structure. Since society cannot be observed as such, a perceptual criterion of ontological existence cannot be used. Instead, Bhaskar and colleagues rely on a causal criterion of existence and argue that society and/or different social strata have a real ontological existence to the extent that they are causally efficacious; “their causal power establishes their reality” (Bhaskar 1998 25).’ (original emphases) (Hedstrom 2005 72)

Mechanism

- ▶ ‘The core idea behind the mechanism approach is that we explain a social phenomenon by referring to a constellation of entities and activities, typically actors and their activities, in such a way that they regularly bring about the type of phenomenon we seek to explain.’ (Hedstrom 2005 ix)
- ▶ The core idea behind the mechanism approach is that we explain the state of a social system at a point in time and explain the trajectory of that system through past times by referring to a constellation both of internal control parameters and of the state(s) of systems with which the system of interest intersects. We generalize within a scoped range by considering that similar constellations might engender the same system state / trajectory for systems sufficiently similar to our system of interest. - Complexity translation of Hedstrom by Byrne.

The Essence of Complex Realism

- ▶ ‘... the world is composed of a complex array of material entities and causal processes which are not immediately available to everyday experience. Moreover, the structure of scientific knowledge and its progressive, cumulative nature demonstrates that these entities and their causal powers are “ontologically stratified” in that they form several structurally distinct levels of reality which are irreducible to one another. Further, the resulting strata are emergent realities in that each level is the product of the reproductive mechanisms inherent in the more basic strata grounding it: but, for all that, these emergent strata are not strictly reducible to those more basic strata and structures. Finally, these strata are hierarchically structured and loosely nested [we might say inter-penetrating] to form an ontologically layered, historically open system. (Harvey 2002 165)

Continued

- ▶ ‘ ... social structures, unlike natural structures, are irreversibly evolving constellations. Because of this constantly emerging complexity and the role played by human intervention in these processes, powers are not always exercised in a constant manner across time. At the same time, social structures and institutions are time-dependent constellations - i.e. they have evolutionary life histories of their own: they are born, are subject to temporal cycles of growth and decay, and eventually cast into the dustbin of history. In both instances, short-term and long-term, social institutions are space-time dependent in their ability to influence human conduct at any given time and place.’ (Harvey 2002 171)

First Insertion for Antwerp - The significance of relations

- ▶ Sociologists today are faced with a fundamental dilemma: whether to conceive of the social world as consisting primarily in substances or in processes, in static ‘things’ or dynamic unfolding relations. Rational actor and norm based models, diverse holisms and structuralisms, and statistical variable analyses - all are beholden to the idea that it is entities which come first and relations among them only subsequently ... increasingly, researchers are searching for viable analytic alternatives, approaches that reverse these basis assumptions and depict social reality instead in dynamic, continuous and processual terms. Emirbayer 1997 281

Second insertion for Antwerp: Yes but re relations

- ▶ My own approach remains fixed on cases but goes some of the way with Emirbayer. That is to say I think that when we define a case we also have to think about the relations of that case and how these relations work through time in a dynamic fashion. A very simple but pertinent example is the relationship between individuals and households. Individuals live in households which may include one person but more commonly include multiple people. The condition - system state - of the individual depends on the relations with other members of the household and with the character of the household as a whole - especially but not exclusively in terms of income. This is an old truism of epidemiology in terms of the impact of an infected person on other members of the same household - see the classical literature on TB. Relations matter.

Third Insert for Antwerp: Crossing levels in exploring causal relations

- ▶ Crossing levels in exploring causation - Whoa - ecological fallacies!! BUT:
- ▶ IF we think of levels in terms of enveloping systems then we have to think about causation across them.
- ▶ Conventional statistical methods now acknowledge this through multi-level modelling.
- ▶ BUT that is variable centred and is not much more than an accommodation made with the causal powers of related systems.
- ▶ Realist evaluation - Pawson and Tilley - takes in this with the term CONTEXT
- ▶ We need to think about context in terms of interwoven - I like that word better perhaps than intersecting - systems.

Final Insert for Antwerp: Crossing levels - a discussion

- ▶ This slide is just an inserted reference to a piece by Emma Uprichard which I thought about when thinking about this presentation:
- ▶ **Crossing levels: The potential for numerical taxonomy and fuzzy set approaches to study multi-level longitudinal change**
- ▶ Methodological Innovations Online (2007) 2(1) 41-58

Equifinality

Equifinality is the principle that in open systems a given end state can be reached by many potential means. The term and concept is due to Hans Driesch, the developmental biologist, later applied by Ludwig von Bertalanffy, the founder of General Systems Theory. They prefer this term, in contrast to "goal", in describing complex systems' similar or convergent behavior. **It emphasizes that the same end state may be achieved via many different paths or trajectories.** In closed systems, a direct cause-and-effect relationship exists between the initial condition and the final state of the system: When a computer's 'on' switch is pushed, the system powers up. Open systems (such as biological and social systems), however, operate quite differently. The idea of equifinality suggests that similar results may be achieved with different initial conditions and in many different ways.

WIKIPEDIA of course - my emphasis

A way to Understand when we engage with Complexity - Comparison

Implicit in most social scientific notions of case analysis is the idea that the objects of investigation are similar enough and separate enough to permit treating them as **comparable instances** of the same general phenomenon. At a minimum, most social scientists believe that their methods are powerful enough to overwhelm the uniqueness inherent in objects and events in the social world. The audience for social science expect the results of social scientific investigation to be based on systematic appraisal of empirical evidence. Use of evidence that is repetitious and extensive in form, as when it is based on observations of many cases or of varied cases, has proved to be a dependable way for social scientists to substantiate their arguments. C.C. Ragin Introduction to *What is a case?* London: Sage 1992 1

Complex causation - configuration

‘For causation, the main contrast is between the conventional view of causation as a contest between individual variables to explain variation in an outcome and the diversity-oriented view that causation is both conjunctural and multiple. In the conventional view, each single causal condition, conceived as an analytically distinct variable, has an independent impact on the outcome. In the diversity-oriented view, causes combine in different and sometimes contradictory ways to produce the same outcome, revealing different paths.’ (Ragin 2000 15)

And again

- ▶ For complex systems what is caused is the state of the system, the character the system has at any given time point in its trajectory.
- ▶ There is no simple direction of causality in any sense for complex systems. The complex can cause the simple. The aggregate level can have causal implications for the micro elements which constitute it. Wholes have implications for parts. Intersected systems have causal powers in relation to each other. Cause operates in any and all directions.
- ▶ Causes in relation to complex systems are seldom if ever single or additive. Superposition fails every time. Interaction among elements is always what matters. That is the core of emergence.
- ▶ For complex systems of the same kind, for ensembles, the same system state may be produced in different ways and those ways are not only multiple in number but generally are complex and interactive in kind.
- ▶ Time matters. Sequence and duration both have to be considered when exploring causality in complex systems.
- ▶ The point of hunting causes is only secondarily to explain what is in terms of retroductive history. The really interesting thing is the informing of action directed towards the achievement of futures.

The importance of difference

‘the search for causes is directed to the differences between things... Underneath all our questioning lies the implicit acceptance of the axiom that no difference exists without a cause’. (McIver 1942 /64 27-28)

What this means for Evaluation.

- ▶ The question in Evaluation is not only: Did it work? We also need to know:
 - ▶ How did it work? Mechanism / Action issues
 - ▶ Issues of agency
 - ▶ Multiple routes to outcome - Equifinality
 - ▶ Negotiated Orders - plural is deliberate
 - ▶ Contexts - plural is deliberate - in which it worked
 - ▶ When
 - ▶ Where
 - ▶ And perhaps above all else: what do we mean by "IT HAS WORKED"? Complexity deals in system states as outcomes.

Systemic comparison

' ... policy researchers, especially those concerned with social as opposed to economic policy, are often more interested in different kinds of cases and their different fates than they are in the extent of the net causal effect of a variable across a large encompassing population of observations. After all, a common goal of social policy is to make decisive interventions, not to move average levels or rates up or down by some miniscule fraction.' (Rihoux and Ragin 2004 18)

SYSTEM STATES is what they are talking about.

Key ideas for comparison

- ▶ Near neighbours in the possibility space
- ▶ Classifying
- ▶ Quantitative narratives of trajectories
- ▶ Qualitative narratives of trajectories
- ▶ Multiple levels of intersecting systems
 - ▶ Individuals
 - ▶ Social aggregates
 - ▶ Geographical areas
- ▶ Configuring through exploratory QCA

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