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Causation in complex systems where human agency is in play

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ABSTRACT

Conventional approaches to causation in the social sciences draw on approaches in the Philosophy of Science in which a causal force acts on cases and generates change in the form of events. This relies on just one of the Aristotelian conceptions of cause – efficient cause – what brings the effect in to being. We should also pay attention to Final Cause – purpose and Formal cause, what makes something what it is and no other. The somethings are complex far from equilibric socio-ecological systems in which human agency has causal powers. This resonates with the understanding of the nature of effect in the complexity frame of reference as the state of the system both in relation to stability and transformation of kind. Effects are systems states. The argument draws on Hegel's and Dewey's understandings of cause / effect relationships as not separable but intimately interwoven. Effects have continuing reciprocal impacts on causes themselves as in positive feedback in systems. This way of thinking about causation allows us to engage with macro social change. The argument will be illustrated by a discussion of the transformation from industrial to post-industrial character across port city regions in high income countries.

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... the explanation of social phenomena by revealing the causal mechanisms which produce them is the fundamental task of research.
(Danemark et al., 2002, p. 1)

Introduction

Any social science which claims to be a social science in the terms identified by the Gulbenkian Commission: ‘... systematic secular knowledge about reality that is somehow validated empirically.’ (1996, p. 2) has to engage with the causal character of the social world (and in the era of the Capitalocene with the intersections of the social and the natural). This is necessary not just for research as a process but is fundamental to how social science generates to be applied in policy and practice. The socio-ecological world system is not static and fixed. Both it as a whole and the sub-systems which constitute it are complex and go through periods of relative stability but also experience radical changes of kind – phase shifts. They exist in and through time. Crises are periods when causal pressures, both from within systems and from the relations among systems mean that there must either be a restoration of the former system stability state or a radical change of kind to a new stable state or at the extreme the termination of the system as a coherent entity. Climate crisis is a crisis in the world system of the Capitalocene – capitalism founded on energy derived from fossil carbon. The complexity frame of reference in its complex realist formulation (Reed & Harvey, 1992) allows us to understand both stability and change at all social levels – macro (whole socio-ecological system), meso (institutions and localities/regions) and micro (individuals and

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households). At the macro and meso levels, it enables engagement with the interfaces of the social and the natural, especially the social and the ecological.¹

Complex realism is a development of Bhaskar's (2008) realism and that has strong implications for the ways in which we think about causality. It allows for causal powers, with causes here understood as determinant in the sense of setting limits to the possibility space for systems in the sense of determine presented by Williams (1980), which derive from underlying generative mechanisms at the level of the real which find expression in the actual that constitutes the reality of human experience and all biological life. This needs to be said here because the example which will be used to illustrate this proposed mode of understanding for causation in complex systems and a mode of exploration of causes in such systems – the potential future trajectories of port cities – is founded on a recognition of the underlying real generative mechanisms of the Capitalocene (see Flaherty, 2019). This is a synthesis of Marx's understanding of the generative power of capitalism as a global social system – which is very much the case in the 21st century – with an understanding of the way in which fossil fuels have both fuelled the capitalist system itself and through the generation of CO₂ and other greenhouse gases have led to global warming and probable sea-level rise. Port cities in high-income countries have both been severely deindustrialized in employment base through a combination of technical innovation – containerization – and globalization of production. As coastal cities, they are under very real threat from climate change.

Engaging with causation in complex open interwoven systems

It is useful to begin by reviewing how social theory has engaged with causation, although social theory has often deployed a different vocabulary from conventional philosophy of science, even from the philosophy of social science. Social theory has addressed both the way in which social systems maintain a continuity and how they change. The complexity frame of reference simply adds to these concerns the recognition that social systems are complex systems and in the era of the Capitalocene recognizes that we must always pay attention to the two-way relationship between the social and the natural with causal powers running in both directions.²

One traditional emphasis in social theory has been on how social systems maintain stability with a counter tradition addressing precisely how social systems are transformed into something very different – for example at the macro level by addressing the European transformation from feudalism into capitalism, at the meso level examining the transformation of mental health systems from institutional/asylum based to acute treatment and community based, and at the micro level by exploring the social mobility of individuals.³ Both Parsonian systems theory and anthropological structural functionalism⁴ focus on maintenance of system continuity and a major criticism of them is that they do not address social transformation. That said, Parsons did distinguish between developmental processes which did not alter the overall social system and phase-shift processes which did. The causes of maintenance of system continuity of nature resonate with Aristotle's notion of formal cause – that which makes something what it is and no other.

Khalil's (1996) discussion of the difference between the real and the artificial helps here. For him, real forms are inherently complex systems. Artificial forms are entities which exist but without the dynamic character of complex systems. Unlike natural systems they have sharp boundaries, whereas real natural systems have boundaries which are as much the basis of connections with other systems as system demarcation.

The language of cybernetics becomes useful. Maintenance of system continuity in the same form is a product of negative feedback. System transformation involves positive feedback. Now we encounter a challenge to the longstanding assertion in philosophy that an effect cannot be its own cause. Positive feedback is exactly that – an effect which reinforces the cause which led to it in the first place. Positive feedback does not fit at all into the category of cause which Juarrero describes as the dominant mode of philosophical thinking about causation over 2,000 years – that of efficient cause:

Understanding all cause as collision like, and the explanatory ideal as deduction from deterministic laws,⁵ are two examples of a trend that has characterized the history of philosophy for over 2,000 years: the progressive elimination of time and context from metaphysics and epistemology. (2011, 3)⁶

A key word in understanding cause as collision like is effect in the usual dualism of cause and effect. In dynamics, causes generate motion as an effect but motion dependent solely on the nature of the forces creating the impact.⁷ For complex systems, the effect is not a motion as in simple dynamics but rather the very nature of the system as a whole, whether maintained without change of kind or transformed (Byrne, 2011). The common description of effects as *events* – see for example Elder-Vass (2010) – makes effects time specific. For complex systems effects are ongoing system states, whether stable or transforming, and should be understood as processes in time, not time-fixed events. Processes always happen through time along the trajectories of complex systems as they move through time.

A crucial issue in understanding causation in complex systems is that causes are neither single nor operate independently which challenges the whole essence of experimental determination of cause through controlled experiments, whether bench or randomized control based.⁸ The key word is control – in those approaches everything but one cause is taken out either directly or by random allocation. Real causes in social and ecological systems are both multiple – equifinal in von Bertalanffy's (1976) terms – more than one way to skin a cat – and complex. By complex, we mean that they operate not as single causes which can be extracted from data by reductionist statistical processes as in variable-based methods derived from the General Linear Model,⁹ but rather in interaction with each other in the way describes as set theoretic from which he developed his approach of Qualitative Comparative Analysis founded around specification not of single specific causes but rather of multiple complex configurations. Likewise, cluster analysis and learning algorithm approaches which generate typologies – which classify – are useful in sorting systems into the kinds which they are. Any method for engaging with complex systems has to recognize their emergent character. Approaches which are inherently reductionist cannot do this.

To bring social theory back into this, let us quote from Rex in his discussion exactly of social transformation:

The case of Marxist social and political theory is of particular interest here, because it has always taken its stand on the Hegelian point that we should study things in process rather than as static entities. Engels, for instance, speaks of Hegel's 'great basic thought that the world is not to be comprehended as a complex of readymade things, but as a complex of processes in which things apparently stable go through an uninterrupted process of coming into being and passing away.' (*Ludwig Feuerbach and the End of Classical German Philosophy* 1955). And the Hegelian notion of dialectical change become even more relevant when we apply it to society than when it is applied in the physical sciences for such change is dialectical in the original sense of the term. (1961, 133)

So let us turn to Hegel, and the very similar position adopted by Dewey, to see what we might make of cause when we take a dialectical approach.

Causes are effects and effects are causes

One central proposition of the complexity frame of reference is that transformational change in complex systems is often a result of positive feedback. The very notion of positive feedback asserts that changes in the effect of a cause feedback into the cause itself. In other words, the effect has a causal impact on its own cause.¹⁰ This gels absolutely with Hegel and Dewey's understanding of causation in which causes and effects exist in an inseparable duality.

Where we have two substances, each of which acts on the other, and each of which receives the action of the other, we have a pattern of action and reaction. There is a reciprocal dynamic which moves beyond the linear regress of finite cause to a more comprehensive mutuality of interaction. (*Burbidge on Hegel* 2006, 79)

As Good and Garrison put it in concluding their discussion of Hegel and Dewey's theories of causation: 'Taken together, they provide a stiff challenge to the standard account of cause and effect as discretely independent realities.' (Good & Garrison, 2010, p. 118). This passage from MacIver illustrates the issue at the macro-social level very neatly:

The risk of the ideal type approach is that it may discount or ignore the tendencies to change already present in the situation. This risk is not absent from the treatment of the subject by Max Weber. He takes the position, for example, that the Protestant ethic was in a special way the solvent of the traditional restraints on business enterprise and monetary acquisition and thus a primary cause of the rise of capitalism in Western Europe and America. But it might easily be claimed that the rise of the Protestant ethic itself, with its stern individualism, its 'worldly asceticism', and its doctrine of stewardship, was the expression in the religious sphere of a pervasive change of social attitudes corresponding to and causally interdependent with a changing socio-economic order. (1942, 177)

The Protestant ethic and capitalist social relations were both causes and effects of each other. We must note that there was something else in play – the massive demographic transformation across Europe in consequence of the Black Death. However, the Black Death had just as severe a demographic impact across much of the Levant and elsewhere and capitalism did not develop in those societies in the same way as in Northern Europe. Rather the way the Black Death shook up the previously stable relations of the strong system of feudalism in a context of religious upheaval in part driven by the consequences of that epidemic, facilitated the general development of wage labour rather than feudal duty labour and this interaction enabled capitalism to spread beyond urban centres embedded in a feudal world to become dominant across the whole social order. Feudalism in interaction with western Catholicism was stable, but it was the interaction and positive feedback, subsequent to a change in many ways driven from the natural world but generalized by emergent capitalist trading relationship and sea-born transport, which led to a profound social transformation.¹¹ All this was driven by positive feedback from a complex and interwoven set of causal processes.

The role of intentional human agency in system transformation

People do things for reasons – the central element in Juarrero's discussion of *Dynamics in Action* (Juarrero, 1999) and a core element in all social theory which addresses action. Collective real social entities with agentic powers act for a reason. The central principle for understanding organizations as Mouzelis (1968) put it drawing on Herbert Simon is that organizations are social collectivities directed towards achieving objectives. They are goal oriented. People, individually and collectively, have a capacity for action, however determined in the sense of setting limits by path dependency – a central principle in understanding social causation which introduces an arrow of time and the constraining (important word) character of the past into causation. Moreover, although social structures, including cultural forms, have a profound influence on actions, they do not have an overwhelming set of causal powers as the more extreme forms of for example structural Anthropology would assert. Dawe (1970) distinguished the two sociologies with one founded on order, which corresponds to extreme structural determination and another based on the ability of human beings to act for their own purposes both individually and collectively.¹² In exploring the future of complex social systems in the era of the Capitalocene, it is as O'Connor (1981) put it in his discussion of 'The Meaning of Crisis' not a matter of what will happen but of what will be made to happen by people acting in accord with conflicting sets of primarily material interests. We will review the transformation of port cities in formerly advanced industrial countries as an illustration of this in practice.

How to explore causality in complex social and socio-ecological systems

Note that word ‘explore’ – explore causality. Tukey (1977) called for exploratory data analysis so we could see what the data are telling us. That is what we have to do in looking into complex systems in a search for understanding the causal processes which drive them, both in maintaining stability when they are stable and transforming them when they change. Abbot called for a return to what he saw as the lost synthesis between History and Sociology:

... the synthetic revolution that Abrams and others wished to see – the merging of determinate and contingent explanations in a fully historical social science.’ (1992, 202) ... ‘... the historical sociologists accepted from history the positive value of limiting generalizations and mastering details but reinterpreted social science’s belief in causality in qualitative (original emphasis) terms. (1992, 211)

This is exactly what is required when exploring causality through a complexity frame. Something which gets part of the way towards what is required is process tracing described by George and Bennett (2005) as a mode for developing theory on the basis of case studies. This book and many subsequent publications informed by it belong in the traditions of US political science with its desperate efforts to establish a quantitative programme equivalent to that which informs neo-classical economics. That said, political scientists do real empirical research even if they continue to believe in the causal powers of variables abstracted from the cases which are the real entities of the social world. They also have a rather uneasy relationship with older traditions which were essentially historical in form and did do qualitative work on a case basis. Both Process Tracing (George & Bennett, 2005) and Qualitative Comparative Analysis as developed by require a deep qualitative understanding of the causal processes which lead to what are always system states, although these are described simply as outcomes. In recognizing the significance of sequence and the importance of the conjunction of events, both engage in narratives. There have to be narratives. Blatter and Haverland (2014) without referring to the complexity frame do use a vocabulary of multiple causation, conjunctions of causal processes and transformative potential as constraints break down, which has much in common with a more developed complex systems understanding. So, we need developed historical narratives which we can deploy to develop models, sometimes mathematical but also mental and qualitative, which seek to explicate what are commonly described as the mechanisms which engender stability or change.¹³

Any method which can be used in a way compatible with the complexity frame of reference can be deployed in exploring causation in complex social and socio-ecological systems. When engaging in comparative work, QCA has potential, precisely because it allows for multiple (equifinal) and complex causality. However, the start must always be the deep, essentially hermeneutic in the sense of Pawson and Tilley’s *Hermeneutics I* (Pawson & Tilley, 1997) engagement with qualitative narratives supplemented by quantitative narratives from time series describing traces of the trajectories of systems. In exploring complex causality anything other than controlled experiments goes and multi-method approaches are particularly useful. This is what Pagliarin and Gerrits argue for in their discussion of trajectory-based qualitative QCA as a way for exploring and accounting for case based time dynamics:

Qualitative comparative analysis was initially time-agnostic, but efforts to make the method more time-sensitive have been made since the mid-2000s. These attempts mainly focus on cross-case differences, accounting for change over time at the level of attributes or conditions. While useful, they cannot account for the fact that individual cases also develop over time. As such, strategies regarding “within-case” development have remained under-theorized in qualitative comparative analysis (QCA). To address this gap, we propose trajectory-based qualitative comparative analysis (TJ-QCA) building on the logic of the diversity oriented approach: meaningful within-case change is carefully defined in terms of development stages that capture qualitative case-based change patterns. We conceptualize configurations dynamically so that they express different development stages. Theoretically, our method is rooted in a complexity-informed understanding of cases describing trajectories through the property space. Trajectory-based qualitative comparative analysis works with both numerical and qualitative data. (2020, 1)

Essentially, any research method (in the sense of a tool for investigation) which addresses change as a historical process is compatible with the exploration of causation in complex social systems. The methods of history itself, including both document-based and oral approaches, will form part of the mix in what will usually be a mixed-methods style of investigation. To understand the processes, we need narratives.

Exploring causality in the transformation of port cities

Resilience is a buzz word in systems thinking. It is an ambiguous term. It can mean systems being pushed back to what they were, which was the intention of governance at global and national levels in their interventions in response to the financial crash of 2008 but it can also mean the system continued to exist but in a transformed/changed/phase shifted form. In the literature, these two meanings are seldom distinguished. In the context of oncoming climate crisis in the era of the Capitalocene, it is the latter which should concern us. Özkaynak et al. explain why, deploying the complexity congruent notion of coevolution:

The coevolutionary perspective recognises that all the different aspects of a holistic system are interdependent and evolve together; a change in one affects and brings about changes in all the others . . . to assume that the existing form of modernity, including the technology that coevolved with industrialisation, is the *only* possible form of modernity would be a mistake, since in the nineteenth and twentieth centuries carbon-based industrialisation also coevolved with a historically specific socio-economic system – capitalism. Although different varieties of capitalism currently exist, which place more or less emphasis on market regulation, particularly with regard to income and wealth distribution and environmental protection, experience so far indicates that all have a structural requirement for growth. (2012, 1130)

The above passage with its emphasis on coevolution exactly accords with the conception of causation in complex systems being elaborated here. Note that the mention of multiple possible forms of modernity indicates that at the time of the emergence of industrial society, other forms were possible – existed in the possibility space. Certainly, there are multiple possible futures in the possibility space for deindustrialized port cities in the future. Human agency (or lack of it) will determine the nature of that future.

One crucial factor in allowing globalizing deindustrialization in high-income countries has been the development of a transport system for finished manufactured goods based on shipping containers. There is a long history of mechanical handling of bulk goods and liquids – coal, grain, oil etc. – in ports but it was only in the last quarter of the 20th Century that the development of shipping containers and port systems able to handle them mechanically meant that the transport costs of finished goods were reduced to a small fraction of their cost at the point of delivery for retail sale. This was, alongside of course of relative labour costs compared with newly industrializing countries and increasing efficiency of production, an important factor in the massive decline in employment in manufacturing in what had previously been described as advanced industrial societies – societies which as late as the 1970s remained the most industrial in terms of employment and value added ever seen in world history. Containerization had a particularly massive impact on employment in what were traditional blue collar jobs in port cities. These changes were very rapid. Between 1966 and 1976, East London lost some 150,000 jobs due to the closure of the docks, which was about a fifth of all jobs in the area. London's dock function was lost to container ports elsewhere but even where the container function remained in the original port job loss was massive. Liverpool lost 80,000 jobs. In all cases, large areas of dockland became available for other uses. This was not just a matter of dockland. In many UK cities, former shipyards were demolished and their land also became available for other uses.

Even when port functions survived or even increased, as with Rotterdam, land previously used for marine transport or marine-focused manufacturing was transferred to non-productive uses in retail and housing. In England, this was done in considerable part by removing planning powers from elected local government and transferring them to appointed Urban Development

Corporations. These bodies prioritized realization of value from the land they were allocated, much of which had previously been in public ownership. In most cases, this was done by allocating sites for a mix of retail, leisure and housing, although in the case of the London Docklands Development Corporation the Isle of Dogs, the site of London's largest dock complex became Canary Wharf – a new zone of operation for finance capital.¹⁴ The Tyne Wear Development Corporation, which took over land from former shipyards as well as docks and other port land on the rivers Tyne and Wear, used much of it for housing and retail uses. This led to the sterilization of key deep water fronting industrial sites, some of which had been reserved in the Structure Plan drawn up by the Tyne and Wear County Council – a democratically elected body – for future marine-focused uses. These sites would have been ideal for the construction of offshore wind turbines and their bases but were covered by, to quote a local Conservative councillor (!), by little boxes of houses. The decisions as to the uses of these sites, which had been foundational to the development of industrial capitalism and had been developed by the largest civil engineering projects on any North Sea coast before the oil boom,¹⁵ fixed the nature of what could be done with them over a long term. Developments in the United Kingdom and particularly in English port cities were at the extreme of the shift from marine focus to real estate, but similar developments have happened in all high-income countries for example with Baltimore harbour in the U.S.A.

The effects of this are illustrated by the Regional Gross Value added figures for Tyneside and Hackney and Newham (the East London Unit which was the zone of the docks until the 1970s) for 2017 (most recent available). On Tyneside Manufacturing provides 10% of Gross Value added and Real Estate provides 13%. In Hackney and Newham, where Hackney was a significant locale of large factories in the 1970s, Manufacturing provides 4% of Gross Value added and Real Estate provides 20%. For London as a whole, which in the 1970s was not only a major port but a major locale of industrial production, manufacturing provides 2% of GVA and Real Estate provides 16%. The Real Estate figures include the imputed rents of owner occupiers¹⁶ but that reflects the role of house prices in post-industrial cities and house prices for existing owner occupiers have enormous political salience. So the shift to real-estate-oriented capitalism in former port cities is both a consequence of deindustrialization and changes in port technologies and a driver of continuing emphasis on these cities as zones of consumption, particularly of housing, as opposed to production. Planning decisions driven by real estate values locked in a path dependency which drives the process of what can be called using Polyani's terminology, a second great if partial transformation (Byrne, 2019). There has been positive feedback into the system. The effect-cause relationship is reciprocal.

Planning as a formal system was essential to the way the transformation of port cities worked out in practice. Plans are declared intentions as to what the future should be. Geddes, who more or less invented urban planning in the modern sense, required survey – see what already exists, plan – develop a programme for change and implement – put that programme into effect. In this sense, all planning processes are actually examples of action research – research carried out embedded in action for change. Action Research is NOT a process of outside observers standing apart from a programme of action without any engagement with that action. Rather, it is a process in which research does not merely monitor action (although such monitoring is important) but rather seeks to inform the action towards the end intended by not only reviewing the action itself but also engaging with all the relevant aspect of the environment within which the action is located and understanding how their present and developing nature is relevant to achieving the intended outcome – what 50 years ago in the North Tyneside Community Development Project we called service research. This framing accords exactly with Cilliers' (1998) assertion that the only ethical form of research on complex social systems is done within them.

So we come to the fourth of Aristotle's causal forms – final – that for the sake of which a thing is done. To reiterate O'Connor in his discussion of *The Meaning of Crisis* (O'Connor, 1981) concluded that for social systems (and in his turn to socialist ecology of course he would later say socio-ecological systems) it is never a matter of what will happen but rather of what will be made to

happen. So how might we move towards making things happen as social scientists? – through constructing scenarios which take account of the dialectical relationship between cause and effect.

Getting from here to the future – the role of scenarios

Bell defines scenarios thus:

Scenarios are the representations of alternative futures (by which) analysts sketch a paradigm (an explicitly structured set of assumptions, definitions, typologies, conjectures, analyses, and questions) and then construct a number of explicitly alternative futures which might come into being under the stated conditions
(1967, 865–66)

The complexity frame of reference sees this as the construction of possible futures within the constraining possibility space. What is missing from Bell's definition, although present implicitly, is that policy actions create which of these alternative futures actually come to pass – and in the present context policy inactions are global warming – may be just as important.

Brewer, in an explicitly complexity informed discussion of the issues confronting us with the climate crisis, issues particularly acute in sea-fronting port cities, noted:

There are no data about the future on which to rely. We are challenged to imagine many different and possible 'futures' as humankind seeks to exert its mastery and control No one can predict the future but we can invent and make the future.
(2007, 159, 160)

He argues persuasively that:

Obviously many disciplines and methods can contribute to the analysis of a problem. The problem, embodied in one's evolving appreciation of it, points out, perhaps demands, which disciplines and what methods should be brought to bear. Calling attention to multiple methods lessens a prevalent tendency to celebrate methodology at the expense of substance. Methods have blind spots that focus attention on highly selected aspects of a problem while blocking others One must counteract this by viewing problems with different methods or approaches and working to assemble their partial insights into something approximating a composite whole.
(2007, 163)

There are indeed multiple possible futures in the possibility space for any social or socio-ecological system, but whilst there are indeed no specific data about the future there is a great deal of data of every kind about the present situation and path dependency, one of the most useful ideas in thinking about causation in any complex system of any form, gives us data which can be used to engage with articulating the range of possible futures available to us. The essence of the notions of the Capitalocene and Fossil Capitalism is that human history since the development of capitalism as a generative mechanism at the level of real and of dependency of that mechanism on energy derived from greenhouse gas generating processes is a constraining factor in specifying available futures. Constraint in relation to complex systems is really another way of expressing the reality of path dependency in relation to historical development. So, in articulating the nature of possible futures we can explore causation towards the present state of systems as a basis for identifying what control parameters might be modified in order to redirect, tune we might say, futures towards a better – absolutely a value and interest-based conception of better – future. In relation to port cities, we might well conclude that many of the key water-fronting sites which have been transformed into residential, retail and office park locales, may well need to be reconstituted as the bases for major civil engineering projects designed to prevent cities flooding beyond control. For example, the Thames Barrier has so far prevented 124 square kilometres of central London from flooding but there is a real risk of it no longer being adequate to cope with the implications of positive feedback climate warming driven sea-level rise. We need scenarios constructed on a proper understanding of the nature of interwoven causal processes which have engendered present system states.

Kim Stanley Robinson has a scenario for New York in 2140 (Robinson, 2017)¹⁷ in which the city has flooded and the major social confrontations are between real estate capital coupled with global

elites who have used residential property as a store of value, and ‘ordinary residents’ threatened by yet another flood surge and the problems of living in a city where real estate values dominate the political system. Getting a grip on causation in complex systems and breaking with the restricted conceptions which do still dominate much understanding will be crucial if anything is to be done to avoid that all too possible scenario being realized.

Scenarios must be enacted, not just built as exercises. The mixed methods approach proposed by Brewer must therefore be embedded in action-research directed towards social transformation. Doing just that is the absolutely necessary task of social science informed governance at this crucial conjuncture in human history

Conclusion

Bluntly put most discussion in ‘the philosophy of social science’ of causation in relation to the social AND to the interfaces of the social and the ecological is founded on fundamental misconceptions. Covering laws are useless for complex systems and particularly useless when human agency is in play. The turn to explanations in terms of mechanisms has some value but does not really handle issues of two directional processes, precisely because the mechanism is still considered as cause without reciprocal processual relationship with effect. Hegel is the boy for this stuff – process and cause and effect in a dialectical relationship as an inseparable binary dualism. Contemporary philosophers of science have had a distressing tendency to come into arguments about causation in the social world (and interface of the social and ecological) with two great deficiencies in their background which disqualify them from useful intervention. First, they generally know little about social theory and its traditions and knowledge base.¹⁸ Second, they know even less about the practical processes of social research and the generation of socially useful knowledge. This is a consequence in large part of their ignorance, particularly in the Anglo-American tradition of Hegel and frankly of much of what is separated off from their analytical concerns as continental philosophy. Certainly, if they engaged with Jaspers and Freire, they would be much better for it. At the same time, the post-structuralist turns in social theory, whilst at least not dictating about causality because it essentially ignores it, by engaging solely (and not very well) with epistemology has nothing to contribute to our understanding causes and how to use that understanding for meaningful social action towards necessary end. The great exception is Bhaskar and it is from Reed and Harvey’s (1992) synthesis of his critical realism with the complexity frame of reference, taken into an engagement with Hegel, that we can start to say useful things about complex causation.

Notes

1. In the domain of health, it enables engagement at the micro level of the individual and the totality of both internal organism and all aspects of the environment of the body.
2. This is the limiting case of the necessity for understanding complex systems not just in terms of their own properties but in terms of their relations, including of course the internal relations of their sub-systems but also of their relationships with all relevant systems in their environment. Latour’s review of Stenger’s *Thinking with Whitehead* (Stengers, 2011) is useful here.
3. More attention should be paid to the mobility of households, particularly in relation to wealth acquisition.
4. Where function stands for causal power of subsystem in maintaining the integrity of the system as a whole.
5. Cartwright’s (2007) approach in her important book *Hunting Causes and Using* does not much engage with social science in the Gulbenkian sense of science as founded on empirical investigation but rather by, very competently, demolishing many of the deductive claims of positive Economics as expressed in mathematical terms, confronts a discipline which in its neo classical form is neither social – it has only one social posit: maximization of value and that is wrong – nor scientific status which would require a proper empirical research programme. To understand complex social causation we have to depart radically not just from Hume’s conception of constant association but from his assertion of the centrality of deductive logic to the scientific programme.

6. Rosen makes an important relevant point here.

‘... every mode of system description which we possess ... is at heart the same as the one Newton propounded in the 17th century. However much these modes of system description differ technically among themselves, they all share a fundamental dualism, which can be thought of as a separation between *states* and *dynamical laws* (original emphases).’ (1987 324)
7. A balance of forces maintains stasis – a central objective in construction engineering. A structure is constituted by the balance of forces. Even structures are complex systems which require maintenance to sustain continuity of form and have relations with other systems, notably weather as an aspect of the natural. It is worth noting that Lewes drew exactly on the parallelogram of forces, on effect as a product of interaction, to develop his account of emergence at the system level. The idea of social stability through countervailing power proposed by Galbraith (1963) works in this structural mode and does describe the period regulation theory identifies as Fordist during the long period of relative stability post the second world war in advanced capitalist democracies.
8. The deployment of counterfactuals is in essence the construction of experimental reasoning at the mental level – counterfactual reasoning looks very like thought experiment. One thing is made different.
9. The specification of interaction terms is the tribute conventional statistical modelling pays to complex causation, but it is both clumsy and not that much done.
10. Contra Aristotle’s principle that a thing cannot be the cause of itself.
11. Coleman’s (1990) critique of Weber’s account of the relationship between Protestantism and the rise of capitalism not only fails to take account of the importance of the comparative method in Weber’s argument – as MacIver puts it for every difference there is a cause – but by demanding a specific causal chain misses entirely the reciprocal dualism of cause and outcome.
12. Bourdieu considers that structure is embodied in agents – the core of the idea of habitus. Note this is a two-way relationship and itself complex and iterative. Bourdieu, especially in his later work, recognized explicitly that profound structural transformation shatters existing habitus forms.
13. In doing this time series of date which describe traces of systems through their trajectories are of enormous value. Deploying quantitative alongside qualitative historical narrative enables QCA to engage with large numbers of cases in causal exploration.
14. The zone was also used as the location of a shift in newspaper production to bust the Fleet Street printing unions, although the site used for that purpose is now itself being used for real estate purposes with its owner being given planning permissions by national government in a way which massively reduced his public benefit charges.
15. The Tyne Improvement Commission in the mid 19th century transformed the River Tyne from a river which could be waded at the mouth at low tide and was notoriously dangerous for shipping to enter into one where a battleship could reach 15 miles upriver and where the harbour was now the biggest harbour of refuge – one which can be entered in any weather and tide state – on the UK’s East coast.
16. The very real income people derive from living in a house they own net of costs in incurring that income – mortgage interest and repair and maintenance. This constitutes about 20% of all real household income in the UK.
17. Near future science fiction is very good at anticipating the implications of global warming.
18. In a major handbook on the philosophy of social science (Kincaid ed. 2012) there is little discussion of social theory other than in one chapter. Bhaskar is only mentioned in that same chapter and Hegel is only mentioned in relation to the historical development of the University of Berlin.

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