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Hunting causes and using them: approaches in philosophy and economics: summary

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Description of *Hunting Causes and Using Them: Approaches in Philosophy and Economics*
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Hunting Causes and Using Them: Approaches in Philosophy and Economics (HC&UT) is about notions of causality appropriate to the sciences, mostly generic causal claims (causal laws), and especially notions that connect causality with probability.[1] Most of the work for the book is associated with the project 'Causality: Metaphysics and Methods'. This project argued that metaphysics – our account of what causal laws are or what general causal claims say – should march hand-in-hand with our ways of establishing them. It should be apparent, given the kind of thing we think causality is, why our methods are good for finding it. If our metaphysics does not mesh with and underwrite the methods we are willing to trust, we should be wary of both.

Many philosophers nowadays look for a single informative feature that characterizes causal laws. *HC&UT* argues instead for causal pluralism, for a large variety of kinds of causal laws as well as purposes for which we call scientific claims causal. Correlatively different methods for testing causal claims are suited to different kinds of causal laws. No one analysis is privileged and no methods are universally applicable. Much of the argument for pluralism is provided by authors of different accounts of causality, who provide intuitively plausible counterexamples to each other. Still, most of these accounts seem adequate for the kinds of examples the authors focus on. From the point of view of *HC&UT* these examples involve different kinds of causal laws or set causality to different jobs, and the concomitant characterizing feature marks out this one kind of causal law.

Importantly for the argument, often we can specify what characteristics a system of laws should have in order for an account/method pair to be applicable. An example is James Woodward's *level invariance,* which I see as a test but which he offers as a characterizing criterion.[2] Woodward argues by example: He shows that many noncausal associations are not level invariant. *HC&UT* goes further. It proves that for a system of causal laws that satisfy a number of familiar conditions, level invariance is sufficient for causality. The conditions include the requirements that causal laws be expressible as linear equations with dependent variable as effect and independent variables as causes (hence causality in this sense is deterministic and the effects of separate causes add); that causality be asymmetric and irreflexive; and that any true association among the quantities in the system can be derived from the causal laws. So level invariance is a provably good criterion for a special kind of system of causal laws and it can further underwrite a closely associated test. But neither the analysis nor the test are appropriate where causes act indeterministically, where true lawlike associations can hold without a causal base (perhaps conservation laws are like this), where causation is cyclical or where linearity fails.

Another case are 'causal Bayes-nets', which are characterized by three axioms. Algorithms derived from these axioms can produce every causal graph consistent with given probabilistic information, hence providing powerful methods for hunting causes. Given the axioms it is also possible to predict how changes in probability will propagate across the

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[1] Sadly it thus short-changes other important scientifically relevant accounts, most notably process and activity theories, in favour of those I have more expertise with.

[2] Roughly, a linear equation is level invariant if it holds under surgical substitution (that is, changes made in much the way required in Lewis's counterfactual account of causality) of different values for right-hand-side variables. Cf. Woodward (2003).

system if the probability of one quantity is changed surgically.[3] This can be extremely useful if ever we envisage making these kinds of changes. But the methods both for testing and for prediction are only appropriate where the axioms hold.

HC&UT looks at cases where these axioms might fail. For example, the 'faithfulness' axiom says that causes and effects are probabilistically dependent. But systems are often designed so that a cause's ineliminable positive contribution to an unwanted outcome is cancelled by its negative contribution. The 'causal Markov condition' says that two factors not related as cause and effect must be probabilistically independent once the causal parents of one are conditioned on. This can fail when probabilistic causes produce their effects in tandem, in populations with so-called 'selection bias', when two unrelated quantities each change monotonically in time, etc.

Bayes-nets experts are naturally working hard to extend the methods to deal with cases like these. But the point here is the lesson about pluralism and about the match of methods to kinds of causal laws. There is no reason to suppose that it is in the nature of causality that a probabilistic cause produce its effects independently of each other (rather than in tandem) nor that properly caused quantities not share time trends nor that positive and negative contributions to the same outcome from the same cause not cancel. The three axioms provide criteria not for something to be a causal law but for one kind of causal law, with matched methods for finding causal laws and using them. In the same vein my axioms pick out laws for which Woodward's level invariance is an appropriate criterion for causality and a sound basis for testing.

A third example is manipulationist accounts. Woodward and Daniel Hausman take invariance under (surgical) manipulation to be the key criterion for causal laws[4]. In a series of heroic efforts to establish unity among causal notions they tried to show that the causal Markov condition so important for Bayes nets can be derived from this. Two chapters of *HC&UT* show that these efforts fail.

At any rate, surgical interventions have little application. *HC&UT* looks at two further manipulationist accounts that can do real predictive work. Econometrician David Hendry takes causal laws to tell what happens under a *proposed* set of interventions.[5] These laws license what chapter III.6 calls 'implementation-specific counterfactuals'. The second account, which I attribute to economic methodologist Kevin Hoover,[6] takes causal laws to tell what happens under all intervention possible for us, which license 'implementation-neutral counterfactuals'.

These geared-to-usage manipulationist accounts show how deeply causal pluralism cuts. *HC&UT* describes a machine where mechanical and manipulationist criteria dictate back-to-front results: A causes B on the mechanical account; the reverse on a manipulationist. Yet mechanism and manipulation are both central to our thinking about causality.[7]

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[3] This involves leaving all causal laws intact except those producing the changed quantity plus supposing that what I have elsewhere called 'the strength of a cause's capacity' (measured by a particular partial conditional probability) stays the same for all causes. See Cartwright (1989).
[4] See Hausman (1992).
[5] Hendry (2001).
[6] I take my interpretation from what I think is a literal reading of Hoover's definitions and it produces what I think to be an excellent and exciting account of causation. Hoover however sometimes seems to want his account instead to capture what I call 'mechanical' causation. See Hoover (2001).
[7] Some people feel that the manipulationist causal laws hold only 'on account of' the mechanical ones. I am not at all sure we can make sense of this 'on account of'; but even if we can, I don't see how it privileges one over the other as an account of what a causal law is. (Of course on my view it should make sense to say that they all hold on account of thick causal relations.)

The last chapter of *HC&UT,* from research done jointly with Julian Reiss, focuses on action-guiding counterfactuals, especially as treated in economics, which is different in interesting ways from work familiar in our own field. I echo the standard advice to evaluate counterfactuals from a 'causal model', but a model that represents the causes and causal laws that obtain *post*-intervention since interventions typically change causes other than the targeted one and not unusually change the causal laws at work as well.[8] This advice is all to the good. EXCEPT: Our methods for hunting causal laws, as well as concomitant accounts of what causal laws are, are almost all suited for establishing pre-intervention models, not for constructing models of what causes and causal laws obtain post-intervention, which is a more creative, less rule-governed enterprise.

When this problem became clearly visible, near the end of the project that spawned *HC&UT,* I realized that it is not enough to match metaphysics and method. Use must mesh with these two as well. Knowledge of causal laws should gain us something; it should empower us to do things, make new inferences and make new outcomes. But how do we know that what has been warranted by our tests for causal laws will in turn warrant the inferences we want to draw from them? Normally it should be metaphysics that does this job: We can see from our account of what causal laws are both why our methods are good for testing them and why our inference from them are justified. Available accounts of causal laws, even when restricted to specific kinds of causal laws or specific purposes, are too close to either hunting or using to do this job. They are almost read off from either a favoured method for testing causal claims or a favoured use to which they might be put. So *HC&UT* ends on a despairing note. Despite all the hard work already done, we still need richer, more detailed theories of causal laws if we are to justify using the causal knowledge we pay so dearly to gain.

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[8] They often do so by disturbing the underlying structure that gives rise to those laws, as when I press too hard on the lever in my toaster and it no longer triggers the heating element to produce browning as I expect.

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