On the Distinctness of Causal Variables

Distinctness is meant to capture the intuitive idea that causes and effects are somehow spatio-temporally distinct. For some, distinctness of causal relata is construed as a consequence of causation and aims at capturing the idea that distinct causal relata bestow different causal powers (e.g. Achinstein 1974, Armstrong 1978, Shoemaker 1984), that is to say that, if two causal relata have different causal powers than they are distinct; and if they are distinct, they differ in causal powers. For others however, distinctness appears as a foundational assumption of causation, and is defined as such (e.g. Hausman 1998). Woodward's manipulationism somehow falls in this second category, yet distinctness is not explicitly defined in this account: causal relata are assumed to represent "different and incompatible properties" (2003, 98); and causation is formally defined by means of intervention variables that are themselves assumed to act surgically on the cause variable without acting at the same time on other possible "distinct" causes of the same effect (condition I3, see: 2003, 98). Distinctness in manipulationism thereby appears (1) implicitly as a foundational assumption that concerns the very variables that enter into causal relationships, and (2) explicitly in the definiens of an intervention variable. However, it is nowhere defined. The aim of this paper is precisely to explicate "distinctness" within a manipulationist account of causation and to explore consequences.

I first investigate the possibility of a reductive account of distinctness, that is to say of an account that would explicate "distinctness" with concepts that are not causal. Because manipulationism takes causal relata to be variables, distinctness in manipulationism ought to be construed as a relational property of causal variables. Based on Woodward's account (2003, 39), I first explicate the notion of "variable": I propose to construe a variable X (referring to a property P) as a mapping from an individual I (chosen within a domain of individuals D_I and located at a particular place p and a particular time t) to a value x_i (taken within a domain of definition D_X). In such a case, $X=x_i$ is the instantiation of the property P for the individual I at place p and time t. Following from this formal construal of "variable", I argue that there are four ways in which two variables X and X' might be considered as "distinct": (1) they might be

distinct with respect to their domains of definition, or (2) with respect to their domains of individuals or (3) with respect to the mapping itself, or (4) they might simply refer to different properties P and P'. I explore each one of these cases. I argue that a distinctness in terms of domains of definition is neither sufficient nor necessary for distinctness of causal variables. I formalize a condition of distinctness in individuals (DI), as well as a condition of conceptual distinctness in properties (DP-C), and argue that both are individually sufficient for variable distinctness, yet neither is necessary.

I turn to the possibility of a non-reductive account of distinctness. According to such an account, two causal variables X and X' are distinct if and only if they have different causal powers. In this case, there must exist at least one third variable X'' such that the causal relationship between X and X'' is different from that between X' and X''. Because, in manipulationism, distinctness of variables is a prerequisite for including variables into a causal model, let us assume that X and X' are indeed distinct, and then ask whether there exists or not an arrow-breaking intervention on X with regards to X'' (or on X' viz. X''). If this is the case, then this is sufficient for establishing that X and X' are distinct, and I formulate a third sufficient condition for distinctness (DP-S). If this is not the case, I argue that there is then no possibility within manipulationism to assess whether X and X' are distinct or not, for there exists other reasons – like cyclicity of causal relations – for such impossibility of intervention.

Both reductive and non-reductive approaches to defining "distinctness" in manipulationism lead to sufficient yet non necessary conditions. I thereby argue that there remain two options for manipulationism: (a) either accept stronger foundational assumptions than is currently the case, for instance by explicitly adding a condition of independence of exogenous variables (Steel 2005) from which distinctness might then be derived , or (b) eliminate reference to distinctness in all of its formal conditions that define causation. I argue against the latter. Hence the need to strengthen the foundational assumptions of manipulationism if it is to be considered as a proper construal of causation.