Causal Explanation, Intentionality, Determinism, and Prediction

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1 Introduction

The recent development of critical realism is one of the most notable developments in contemporary philosophy of the social sciences. This philosophical tradition, which is also known as transcendental realism, originated in a number of books written by Roy Bhaskar (Lawson 1997; Cottrell 1998:347). In economics, the tradition has found considerable support, especially among the members of traditions that are in opposition to ”mainstream” economics. It has been especially influential among Post Keynesians, with some authors even claiming that adherence to it is what makes it possible to talk about a Post Keynesian School at all (Lawson 1999:3).

Following the lead of Tony Lawson, many critical realists believe that the alleged failings of mainstream economics are to a significant part due to its adherence to a methodology referred to as *deductivism*. This methodology, it turns out, is nothing less than the most widely accepted view of scientific explanation, the causal model. The argument proceeds in two steps. Firstly, it is argued that the causal model is given to serious shortcomings (cf., e.g., Lawson 1992, 1996, 1997; Pratten 1996, 1997; Rotheim 1999). According to many of these authors, an alternative method referred to as abduction or retroduction is adhered to (Lawson 1996:412-414, 1997:24-25; Rotheim 1999:74-75). Secondly, it is claimed that mainstream economics actually proceeds along the lines of the causal model (Lawson 1997).

One of the main weaknesses of the causal model, according to the criticism, is that it relies on so-called event regularities. An even regularity is a statement of the form ”whenever event x then event y” (Lawson 1997:17). In this paper, it is argued that the causal model does not rely on event regularities.

Nevertheless, the question of what constitutes acceptable laws in the social sciences is an important one. Three aspects thereof are examined. Firstly, what it is that make laws ”work” across different objects in the physical sciences. Secondly, whether a universal law can be based on human intentionality. Thirdly, whether free will by necessity rules out by the possibility of scientific explanation. A number of concluding comments follows.

2 The Causal Model of Scientific Explanation

In what follows, we shall frequently refer to the causal model of scientific *explanation*. This model, which is also referred to as the deductive-nomological or covering-law model,[1] was explicitly developed by Popper (1934/1980) and Hempel & Oppenheim (1948). There are a number of differences in notations and formulations, and also a few differences of a more substantive character, between the two sources. The presentation here follows Popper's, which seems to be superior to Hempel and Oppenheim's in its view of the relation between explanation and truth (Hempel and Oppenheim linked the conception of truth, or a high probability of truth, to the concept of explanation, whereas Popper makes a distinction between the form of an explanation, which is given in the quotation, and its truth).

In his path-breaking book, ”The Logic of Scientific Discovery”, Popper offered the following succinct statement of what a causal explanation is:

> "To give a *causal explanation* of an event means to deduce a statement which describes it, using as premises of the deduction one or more *universal laws*, together with certain singular statements, the initial conditions" (Popper 1934/1980:59).

What constitutes an *event* should be understood broadly. It could be an apple, at a specific position in space-time, falling from a tree; it could be a particular company going broke at a specified date; it could be a revolution in a particular backward country. In stead of the term ”event”, *effect* is also used.

The *initial conditions* together yield the (theoretically based) specification of the particular case in question. They are expressed in so-called singular statements. Taken together, the initial conditions constitute what is often (with a somewhat unfortunate name)

[1]The name covering-law model was given by one of the model's critics, William Dray (1959/1968).

referred to as the "cause" of the event (cf. Popper 1934/1980:60). It should be kept in mind that the purpose of the model is to explain actually ocurring events. Therefore, the initial conditions must refer to an actual state of reality at a particular point in time. And it should further be noted that the way the initial conditions enter the model renders the frequently invoked concept of multi-causality meaningless. This is because the way that the cause, i.e. the initial conditions, enters the model does not limit the number of co-determinants in the explanation. This goes against the colloquial use of the term, which is often thought of as singular (and this is why I find the name ”cause” unfortunate).

The universal laws or statements referred to can be thought of as "... hypotheses of the character of general laws" (Popper 1934/1980:60). The "universality" of them signify that they refer to all elements in a set of elements. The statement ”All capitalist firms attempt to maximize profit” is a universal statement. This is so because it refers to a property (attempts to maximize profit) which is supposed to be fulfilled by all members of a class (all firms in the set of capitalist firms). It should be noted that the characterization allows for ”one or more universal laws”, so that mulitiple laws may enter. The same goes for the model as formulated by Hempel & Oppenheim (1948:135-140).

According to the covering-law model of explanation, the strategy when explaining why a particular event occurred proceeds along the four following steps: (1) Identify the event or phenomenon in need of explanation. (2) Identify the "initial conditions" that relates to the event in question. (3) Identify the universal statement or set of statements ("general laws") relating to ("covering") the initial conditions. (4) Deduce the implications of using the universal statement or statements in question on the specific case as specified by the initial conditions.

3 Lawson’s criticism of deductivism

A central point of Lawson’s criticism of economics is that it proceeds along the lines of a flawed methodology, which he refers to as *deductivism*:

> ”The main ’culprit’, I shall argue, is a mode of explanation that can be referred to as *deductivist*, or, more particularly, it is the conception of laws (or

’significant results’ or ’theoretical formulations’) upon which deductivist explanation depends.

This conception of laws is formulated in terms of constant conjunctions of states or affairs…On this view, laws…express regularities of the form ’whenever event x then event y’.” (Lawson 1997:16-17; emphasis in original; one footnote omitted).

The same criticism can be found at various other places in Lawson’s book, earlier papers by Lawson (e.g. Lawson 1996:407.412), and repeated by a number of followers (e.g. Pratten 1996, 1997). That Lawson consider deductivism as being tantamount to using what we termed the causal model in section 2 is quite evident:

”We can note, paranthetically, that this theory of explanation is also variously known as the covering law model, the Popper-Hempel theory of explanation…the deductive-nomological model…” (Lawson 1997:17).

Accepting this, any shortcomings of deductivism must also be shortcomings of the causel model, and shortcomings of the causal model must also be shortcomings of deductivism. Hence, we can analyze the validity of the criticism of deductivism by evaluating it with reference to the causal model. This is what we attempt to do in what follows.

Is there anything wrong, according to critical realists, with the causal model besides its alleged reliace on event regularities? We may take a clue from the following description of the alternative model of scientific explanation adhered to by many critical critical realists, the retroductive or abductive method, which

”…compels the scientist to think ”from a description of some phenomenon to a description of something which produces it or is a condition for it…” (Bhasker 1986:11; quoted in Rotheim 1999:75).

Now, the ”something” of the quotation would seem to correspond to what is called initial conditions in relation to the causal model. It would seem, then, that the first part of the quotation (”something which produces it”) is consistent with the view that explanation requires a logical operation. Since these elements in an explanation are acknowledged, what is problematic must be the remaining element, the reliance on event regularities.

Two questions will have to be considered. Firstly, what is wrong with event regularities as laws? This is the topic of the present section. Secondly, can the laws referred to in the causal model be interpreted as event regularities? We shall start by looking at why they are considered to be problematic, postponing our answer to the second question to section 4:

> ”In addition to such problems, and at least as significant, the constant conjunction view of laws leaves the question of what governs events outside of experimental situations not only unanswered but completely unaddressed.” (Lawson 1997:28).

A similar position is taken by Stephen Pratten:

> ”If we ask what governs the behavior of phenomena outside experimental conditions, i.e., in open systems, we are forced to give the counter intuitive reply that either nothing does or that no laws yet have been discovered by science” (Pratten 1997:788).

As already noted, an event regularity is formulated along the lines: ”Whenever event y then event x”. An example of such a formulation would be: ”All gaseous substances will expand when heated”. There is nothing wrong with the logic of Lawson’s argument. If the laws entering causal explanations were to be interpreted as strict event regularities, the causal model of scientific explanation would indeed be susceptible to his criticism. In this sense, Lawson has a point. The interesting question is, however, whether that point is relevant for evaluating the causal model of explanation? This is the topic of the next section.

4 Evaluating Lawson’s Criticism

But is the causal model susceptible to Lawson’s criticism by relying on statements like ”whenever event x then event y”? This is not something which can be answered by looking at the offered definitions of it, which differ between authors and are, anyway, normally rather imprecise (which also goes for the definition from Popper given in section 2).

If we go to the acual sciences, we find that many laws are not stated in terms of event regularities. As an example of this, consider Newton's law of gravitation. According to Newton's theory, the gravitational force acting upon two objects 1 and 2 with masses m_1 and m_2 is determined by the formulae $F = Gm_1m_2/r^2$, where G is the gravitational constant, and r is the distance between the two points of gravitation. And this law is not unique. If one goes through an elementary handbook of physics (I used Andersen et al 1972), one finds that the great majority of laws are of this kind. And for those few laws that are expressed as event regularities, there will be a number of causal explanations ”behind” the event regularities that can be expressed in the same form as the laws mentioned above. The event regularities can, therefore, be considered as convenient ”shorthands” for underlying laws. Shortly put, event regularities does not characterize at least physics.

Those law that are given in the forms of event regularities must either be interpreted as given to a ceteris paribus clause, or be used in conjunction with some condition outlining the circumstances under which the law will strictly apply, if they are to be used by science. Lawson clearly operates with the latter kind of statements, and notes, rightly, that in order to explain what takes place outside what he call closures, strict event regularities cannot be upheld. What is dubious in his account is the claim that the universal laws of the causal model are to be interpreted as strict event regularities.

Many of the philosophers associated with the causal model of scientific explanation had a very thorough knowledge of modern natural science,[2] especially physics and astronomy, and some of them even contributed to it. This may be exemplified by the three most important contributors to the causal model, Karl Popper, Carl Hempel and Paul Oppenheim. It is evident from Popper's writings that he had an immense knowledge of modern science, and physical experiments are still carried out in order to investigate some of his positions on the problems of quantum physics, where he

[2]It is not easy to put an exact date on the birth of modern science. As the term is used here, Galileo Galilei (1564-1642) is one of the pioneers, so that the period around the date of his birth may serve as a

remained sceptical of some of the reigning interpretations (cf., e.g., Kim & Shih 1999 for one such experiment). Carl Hempel received an education in the natural sciences before turning to philosophy (Lübcke et al 1983:182), and Paul Oppenheim was a doctor in chemistry (Lübcke et al 1983:324).

What Lawson will have us believe is that these people did not understand even the most elementary parts of modern science. It is not necessary to go far in order to find evidence to the contrary. In Lawson's own book, an example is provided with a freezing car radiator (Lawson 1997:17). This example is based on an earlier example by Carl Hempel, which is referred to in the notes to the main text (Lawson 1997:291,n.4). But Lawson overlooks that Hempel, in the part qouted, actually employs a causal law with explicit reference to some limiting conditions. Hempel writes: "Below 39.2°F, the pressure of a mass of water increases with decreasing temperature, *if the volume remains constant or decreases*" (quoted in Lawson 1997:291,n.4; emphasis added). Such modified (non-strict) event regularities are, according to Lawson himself, acceptable (Lawson 1997:27-28). It would seem, then, that at least Carl Hempel, who Lawson has referred to as "the most ardent defender" of the causal model (Lawson 1997:17), did not rely on strict event regularities in his interpretation of the model.

What is even more striking, I think, is the following argument. Assume that the universal laws according to the causal model were in fact to be interpreted as strict event regularities. Then the whole methodology of falsificationism would be completely eliminated. It would be so because we could find falsifying instances to laws just be making simple combined experiments. The by now familiar $F = Gm_1m_2/r^2$ would be falsified by an experimental set-up where we added a magnetic effect. The same experiment would, by the same token, falsifify the law describing the magnetic effect. Given this interpretation of causal laws, the only thing needed to provide for a falsification would be a countervailing effect.[3] It does not seem very likely that Popper and other followers of falsificationism should have made such a blunder.

(somewhat arbitrary) proxy.

[3]Many of these falsifications would not need any experimental set-up. The gravitational law referred to several times in the above (as well as Einstein's more sophisticated law) would be falsified by the observation that boats do not sink when put into water, as well as many other observations. Newton's famous first law, that "Every body perseveres in its state of rest or uniform motion in a straight line except in so far as it is compelled to change that state by forces impressed on it" (Pitt 1988:258) would be falsified by any jump made by man or animal.

A further, and perhaps even stronger, argument can be given. As noted in section 2, both Popper and Hempel & Oppenheim explicitly allowed for the inclusion of more than one law. But if the laws included relate to the same property (e.g., the movement of a body), then a ”strict” application of the laws (that is, interpretations without ceteris paribus clauses or some restraining conditions for use) will not allow any deduction to be made at all. All one ends up with is a number of consistent statements. It is difficult to believe that some of he greatest philosophers of science in this century shoul have such a deficient understanding of elementary logic.

There is one point where the causal model is, perhaps, underspecified. It is at least conceivable that, in some applications where more than one law is involved, there is a need for extra-logical principles for ”adding” the effects of the laws involved (I hasten to add that I do not know any examples of this). We may perhaps refer to these as coordination principles. If such principles are called for, and they cannot be expressed in terms of universal statements, then the causal model as outlined by the quotation of Popper in section 2 is in lack of an important structural component. The reason for this is that applying ordinary logical principles will not be sufficient to allow the deduction of the explanandum. Only with the addition of the principles of coordination will the deduction that is an integral part of the causal model be possible.

Even if one accepts the above criticism of Lawson’s conception of deductivism and the causal model of scientific explanation, one might ask whether this is important? Judged from the considerable emphasis put on it by Lawson and his followers (cf. section 3), they apparantly believe that it is. There are also a number of relevant questions the answers to which partially depend upon the result of the above analysis. Should economists learn methodology? If so, should they learn the causal model? And ought they to practice it? I shall not attempt to answer these questions herein.

5 Some Reflections on Laws in the Social Sciences

Even accepting the view that the causal model of scientific explanation does not rely on event regularities, it may be asked whether parts of the criticism based on that position is nevertheless useful. This seems to be the case. One of several important themes relates to the character of the concept of a law. We shall take a closer look at this in what follows. Since my commentaries in section 4 were highly critical of earlier contributions, it may be added that the comments presented here are not intended to be much more than additions to earlier views exposed by others.

The laws employed in the causal model are universal statements. The natural sciences have been enormously succesful in their pursuit of universal laws. Lawson asks whether there are any event regularities in the social sciences, and claims that very few have sofar been identified (Lawson 1997:31). This question may be transformed into concerning whether there are universal laws in the social realm. And it is true, I think, to say that the social sciences do not have an abundant supply of universal laws. In this section, I present some reflections which seems to me to be relevant for whether universal laws can be identified in the social sciences. Finally, it is investigated whether intentionality precludes scientific prediction.

5.1 Object, Property and Law

A potential argument against the existence of universal laws in the social sciences might be that the objects of social science (individuals, groups, institutions, societies, customs etc) are so different as to make any law-like generalizations possible.

In the natural sciences, a number of objects have been identified which can be said to be ”intrinsically” identical. By this I mean that, apart from their location in space-time, and similar ”extrinsic” properties, the so-called elementary particles appear to be exact replica in the sense that they have identical properties, e.g., behave in a certain, or at least statistically determinate, way, when exposed to identical conditions. But some objects are clearly unique. As noted by Popper and others before him (Popper 1957), there is only one history. And, except perhaps for identical twins, not two human beings are alike. There are also enormous differences between countries. At first sight, this diversity may seem to support the case against universal laws.

All candidates for succesful scientific laws of which I am aware relates, however, not to objects in their totality, but to the properties of objects. That a group of objects are not identical is, therefore, not a sufficient condition for the non-existence of causal laws applying to (all of) them.[4] That depends not only on the objective characteristics of the objects, but also on the point of interest, i.e. the proporty in question. This can easily be exemplified. The Brooklyn Bridge may be different from a piece of wood, but their proporties are so that gravity applies to both of them. Turning on a mobile phone and bringing a nuclear warhead to explosion are different actions, but both results in the emission of an electromagnetic impulse. A mouse and a blue whale look very dissimilar, but the structure and basic biochemical functioning of their cells are almost identical. With these examples as supporting instances, one might propose the hypothesis that it is a necessary condition for a single law to apply to two different objects that they have one or more properties in common.[5]

What this serves to demonstrate is not that there are, after all, universal laws in the social sciences. It simply serves to put attention to the fact that diversity among objects is not in itself an indication of non-existence of universal laws.

5.2 The Intentional Model and Prediction

One argument for disposing of universal laws in the social realm is that they are incompatible with the possibility of genuine choice of action. But insisting that people can somehow act, or do indeed act, at least partly according to their free will, would seem to be close to admitting the possibility of making a universal (ceteris paribus) law with this as an integral part. We find a related idea in the so-called intentional model of individual behavior (Elster 1983, 1986).

Intentional models explain the behavior of actors with reference to the intentions they seek to fulfil and to their perception of the situation. The latter includes their beliefs concerning the relations between the actions they take and the state of the environment. Note that behavior can only be predicted when both intentions and perception are known.

Although I suggest that a universal model of individual behavior is possible, one can hardly expect that it can be used to give anything but qualititive predictions. I do not wish

[4]This may also be used to form an argument against the more vulgar forms of quests for ”holistic” theories. I hasten to add that not all such claims are vulgar.

to maintain that there is anything in the social realm corresponding to the constants of physics, such as the gravitational constant, G. It is certainly also possible that a law along the lines of the laws of physics cannot be developed.

What I have in mind may be illustrated by a methodology for the social sciences developed by Popper (Popper 1994; for expositions and discussions, cf. Chalmers 1985, Lagueux 1993, Bunge 1996, Bichlbauer 1998, Matzner & Jarvie 1998, Notturno 1998[6]). This scheme employs *models*, which "…represent something like typical initial conditions" (Popper 1994:164). Instead of using universal statements or laws, such explanations make use of "animating principles". More specifically, Popper developed the so-called situational-logic model of individual behavior, which is animated by *the rationality principle*. This model can be seen as a specification of the intentional model of individual behavior. The rationality principle is often expressed along the following lines:

> "…individuals act appropriately to the situation in which they find themselves" (Chalmers 1985:83).
>
> "Each person acts adequately to the situation" (Notturno 1998:403).[7]

The rationality principle is, according to Popper, not itself a law, because it cannot be used to make predictions of particular events in the same sense as the laws from the physical sciences can.[8] It can, however, be used to make qualitative predictions. And principles of the above kind share an important property with "ordinary" laws. Both clearly prohibits certain outcomes, which is an important characteristic of a causal law (Popper 1934/1980), and which is, of course, what is needed to fulfil Popper's famous criterion of demarcation between science and metaphysics (Popper 1934/1980). Hence, it might be suggested that we consider the intentional model embodied in the rationality principle as a universal law of the social realm. Accepting this, it would seem that, although intentional explanations only allow for qualititive predictions, the essence of causal explanation is upheld by the intentional model of explanation.

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[5]It cannot, I believe, be a sufficient condition.

[6]Popper's paper was originally presented in 1967, and circulated in various versions in the scientific community. Hence, Popper's ideas, although unpublished, were frequently commented upon prior to the publication of he paper in 1994.

[7]These formulations are not identical. Although Popper himself came closest to the second, support for both formulations can be found in his paper.

[8]Popper is, in my view, not entirely clear on this, but the idea might be that the timing of actions is

So much for causality. But what about determinism? Before this question can be answered, we need to define determinism.[9] In order to define it, we need to define two further concepts: that of the state of a system, and that of rule(s) of transformation. *The state of a system* is a set of values for all the variables that define the system at a certain point in time. *A rule of transformation of a system* is a description of the relation between the value of at least one variable X_i at at least one point in time (say t_0), and the value of at least one other variable X_j at at least one other point in time (say t_1). We allow for i=j and $t_0=t_1$, but not simultaneously. We may now define a system as deterministic in an interval of time T, if the following condition holds true: For all $t \in T$ and all i: X_i can in principle be calculated, with any level of accuracy required, on the basis of a number of rules of transformation {TR}, and the complete knowledge of the state at a time $t_0 \in T$.[10] As noted, intentional explanations will probably only allow us to make qualitative predictions. It would seem that this effectively rules out determinism.

To sum up: intentional explanations are compatible with causality, but not determinism.

5.3 Free Will and the Prediction of Behavior

One sometimes comes across the argument that if choice can be foreseen or predicted, then the person making it cannot be said to exercise free will. This may well be true, although it is not universally recognized (cf. the exchange of views between Cottrell 1998 and Lawson 1998). I suggest that the following example may be illustrative.

Consider, e.g., Hitler's decision to attack the USSR in June 1941. Assume that Stalin had been able to predict this,[11] on the basis of at least rudimentary knowledge of Hitler's intentions and beliefs. Note that we assume that Stalin made use of the intentional model (if he did not use intentional explanation, or another theoretically based method, the prediction was irrelevant in relation to our interest). Now, if Stalin had been able to make a succesful prediction, using the procedure described, would that mean that Hitler

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inprecise.

[9]This definition follows Koch (2001).

[10]Note that the notion of determinism used here exclusively relates to a particular system for a period in time. It is only weakly related to the fundamental philosophical issue of whether the universe as a whole is, or is not, deterministic.

did not have a free choice to make after all? Or is it a necessary condition for Hitler to have had a free choice that Stalin (and anybody else, of course) was unable to predict his behavior, using the intentional model? To maintain this is logically possible,[12] but it is obviously a very odd position. It would seem to be more reasonable to maintain that the possibility of free will is independent of anybody being able, or not, to forecast the decision.

6 Conclusion

In this paper, a number of topics were discussed. The first was Lawson's criticism against the causal model of scientific explanation for relying on event regularities. It was argued that Lawson's criticism of a "constant conjunction" or "event regularity" view of laws is logically true, but does not apply to the causal model of scientific explanation. The reason is that laws are not interpreted as strict event regularities according to that model. Hence, to claim that the deficiencies and problems of mainstream economics lies in its application of the causal model of scientific explanation can hardly be acknowledged. Based on the reasoning discussed in section 4, there is no need for a revised ideal model of scientific explanation.

Following this, three additional topics were very shortly adressed. The first related to what it is that have made in possible to formulate succesful universal laws in some fields. It was argued that a necessary condition for the formulation of a universal law would seem to be, not that the objects to which it applies are identical or even similar to each other in some absolute sense, but that they possess similar or identical properties (such as possessing mass). The second additional topic concerned whether it is possible to formulate a universal law based on human intentionality. It was suggested that this can be done, althought it, of course, critically depends on the definition of a law. We defined a law as a universal statement with potential falsifiers. This allows us to rescue causality in the social realm. It was also suggested, however, that the intentional model interpreted as a law only allows for qualitative predictions. If this is accepted, then

[11]It is inconsequential for the argument whether Stalin in fact did so or not.

[12]At the level of quantum events from the physical realm, experimental evidence suggest that the act of measurement alone is able to change the outcome of certain experiments (Rae 1986). But there is no reason whatsoever, and certainly no evidence from physics, to suggest that such effects exist outside the quantum realm.

determinism has to be abandoned. Finally, the question whether the possibility of scientific prediction of action precludes the reality of free will was touched upon. An example was supplied which suggested that prediction and free will need not be in conflict, given that the prediction was based on the use of the intentional model.

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