Keeping track of the time: emending the counterfactual analysis of causation

L. A. Paul

Counterfactual analyses of causation can provide elegant analyses of many cases of causation. However, they fail to give intuitively correct analyses of cases involving a commonplace variety of late preemptive causation. I argue that a small emendation can solve the problem.

1. The analysis.

I will focus on the most well developed analysis, David Lewis's (1973, 1986a) version, although the emendation that I suggest can be modified and applied to other counterfactual analyses.[1] The analysis for deterministic causation states that for any two actual, distinct events *c* and *e*, *e* depends counterfactually on *c* iff, had *c* not occurred, *e* would not have occurred.[2] Causation is the ancestral of counterfactual dependence: *c* causes *e* iff there is a chain of counterfactual dependencies running from *c* to *e*. The probabilistic version of the analysis (1986a: 175–84) states that *e* depends probabilistically on *c* iff, given *c*, there is a chance *x* of *e*'s occurring, and if *c* were not to occur, there would be a chance *y* of *e*'s occurring, where *x* is much greater than *y*. Causation is again taken as the ancestral, this time of probabilistic dependence, so *c* causes *e* iff there is a chain of probabilistic dependencies running from *c* to *e*. The chance of the effect's occurring is assessed immediately after the cause occurs, and the truth value of the counterfactual at each step is evaluated based upon that chance.

There are problems with both versions of the analysis. The best known problems involve preemption: a kind of redundant causation in which c_1 and c_2 both occur, and each in the absence of the other is sufficient to cause *e*, but it is intuitively clear that c_1 causes *e* and c_2 does not. Often (but not always) the preempting causal process from c_1 interrupts or cuts off the preempted causal process from c_2, preventing c_2 from causing *e*.[3] In cases

[1] Such as the various accounts put forward in Ganeri, Noordhof and Ramachandran 1996, Lyon 1967, Menzies 1989 and Ramachandran 1997.

[2] Backtracking counterfactuals, counterfactuals with antecedents that refer to times later than the times referred to in their consequents, are (in most circumstances) prohibited. (Lewis 1986a: 169)

[3] For cases where the preempting causal process does not interrupt the preempted causal process, see Paul 1998

Analysis 58.3, July 1998, pp. 191–98.

of preemption, the occurrence of *e* does not counterfactually depend on the occurrence of c_1, since *e* would have occurred without the occurrence of c_1 (c_2 would have caused *e*).[4]

There are two varieties of preemption, early and late. Early preemption occurs when '... the process running from the preempted alternative is cut off well before the main process running from the preempting cause has gone to completion.' (Lewis 1986a: 200) The cases seen as compelling can be solved by step-wise dependence. Since the preemption is early, there exists an intermediate event *d* along the process of the preempting cause that occurs *after* the causal process of the preempted alternative has been cut off. Since the effect causally depends on this intermediate *d*, and since *d* causally depends on the preempting cause, by transitivity, the preempting cause comes out as the cause of the effect.

Late preemption is the main problem for the account. It occurs when the process running from the preempted alternative is cut off very late, so late that there is no intermediate event *d* in the preempting causal process left to occur after the process from the preempted alternative is interrupted. In the cases that are of particular concern, the alternative causal process runs more slowly than the main process, so that the alternative process is cut off by the effect itself. If the preempted cause had been left to produce the effect, the effect would have been delayed. (Lewis 1986a: 203–4) These cases are particularly troublesome because they are common in the actual world.[5]

Consider a showdown at high noon, where Quickdraw McGraw and Slow Joe face off against Billy the Kid. A few seconds before noon, McGraw and Joe see Billy and begin to draw their guns virtually simultaneously. However, McGraw's draw is a bit faster than Joe's, so McGraw fires first, and as a result, his bullet gets there first. As it happens, McGraw shoots Billy dead precisely at noon—Billy dies instantly from the bullet wound. Without McGraw's act, he would have died that same day, but at a second past noon, by the hand of Slow Joe. So if Billy had not died at noon, he would have died at a second past noon; the preempted process is doomed only by the occurrence of the effect (the death) itself. Assuming that the event of the death at noon is close enough in relevant respects to

[4] We could have more than one preempted cause. For simplicity, unless otherwise specified, I will assume the case where there are only two (possible) initial causes, one preempting and one preempted.

[5] I argue in Paul 1998 that Lewis's (1986a) solution to late preemption, involving what he calls 'quasidependence', and Ganeri, Noordhof and Ramachandran's (1996, 1998) solution using their 'PCE-analysis', cannot handle many commonplace cases of late preemption. Ramachadran's (1997) 'M-set' analysis suffers from the same defects as these accounts.

the death at a second past noon to call them the same event, Billy's death is not counterfactually dependent on McGraw's acts. Further, there is no stepwise dependence, since the preempted process is not doomed until the occurrence of the effect.

Since Billy's death does not depend on McGraw's shooting, McGraw's actions are not, according to the original counterfactual analysis, among the causes of Billy's death. This conclusion violates our common sense intuitions about what happened: it should be the case, in an acceptable analysis of causation, that McGraw's act of shooting Billy (and by transitivity, his act of drawing his gun) are among the causes of Billy's death.

2. Hasteners.

Why do we identify, without question, McGraw's act as the cause of Billy's death? The common-sense answer is that we are sure that McGraw's act and not Joe's was causally responsible for Billy's death since we know that McGraw's bullet got there first. McGraw's act caused the death before Joe's act would have—so McGraw's act is the genuine cause. Recognizing this can help solve the problem of late preemption. Recall that in the cases identified as problematic, the chunk of the preempted causal process that we are interested in runs more slowly (or starts later) than that of the preempting causal process. Thus, the occurrence of the effect is earlier than it would have occurred as the result of the preempted cause; in this sense, the occurrence of the effect is the event that preempts the slower causal process.

In each of these cases, the effect, supposing that it would have been the same effect, would have been delayed had it been caused by the preempted cause. Moreover, it is natural to think of the time that an effect occurs as dependent upon what causes it. This suggests a simple solution; amend the counterfactual analysis for deterministic causation to read: *e* depends causally on *c* iff *c* occurs, *e* occurs, and if *c* had not occurred, then *e* would not have occurred at all, *or would have occurred later than the time that it actually did occur.* So *c* is a cause of *e* because *c* caused *e* to occur at the time that it actually did occur, rather than at some later time.

In the emended version, as in the original, causation is the ancestral of causal dependence: *c* causes *e* iff there is a chain of causal dependencies running from *c* to *e*. Often, of course, the additional clause 'would have occurred later than the time that it actually did occur' will make no difference, because often it will be clear that without the cause, the effect would not have occurred at all. So long as transitivity is accepted, the two-step solution to early preemption, where the effect depends causally upon an appropriate intermediate event which depends causally in turn upon the

preempting cause, can be retained. [The emendation will not help Lewis solve some of the far-fetched cases of preemption involving action at a distance or infinitely many preempted alternatives that he explicitly disregards. 'I do not worry about either of these far-fetched cases. They both go against what we take to be the ways of this world; they violate the presuppositions of our habits of thought … spoils to the victor!' (1986a: 203)] [6]

How would the new analysis work in the case with McGraw and Joe? Since if McGraw had not acted, Billy's death would have occurred later than the time that it actually occurred, McGraw's act counts as a cause of Billy's death. Not so for Joe's act: if Joe had not acted, Billy's death would still have occurred, and it would not have occurred later than it actually did. So the proposed emendation resolves the problem for the counterfactual analysis.

Note that the new analysis does not resolve the problem by adopting a theory of the extreme fragility of events, i.e., that events could not have occurred at a different time or in a different manner. A fragility solution would stipulate that the death Billy died as the result of McGraw's act is necessarily a different and distinct event from the death he would have died as the result of Joe's act, in order to secure the requisite counterfactual dependence of Billy's death on McGraw's act. But I (and many others) reject this sort of solution since it implies, among other things, the counterintuitive view that events must meet extremely stringent identity requirements.

The solution I offer is different. We need not count the death at noon as different from the death at a second past noon for the analysis to succeed: we need only recognize that the event of Billy's death has a property (of occurring exactly at noon) it would not have had if Slow Joe been its cause. We can reject (or at least ignore) the troublesome metaphysics of fragile events.

[6] The cases that remain unsolved are similar in structure to cases of early preemption: if the effect had been caused by the preempted chain, it would have occurred at the same time as it actually did, and the causal chain(s) of the preempted cause(s) is (are) interrupted by the causal chain of the preempting cause. Lewis classes these cases as late preemption. But because of their structural similarity to the paradigm cases of early preemption, they are more appropriately classed as early preemption. If they are seen as a species of early preemption, then they should be counted as counterexamples to Lewis's two-step solution to early preemption (if they are admitted as counterexamples at all).

For those who accept cases involving action at a distance as compelling, a version of the hasteners emendation can be applied to counterfactual analyses that address such cases (e.g., Ramachandran 1997 or Ganeri, Noordhof, and Ramachandran 1996, 1998) in order to solve the problems those accounts have with late preemption (as noted by Ramachandran 1998: 467).

There is, however, an objection to address. The new analysis implies that hasteners, events that speed up the occurrence of an effect that would have happened anyway, count among the causes of an effect. For example: on Tuesday, a patient with a susceptibility to heart attacks is given a massage by a nurse, causing the patient to have heart palpitations, weakening her heart. That night, the patient receives a mild fright, and because of the weakened state of her heart, dies of a heart attack. Had she skipped the massage, on Wednesday she would have received a worse fright, one which would have caused her to die of a heart attack that night. The argument implies that the massage on Tuesday was one of the causes of the patient's death.

I think such a consequence is acceptable, even apart from the motivation one might have to accept it in virtue of the usefulness of a solution to late preemption. It may be that cases with parallel circumstances will also be acceptable. If an event causes an effect to happen earlier than it otherwise would have, then often it is consistent with common sense intuitions to call it one of the causes of the effect. [7] (We might even call it 'the' cause of the effect, implying that the cause was particularly salient.) When the nurse's massage hastens the death of her patient, we call the massage a cause of the patient's death, even if the patient was terminally ill.[8]

Perhaps the most worrisome possibility involved in accepting hasteners as causes is that we would have to include events that speed up the occurrence of an effect by only a minuscule amount. Even if the massage had hastened the death of the patient by only a millisecond, it would still be counted as one of the causes of her death. This might cause sceptics to balk. But such balking may be unwarranted: although it does seem strange to count something as a cause that has such a minute influence on the effect, the strangeness could have more to do with salience than with the unsuitability of hasteners as causes. Whether the nurse's massage hastens the patient's death by heart attack by a minute or a month, the massage is a cause of the death, even though the cause in the former case seems much less important than the latter. The situation is not unlike the one we find ourselves in when we accept that my birth is among the causes of my writing this paper, or the existence of the sun is a cause of the rise of the Roman Empire. For those who are sympathetic to counterfactual accounts but feel

[7] Acceptance of hasteners may be made more palatable by rephrasing our explanation of the causal relation between *c* and *e* in order to reflect the change in the analysis: we could say that the massage is a cause of the death's occurring before *t*, where *t* is the first moment after the time that the death actually occurred, and causing the death to occur before *t* amounts to causing it *simpliciter*.

[8] Bennett (1987, 1988), Hall (1994, 1998), and Mackie (1992) argue (for independent reasons) that hasteners are causes.

less sanguine about accepting hasteners as causes, perhaps the benefit of having a fairly simple solution to one of the most outstanding problems for counterfactual analyses will outweigh the cost.[9]

Assuming hasteners as causes are accepted, a solution along the same lines as the deterministic analysis can be fashioned for the indeterministic case.[10] One may say that *e* depends causally on *c* iff, given *c*, there is a chance *x* of *e*'s occurring at time *t*, and if *c* were not to occur, there would be a chance *y* of *e*'s occurring at or earlier than time *t*, and *x* is much greater than *y*. If this condition is met, *e* probabilistically depends upon *c*, and, taking the ancestral, *c* causes *e* iff there is a chain of probabilistic dependencies running from *c* to *e*.

These modifications allow the new analysis to circumvent part of Menzies' (1989, 1996) argument that Lewis's probabilistic analysis fails.[11] For cases of late preemption where the preempted process is slower than the preempting process—and Menzies (1996: 94–6) cites such cases as the most damning evidence against Lewis's view—the new analysis gives the right answer. Take such a case, with preempting cause c_1 and preempted cause c_2. If c_1 were to occur, just as in fact it did, the chance of *e*'s occurring at time *t* would be *x*, and if c_1 were not to occur, but c_2 were to occur (just as in fact it did), the chance of *e*'s occurring at or earlier than time *t* occur would be *y* (and if *x* is much greater than *y*), then *e* will probabilistically depend on c_1. Not so for the preempted cause c_2. Whether or not c_2 occurs, the chance of the effect's occurring at time *t* is *still x*. c_2 makes no change to the chances of *e*'s occurring at or earlier than *t*, and thus is not counted as a cause of *e* if *e* occurs at *t*.

For example: imagine that Billy had a 50% chance of dying from McGraw's drawing and shooting but a 90% chance of dying from Joe's (Joe's draw is slower, but his shot is more accurate.) Give Billy a negligible chance of dying for some other reason (heart attack, whatever.) I McGraw's acts occur, as in fact they did, Billy has (roughly) a 50% chance

[9] Moreover, if we take up the suggestion that causation is a matter of degree, we can militate still further in favour of accepting hasteners as causes. If a hastener affects the effect only slightly, so that the effect happens only slightly earlier, then perhaps the hastener is only a very small cause of the effect.

[10] Although I have not argued for it here, I believe that delayers should count as causes as well. Our emended analysis would then read: *e* depends causally on *c* iff *c* occurs, *e* occurs, and if *c* had not occurred, then *e* would not have occurred at all, or would not have occurred when it actually did occur.

[11] Menzies 1989 and Menzies 1996 show that in some cases of probabilistic causation Lewis's analysis tells us (incorrectly) that the preempted cause is the cause of *e*, and that the more general problems with late preemption infect Lewis's probabilistic analysis as well as his deterministic analysis.

of dying at noon, and if McGraw's acts don't occur, but Joe's acts still do, then Billy has a negligible chance of dying at (or earlier than) noon. (And his chance of dying later than that is irrelevant.) If Joe's acts occur, Billy has (roughly) a 50% chance of dying at noon, but if Joe's acts don't occur, Billy *still* has (roughly) a 50% chance of dying at noon. Since Billy's death at noon does not probabilistically depend on Joe's acts, Joe's acts do not cause it.

3. *Conclusion*

The emended analysis solves the problem of commonplace late preemption for counterfactual analyses without having to specify how events are to be individuated.[12] Assuming transitivity, Lewis's (1986a: 200–1) two-step solution to early preemption still applies, so he can solve all the major (extant) preemption problems for the deterministic version of the counterfactual analysis.[13] If Lewis accepts the emendation to the indeterministic analysis along with a version of Menzies' (1989) solution to early preemption for the indeterministic analysis (Menzies' solution precludes causation by action at a distance), then he can solve all major (extant) preemption problems for the deterministic and indeterministic versions of the counterfactual analysis of causation.[14]

Princeton University
Princeton, NJ 08544, USA
lpaul@princeton.edu

References

Bennett, J. 1987. Event causation: the counterfactual analysis. *Philosophical Perspectives* 1: 367–86.

Ganeri, J., P. Noordhof and M. Ramachandran. 1996. Counterfactuals and preemptive causation. *Analysis* 55: 219–25.

Ganeri, J., P. Noordhof and M. Ramachandran. 1998. For a (revised) PCA-analysis. *Analysis* 58: 45–47.

Hall, N. 1994. Problems with the counterfactual analysis of causation. Presented at the annual meeting of the Australasian Association of Philosophy, Canberra.

Hall, N. 1998. Two concepts of causation. Unpublished manuscript.

[12] Disregarding, as mentioned above, complications such as action at a distance or infinitely many preempted alternatives.

[13] Although I think problems with other kinds of redundant causation, such as overdetermination or trumping, and more general problems with the probabilistic version of the analysis, require further work.

[14] I am indebted to Ned Hall, Kieran Healy, Kieran Setiya, Peter Smith and especially David Lewis for helpful comments.

Lewis, D. 1973. Causation. *Journal of Philosophy* 70: 556–67. Reprinted in his *Philosophical Papers*, Vol. 2., 159–72. New York: Oxford University Press.
Lewis, D. 1986a. Postscript to 'Causation'. In his *Philosophical Papers*, Vol. 2, 172–213. New York: Oxford University Press.
Lewis, D. 1986b. Causal explanation. In his *Philosophical Papers*, Vol. 2, 214–40. New York: Oxford University Press.
Lyon, A. 1967. Causality. *British Journal for the Philosophy of Science* 18: 1–20.
Mackie, P. 1992. Causing, delaying and hastening: do rains cause fires? *Mind* 101: 483–500.
Menzies, P. 1989. Probabilistic causation and causal processes: a critique of Lewis. *Philosophy of Science* 56: 642–63.
Menzies, P. 1996. Probabilistic causation and the preemption problem. *Mind* 105: 85–117.
Paul, L. 1998. Problems with late preemption. *Analysis* 58: 48–53.
Ramachandran, M. 1997. A counterfactual analysis of causation. *Mind* 106: 263–77.
Ramachandran, M. 1998. The M-Set analysis of causation: objections and responses. *Mind* 107: 465–71.