Abstract

Setting off from a familiar distinction in the philosophy of properties, this paper introduces a tripartite distinction between sparse causation, abundant causation and mere abundant causation (instances of the latter forming a sub-class of abundant causation). It is argued that the contrast between sparse and mere abundant causation allows us to resolve notorious philosophical issues having to do with negative causation, causation involving institutional properties and physical macro-causation in a way that is unified, intuitive and in line with scientific doctrines and practices.

Keywords Causation · Exclusion problem · Institutional properties · Negative causation · Predicate nominalism · Properties · Relations · sparse/abundant distinction

1 Introduction

In contemporary metaphysics, a distinction between sparse and abundant properties is standardly drawn. Sparse properties are ontic properties (universals or tropes) instantiated in the external, spatiotemporal world by objects and events. Abundant properties are properties nominalistically construed, i.e. properties understood in terms of sets of objects (set nominalism) or – more commonly – true predications

1 The distinction goes back to the work of Armstrong (1978a, b), Lewis (1986a: 59–69) and Mellor (1991). For more recent applications of it, see e.g. Heil (2003, 2012), Bird (2007, 2016) and Sider (2011). The exact terminology varies in the literature: thus Heil (2012) speaks of properties versus properties by courtesy and Bird (2016) of ontic versus predicatory properties. The sparse/abundant terminology was introduced by Lewis (1986a).
(a kind of predicate nominalism). Sparse properties are supposed to be intrinsic, to ‘carve at the joints’\(^2\), and to ground objective similarities. They cannot be negative. Nor can they be disjunctive. The collections of their instances are, as Lewis (1986a: 60) puts it, ‘ipso facto not entirely miscellaneous’. Abundant properties, on the other hand, can be extrinsic, negative and disjunctive, and the collections of their instances extremely miscellaneous. Paradigmatic examples of sparse properties are properties of fundamental particles such as spin, charge and rest mass. Paradigmatic examples of abundant properties are negative properties such as not having rest mass \(m_0\), disjunctive properties such as being grue,\(^4\) and extrinsic properties such as being such that Napoleon sat on it.

It is sometimes suggested that sparse properties form a sub-set or a subcategory of the abundant properties (e.g. Lewis 1986a: 60). On the orthodox conception of sparseness, this involves a category mistake. A universal/trope is not a set of objects, nor a predicate or concept, but an immanent constituent of some object or event. However, the orthodox account does imply that some abundant properties – a small minority of them – correspond to, or have instances that are unified by, a sparse property.\(^5\) To mark those abundant properties that do not correspond to a sparse property (not having rest mass \(m_0\) and being grue being cases in point), I shall use the term ‘mere abundant property’.\(^6\)

The sparse/abundant distinction is usually applied to monadic properties (as above), but it is natural to make it in connection with relations as well. The distinction is extended in this way in the literature, but typically this is done in a fairly general, sweeping manner (usually in connection with discussions of the so-called internal/external distinction\(^7\)). In this paper, I shall apply the tripartite framework of sparse-

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\(^2\) Lewis (1986a: 50, 60) identifies abundant properties with sets of this-worldly and other-worldly objects. Mellor (1995: 157–159), Heil (2012: 23–27, 152–153, 286) and Bird (2016: 344–345) conceive of objects’ non-sparse ‘properties’ simply in terms of predicates (or concepts) that – for some reason or other – apply to them: they do not commit themselves to set nominalism.

\(^3\) See e.g. Lewis (1986a: 60; Sider 2011: 5). The metaphor ‘joint-carving’ is sometimes taken to signal fundamentality (e.g. Sider, 2011). However, this conception seems unnecessarily restrictive (cf. Schaffer, 2004a): grounded or strongly emergent sparse properties – if there are any – would be higher-level ‘joints’ in nature. Strictly speaking, it makes more sense, I think, to apply the label ‘joint carving’ to those abundant properties that correspond to, or are unified by, a sparse property (which is a ‘joint in nature’).

\(^4\) The abundant property being grue (Goodman, 1983: 74) is in fact not only disjunctive but also extrinsic. For example, the set of all objects with a certain rest mass (assuming here a set-nominalistic account of abundant properties) may be unified by the instantiation of a shared mass-universal (or of instantiations of individual mass-tropes forming an equivalence class of exactly similar tropes). Lewis sometimes calls such unified sets of objects (i.e. such abundant properties) natural or perfectly natural properties (1986a: 60–61, 66), adding to the terminological complexity.

\(^5\) An ascription of a ‘mere abundant property’ may still be made true by a sparse property (or a fact involving a sparse property) although the predication will not, in the sense intended, correspond to a sparse property. For example, the sentence ‘\(a\) is positively or negatively charged’ can be made true by \(a\)’s having the sparse property of being negatively charged even if the predicate, understood as a single disjunctive predicate, does not correspond to a sparse disjunctive property instantiated by \(a\).

\(^6\) Internal relations, such as exact resemblance, are often said to supervene on the intrinsic nature of their relata; external relations, such as spatiotemporal distance, are said to not supervene on the intrinsic nature of their relata (e.g. Lewis 1986a: 62; Armstrong 1997: 12, 87–89). Moreover, internal relations are often held to be ‘ontological free lunches’ that are nothing over and above their relata, while external relations are held to be, at least in some cases, ontic add-ons to their relata (e.g. Armstrong ibid.; Marmadoro.
ness, abundancy and mere abundancy specifically to *causation*, or to the putative ‘causal relation’. My aim is to show that philosophy of causation will benefit from adopting the framework, particularly by distinguishing between sparse and mere abundant causation. By way of illustration, I apply the framework to three notorious problem areas in the philosophy of causation: *negative causation*; *causation involving institutional properties*; and *physical macro-causation*. I argue that with the distinction between sparse and mere abundant causation in place the main philosophical puzzles in these areas can be handled in a uniform, intuitive, non-ad hoc manner, and in line with scientific doctrines and practices. By contrast, current solutions of these puzzles, which largely ignore the sparse/abundant distinction, tend to be piecemeal, unintuitive and ad hoc, and are often in tension with scientific doctrines and practices.

The structure of the paper is as follows. In Sect. 2, I flesh out the framework of sparse, abundant and mere abundant causation. In Sect. 3, I outline what I take to be the main theoretical problems associated with negative causation, causation involving institutional properties and physical macro-causation. In Sect. 4, I explain why existing responses to these problems often are unsatisfactory. Then, in Sect. 5, I tackle the issues described in Sect. 3, applying the distinctions developed in Sect. 2. In Sect. 6, I defend the proposed framework further. I end with some concluding remarks in Sect. 7.

### 2 Sparse causation, abundant causation and mere abundant causation

Below is an initial characterisation of sparse causation (SC), abundant causation (AC) and mere abundant causation (MAC).

**(SC)** A token instance of SC consists in some appropriate physical process connecting worldly entities.

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8 Mellor (1995, Ch. 13) arguably applies the sparse/abundant distinction to the ‘causal relation’, but he does not use this, to my mind helpful and clarifying, terminology. Moreover, his view differs in crucial respects from mine, e.g. concerning the role of processes, and he does not clearly distinguish between – what I call – sparse causation, abundant causation and mere abundant causation (see below, Sect. 2 and Sect. 5.1). Also, in contrast to Mellor’s analysis of ‘causes’, my account of abundant causation is developed so as to be compatible with a variety of views of how our causal talk is to be analysed, if at all.

9 In making this classification, I am picking up on a similar classification made in the philosophy of change, where philosophers (following Geach 1969: 71–72) standardly distinguish between real change (i.e. worldly intrinsic change), Cambridge change (i.e. predicatory change), and mere Cambridge change (i.e. predicatory change not corresponding to real change).
(AC) AC obtains if a sentence (or statement or proposition) involving predication of a relational, causal predicate (or concept) is true.

(MAC) MAC obtains if a sentence (or statement or proposition) involving predication of a relational, causal predicate (or concept) is true and the (putative) causal relata referred to are not connected by some appropriate physical process.

In (SC), I leave it open whether the appropriate physical processes involve transference of some physical quantity such as energy (Aronson, 1971; Fair, 1979; Dowe, 2000), persistence of a trope (Ehring, 1997), exertion of a force (Bigelow & Pargetter, 1990), or ‘passing around of a power’ (Mumford & Anjum, 2011). The characterisation of SC is meant to be compatible with all such specifications. Consequently, I also leave it open whether SC can be realised in multiple ways. However, I take the relevant processes to be propagating at most at the speed of light, in line with the special theory of relativity (see my 2017 and 2021 for defences of this restriction; Reichenbach 1958 and Salmon 1984, Ch. 5, are the loci classici). The significance of this restriction will become apparent in Sect. 5.2.

Some might protest at the idea that an instance of SC consists in a physical process. If this were so, it might be complained, instances of SC could not really be said to be instances of a sparse relation. For one thing, processes propagate over time (in some way or other), but the notion that a cross-temporal relation ‘propagates’ between its relata makes little sense. Cross-temporal relations neither endure nor perdure between their relata. If they endured, they would have to be ‘wholly present’ at distinct times as the self-same entity; if they perdured, they would need spatiotemporal proper parts at distinct times; both options seem forbiddingly absurd.10

I agree that processes are not relations, strictly speaking, although many philosophers (e.g. Salmon 1984: 155–156, Menzies 1996, Beebee 2004, Ney 2009, Schaffer, 2016) speak as if they are. But processes are, I think, the best sparse surrogates we can offer for ‘causal relations’ in the external world – at least, on the assumption that instances of SC are to be generative of, and metaphysically prior to, their results, the relevant effects. For if an instance of SC were indeed a sparse relation, it would not be generative. Relations cannot exist without relating. Thus, if a token instance of SC were an instance of a sparse relation, the instance would depend on the existence of the effect: the effect would be metaphysically (even if not temporally) prior to the relation, and hence the relation could not take part in generating the relevant effect on pain of circular dependence obtaining.11 A process, on the other hand, is not meta-

10 For the endurance/perdurance distinction, see Lewis (1986a: 202; cf. ibid.: 68). There is a related difficulty with identifying processes with relations: some take the relevant causal processes to be, at least in some cases, persisting objects (e.g. Salmon 1984: 139, 145), but it would be absurd to hold that persisting objects like cars and electrons are sparse cross-temporal relations.

11 Ingthorsson (2002: 95) makes essentially the same point. See also Mellor (1995: 162–165) who denies that causation is ever an ontic (i.e. sparse) relation. Mellor’s reasoning seems flawed though: arguably it merely shows that causation is not always an ontic relation, e.g. in cases of negative causation. The argument in the text above is general, covering all putative cases of sparse causal relations. The argument also disposes of the idea that a sparse causal relation (understood as distinct from a process) exists between c and e iff an appropriate process connects them – an idea which, if sustainable, would allow us to retain sparse causation in the form of ontic relations (thanks to a reviewer for requesting me to com-
physically dependent on its outcome but can be metaphysically prior to it.\textsuperscript{12} And, even if it is not itself, strictly speaking, a sparse relation, it can nonetheless figure as the appropriate ontic correlate of a relational, causal predicate in a true sentence of the form ‘c caused e’ (or, tenselessly, ‘c causes e’).

Turning to (AC), the basic idea is that if a sentence involving predication of a relational, causal predicate is true (alternatively: if the proposition expressed is true\textsuperscript{13}), we thereby have a case of abundant causation, irrespective of what the truthmaker(s) happen to be. The predication need not correspond to an instance of SC – just as a true predication of the one-place predicate \( F \) (expressing an ‘abundant property’) need not correspond to a sparse, monadic \( F \)-ness property. The notion of AC does not even require that causal predicates express a set of ordered pairs – it is compatible with a predicate-nominalistic understanding of such predicates (cf. Section 1, especially footnote 2, above). Further, the singular terms flanking the causal predicate need not denote objects or events. They can denote facts or even properties: they can be shorthand for ‘the fact that \( Q \)’ and ‘the fact that \( P \)’ or ‘the trope \( a \) at \( t \)’ and ‘the trope \( b \) at \( t' \)’.\textsuperscript{14} Nor does the AC notion as such presuppose any particular (and possibly controversial) analysis of causal predicates/concepts – indeed, it is even compatible with primitivism about such predicates/concepts (see Sect. 5).

Finally, (MAC): cases of MAC are simply instances of AC that do not correspond to any SC at the level in question. Thus, they are special cases of AC.

3 Three problem areas

I shall now sketch three problem areas in the philosophy of causation. In presenting them I largely ignore the distinctions set out in Sect. 2, as the philosophers whose work I am drawing on proceed largely without relying on them. I return to the categorisations, and in particular the distinction between SC and MAC, in Sects. 4–7.

\textsuperscript{12} If a process is taken to be a four-dimensional aggregate of stages or proper temporal parts, a case can be made for the notion that a process is (as a whole) dependent on these sub-stages (cf. van Inwagen, 1990). However, the outcome of the process (the effect) need not be included as a proper part of the process, even if we require the process to be connected with the effect in the sense that there is no spatiotemporal gap between the process and the effect (or the cause, for that matter). For example, the process could cover an open time interval (\( t, t' \)) and the effect a closed interval \( [t', t^{**}] \) (see my 2017 for discussion). But, importantly, a process need not be understood as a 4-D aggregate of stages or temporal parts. It might, for example, consist in the endurance of something such as a trope (Ehring, 1997; see also Stout 1997).

\textsuperscript{13} I wish to be non-committal on what the appropriate truthbearers are.

\textsuperscript{14} Mellor (1995) prefers the formulation ‘\( E \) because \( C \)’ where ‘because’ is a sentence operator rather than a predicate, but this is immaterial. An instance of a causal ‘\( E \) because \( C \)’ can be reformulated as ‘the fact that \( C \) caused the fact that \( E \)’, as is acknowledged by Mellor (ibid.: 13, 156).
3.1 Negative causation

In day-to-day life, legal contexts and the sciences, non-occurrences, or ‘absences’, are often spoken of as if they have effects (Schaffer, 2000, 2004b). We say things such as ‘the gardener’s failure to water the flowers caused the flowers to wither’, ‘the driver’s inattention and the hole in the road caused the car crash’, ‘scurvy is caused by a lack of vitamin C’, and so on. Further, we often speak of positive occurrences as if they cause absences: ‘her getting ill caused her to miss days at work’, ‘the vaccine prevented him from getting sick’, ‘the flicking of the switch made the light to go out’. And sometimes we talk as though absences cause absences: for example, we might say ‘the delay of the vaccination programme prevented the decline of the death rates’. In the philosophical literature cases like these are usually collected under the heading ‘negative causation’.

Schaffer (2004b: 203) maintains that instances of negative causation refute the influential research programme in which causation involves processes from cause to effect. Others, such as Beebee (2004), Moore (2009), and Mumford & Anjum (2011), take an opposing view, arguing that putative cases of negative causation cannot really be cases of causation. Causation is a relation of some kind, they maintain, and relations require relata. Absences are not entities (‘they’ are nothings), and thus they cannot serve as relata. Hence, alleged cases of negative causation are not really cases of causation.

This stand-off is deeply dissatisfying. Is there negative causation or not?

3.2 Causation involving institutional properties

Institutional properties – or events or facts involving them – are routinely referred to as causes and effects, both in daily life and in the social sciences. We say things such as ‘these events caused Donald Trump to become President’, ‘high employment causes inflation’ and ‘his poor grades caused him to lead a miserable life’. However, the institutional properties being President, being employed and having grade G in subject S are highly extrinsic: they depend on our attitudes for their realisation (e.g. Searle 1995, 2010). Such properties therefore cannot be sparse properties but must be mere abundant properties (Hansson Wahlberg 2019b, 2021). But if institutional properties are mere abundant properties, how can they partake in causation? Being non-immanent, it seems they cannot really be causes or effects (Hansson Wahlberg 2019b). Moreover, Kim (1974), Shoemaker (1980/1997), Lewis (1983: 368–370, 1986b: 263) and Maudlin (2002: 128) have all famously maintained that extrinsic properties cannot play a part in causation. Menzies (1996: 97–100) even claims that this ban is part of the content of various ‘platitudes’ about causation. Yet most of us – social scientists included – take it for granted that there is such a thing as causation involving institutional properties. How can we make sense of this causation, given the incontrovertible extrinsicality and non-sparseness of the supposed relata?

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A research programme often taken to have been initiated by Russell (1948); but see Reichenbach (1958), published in German in 1928.
3.3 Physical macro-causation

In our daily lives we habitually place physical macroscopic objects, properties and events in causal relationships. We say things like ‘the tennis ball broke the window’, ‘the slipperiness of the road caused the car crash’, and so on. Again, scientists in various disciplines routinely try to establish causal relationships at macro-level, with the help of empirical experimentation and statistical tests. However, on Ockhamist grounds many philosophers regard the notion of macro-causation as problematic (this is sometimes called the generalised exclusion problem\textsuperscript{16}). They think postulation of macro-causation involves postulation of systematic over-determination (e.g. Merricks 2001). In rough outline, the argument is as follows. Macro-objects cannot be reduced to (i.e. identified with) pluralities of micro-particles.\textsuperscript{17} Given this, macro-events involving, and macro-properties instantiated by, macro-objects cannot be reduced either. But all the causal work allegedly done by macro-phenomena (by macroscopic objects, events and properties) can presumably be done by the micro-phenomena (micro-particles, micro-properties and micro-events) that make up the macro-phenomena. In the case of the broken window, interactions between the micro-particles of the tennis ball and the window were presumably sufficient to separate and scatter the window particles, and thus sufficient to shatter the window (the latter event, if it exists in an ontic sense,\textsuperscript{18} is presumably fully grounded in the scattering of the window-particles). Any causal work done by the tennis ball itself over and above that done by its micro-constituents appears to be redundant: it seems to involve superfluous over-determination of the scattering of the window particles, and thus of the shattering of the window.

Yet, as I have noted, laymen and scientists habitually speak of physical macro-phenomena as being causal. Can sense be made of such talk in light of the generalised exclusion problem?

4 The disunity of existing solutions

There are a variety of responses in the philosophical literature to the issues outlined in Sect. 3. However, the responses are generally not unified, but tend to be unsystematic – in some cases even ad hoc-like – solutions. On top of that, the responses frequently involve radical, implausible claims, many of which are in conflict with ordinary language, or with scientific doctrines and practice. Let me briefly illustrate with some examples.

Jonathan Schaffer is perhaps the most prominent contemporary defender of negative causation. He thinks it is obviously true that there is negative causation because

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\textsuperscript{16} The problem generalises the so-called exclusion problem in the philosophy of mind (e.g. Kim 2005).

\textsuperscript{17} For example, a tennis ball is a single object, but the micro-particles making it up are many; and a single thing cannot be both one and many. Again, a macroscopic object typically has temporal and modal properties distinct from the temporal and modal properties of the plurality of particles that make it up at a certain time – if such properties at all can be ascribed to pluralities. And so on.

\textsuperscript{18} Merricks denies that there are any macroscopic phenomena (apart from persons) on the basis of their causal redundancy.
most of the paradigmatic cases of causation do, upon scrutiny, involve negative causation (Schaffer, 2000, 2004b). Moreover, he seems to hold that absences are involved in causation in some substantive metaphysical sense. He speaks indiscriminately of negative causation as ‘genuine causation’ (2004b: 197). And he says, of instances of positive and negative causation: ‘Either way is causation full force’ (2000: 286). In his SEP entry on the metaphysics of causation (Schaffer, 2016), he further suggests that negative causation might involve immanent negative properties, without degrading these as mere abundant properties (see also Schaffer 2000: 297; and Wright 2011: 313). This radically permissive approach might fit Schaffer’s liberal stance towards ontology in general (e.g. Schaffer 2009). In my view, it is excessively permissive.19

In the opposite corner, we find people like Michael Moore (2009: 351–354, 399–400, 436–450, 508). Moore thinks it is as obvious that there cannot be any negative causation because causation requires ontic relata and absences cannot figure as ontic relata. Not distinguishing between SC and MAC – merely discussing causation simpliciter, and asking how sentences describing this relation can be analysed, if at all – he therefore rejects negative causation tout court. And by doing this, like others reasoning along similar lines (Beebee 2004: 305, Mumford & Anjum 2011: 146), he denies that statements affirming negative causation are ever true. This highly restrictive view is also too radical – it amounts to an error-theory of negative causation.

Next, consider physical macro-causation. One way of escaping the generalised exclusion argument is by rejecting the irreducibility claim. By endorsing the so-called composition as identity thesis, i.e. the view that a whole (object, property, or event) is identical with its proper parts (e.g. Cotnoir & Baxter 2014), one puts oneself in a position to claim that a physical causal process ostensibly directed from macro to micro (e.g. a tennis ball causing window particles to scatter) is in fact identical with the many causal processes going on at the micro-level in the case at hand. (Kim, 2005: 56 endorses a version of this solution to the generalised exclusion problem.) However, the composition as identity thesis is fraught with difficulties (for detailed arguments see e.g. Moore 2014: 144–145, Sider 2014, Calosi, 2016) and ultimately fails to deliver a plausible option here. A second escape route involves rejecting the notion that the physical micro-level is causally closed (e.g. Dupré 1993: 101–102). With this rejection, one can maintain that there are non-redundant causal processes going from the irreducible macro-level to the micro-level. That is, one can claim that the macro-level can intervene among the processes going on at the micro-level and alter the way these processes unfold. In the tennis ball example, the ball itself, as a whole, can be held to contribute to the way the window particles scatter. Here, physical macro-causation no longer involves mere over-determination. It involves non-redundant (sparse) causation. But rejection of the notion that the micro-level is causally closed is a radical measure. As the physicist Paul Davies (2006) persuasively argues, there is little reason to doubt that the micro-level is causally closed, and at the very least this doubt is at odds with contemporary orthodox physics, quantum phys-

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19 Accepting immanent negative properties in order to save negative causation can even appear self-contradictory: if absences are reified in terms of immanent negative entities, they are no longer nothings but somethings – and then it is in effect denied that there is any causation involving absences (cf. Mumford & Anjum, 2011: 144).
ics included (see also Brenner 2018). Apart from being radical, this escape route is also noticeably ad hoc: the causal closure of the micro-realm is denied simply for the purpose of saving physical macro-causation.

A less radical version of the second escape route is defended by philosophers like Stephen Yablo (1992a: 434–436; 1992b: 277–279) and Christian List and Peter Menzies (2009: 479–480, 488). They acknowledge that events in general do have micro-physical antecedents which are ‘causally sufficient for’, or which ‘causally necessitate’, them; but they maintain that if these antecedents fail to meet a ‘proportionality’ constraint, they do not qualify as causes. To be causes, their would-be effects must ‘require’ them – which they will not do if very similar but distinct micro-physical antecedents would have led to the same result. On this conception, a ‘realisation-insensitive’ higher-level event can cause a micro-physical event without it being the case that the micro-physical ‘implementation’ or ‘realisation’ of the higher-level event causes the micro-physical event – even if the micro-physical implementation is ‘causally sufficient’ for, and is connected with, the event in question. And, according to these philosophers, higher-level events are often realisation-insensitive. Thus, macro-causation does not involve causal over-determination – at least not in the scenarios considered where the ‘same effect’ allegedly would have occurred had the higher-level event been realised slightly differently. But, as just noted, this result is reached on pain of denying that the relevant ‘causally sufficient’ micro-physical antecedents are causes. This denial is highly counterintuitive, as has been pointed out by various authors (see e.g. Beebee et al., 2017: 9).

Again, one might suspect that the denial – i.e., in effect, the proportionality constraint – is motivated primarily by a desire to avoid the generalised exclusion problem, in which case the denial looks suspiciously ad hoc.

Anyhow, these responses are unsystematic and piecemeal: accepting negative immanent properties, rejecting negative causation, defending composition as identity, and denying causal closure at the micro-level are not means for solving the other problems described. Likewise, rejecting causation involving institutional properties

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20 Thanks to a reviewer for suggesting that I comment on the so-called proportionality approach. Yablo, and List and Menzies focus on the exclusion problem in the philosophy of mind, but they make clear that they think their reasoning generalises (e.g. Yablo 1992a: 444 n. 65; List & Menzies 2009: 499).

21 Determinism is assumed for simplicity’s sake (e.g. Yablo 1992a: n. 67, pp. 444–445; List & Menzies 2009: 477–478); it is generally agreed in the relevant literature that the (generalised) exclusion problem does not hinge on whether or not causation is fundamentally probabilistic.

22 Those which are not are assumed to be reductively identifiable with some ‘lower-level’ event (List & Menzies, 2009: 475 n. 2, 500); for criticism of this idea, see my (2019a).

23 The denial looks especially odd in Yablo’s case since he does not, strictly speaking, speak in terms of higher / lower levels, but in terms of determinables / determinates. Determinables – being disjunctive – are arguably mere abundant properties of objects and events. Only determinates (specific token ‘implementations’ of determinables) can be sparse properties (cf. Armstrong, 1997: 48–50; cf. also above, footnote 6.) But the relevant determinates, in the situations in question, are said to be non-causes (although it is admitted that they ‘causally necessitate’ the ensuing events).

24 In fairness, I should mention that these philosophers start off their arguments by assuming that causation is to be understood in terms of ‘difference making’ (Yablo, 1992b: 274; List & Menzies 2009: 476). Note, though, that in his (1996), Menzies defends a process-based theory of causation.

25 As I overhastily did in my (2019b).
will not help us solve the other issues outlined. It would be preferable to develop a unified solution to the problems described.

5 A unified treatment

As promised, I will now argue that the framework presented in Sect. 2 provides the requisite tools for unified treatment of the problems set by negative causation, causation involving institutional properties and physical macro-causation.

5.1 Negative causation

As soon as we distinguish between SC and MAC the air of paradox surrounding negative causation dissolves. Obviously, cases of negative causation are not instances of SC: in them at least one referent, or ontic relatum, of a causal ‘c caused e’ is missing (absences are not entities), so trivially there is no physical process connecting the relata. But want of SC in such a case does not necessarily rule out that the relevant causal sentence (or statement or proposition) is true and expresses an instance of MAC.

Thus, consider a counterfactual analysis of causal sentences which merely requires counterfactual dependence of the truth-value of the relevant consequent on the antecedent, or a chain of such dependencies, as indicated by David Lewis (2004a: 100; see also Lewis 2004b: 282–283).26 On this kind of analysis, causal sentences of the form ‘c caused e’ can come out as true even if, at face value, they refer to, or express, absences. For example, if ‘the gardener’s failure to water the flowers’ is substituted for ‘c’ and ‘the withering of the flowers’ is substituted for ‘e’ the causal sentence may very well express a truth. It can do so if the relevant antecedent, ‘the gardener’s failure to water the flowers occurred’, and the relevant consequent, ‘the withering of the flowers occurred’, are both true and the consequent would have been false had the antecedent been false. (Or better, it expresses a truth if the sentences ‘the gardener failed to water the flowers’ and ‘the flowers withered’ are both true and the latter sentence would have been false had the former been false. This way of putting it may

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26 Famously, in his early papers on causation, Lewis took causation to involve counterfactual dependence among actually existing events (possibly parts of extended processes), even if this dependence was analysed in terms of counterfactual dependence among propositions (of the form ‘O(e)’ / ‘¬O(e)’) saying that these worldly events occur / do not occur (Lewis, 1973b, 1986b). But, in his updated versions (Lewis 2004a, 2004b), Lewis allows for negative causation, a topic that had troubled him in his earlier discussions. Here, I am pointing out that a counterfactual analysis of negative causation along the lines indicated by Lewis (2004a, 2004b) and in the text above is to be understood in terms of MAC, i.e. in terms of causal truths that do not correspond to any SC at the level in question. This clarifying concept is not explicitly invoked by Lewis, and as a result his discussion of negative causation – given his emphasis on worldly events in his (1973b, 1986b) and in the other sections of his (2004a), and given his explicit denial of the notion that propositions themselves can be causes and effect (2004a: 100) – is somewhat cryptic (cf. Paul & Hall, 2013: 182). I note that Hall too oscillates between an event and a truth-theoretic construal of counterfactual dependence (e.g. Hall 2004: 225, 254, 257).
be preferable if one thinks that sentences such as ‘the gardener’s failure to water the flowers occurred’ in which non-events are said to occur cannot possibly be true.\textsuperscript{27}

Again, consider Hugh Mellor’s (1995) analysis of causation in terms of chance-raising of facts. On this analysis, sentences (statements or propositions) about negative causation can come out as \textit{true}, because the putative relata referred to, or expressed, in causal sentences need not exist in a substantive ontic sense: usually we merely express ‘facts’ which are ‘ontologically vacuous’, and which consequently must be distinguished from worldly, truthmaking ‘facta’ (ibid.: 157–162).\textsuperscript{28} Ontologically vacuous facts may even be negative: Mellor exemplifies this possibility by drawing attention to the facts expressed in sentences such as ‘Kim has no children’ (p. 165). Sentences of this sort may express causes or effects in compound causal sentences like ‘Kim works full time because she has no children’ and ‘Kim has no children because she uses contraception’ (ibid., Mellor’s examples are a bit parochial). Where the relevant sentences about chance-raising are true,\textsuperscript{29} the target causal sentences express – as I would put it – MAC (Mellor himself does not use this terminology).

I am fully aware that counterfactual and probability-raising analyses face various difficulties involving ordinary (single-level) over-determination, late and trumping pre-emption and chance-lowering causes (e.g. Collins et al. 2004, Moore 2009, Schaffer, 2016). I have brought in these well-known analyses for illustrative purposes only. As it happens, negative causation can be defended as a species of MAC even by those who deny that causal sentences can be reductively analysed. Take, for example, James Woodward’s influential interventionist theory, formalised in terms of variables and structural equations (e.g. Woodward 2003). This theory (which Woodward argues can handle the pre-emption-style difficulties just mentioned, e.g. ibid.: 74–86) is non-reductive in that the core concept of an intervention it utilises in elucidating causal claims is itself a causal concept (ibid.: 22, 27–28, 70, 98, 104–106, 136). All the same, the theory is compatible with there being \textit{truths} expressing negative causation: the actual ‘values’ (typically numbers) of the relevant variables in the equations may stand for, or symbolise, absences (ibid.: 87–91, 224–225).

Irrespective of which analysis is adopted (if any), I think it is highly important that the defender of negative causation explicitly clarifies that when negative causation is spoken of he or she is \textit{speaking merely of a species of MAC}. Lewis, Mellor and Woodward could, I think, be clearer in this regard. They tend to speak indiscriminately of cases of negative causation as yet further cases of a monocriterial notion of causation (e.g. Woodward 2003: 91–93, 225; Mellor 1995: 60, 67, 163–165).\textsuperscript{30} Since they also often talk in the material mode about causal sequences (e.g. Mellor 1995, Ch. 17), and since they allow that worldly events, properties or facta are often picked out by the cause and effect expressions in causal sentences, their writ-

\textsuperscript{27} Yet another alternative: ‘no event of kind $K$ occurred’ where $K$ is a watering of the flowers by the gardener at time $t$ (cf. Collins et al. 2004: 25; Lewis 2004b: 284–285).

\textsuperscript{28} The distinction being roughly the original sparse/abundant distinction as applied to facts.

\textsuperscript{29} Of the form $ch_c(E)$\textsuperscript{31}$>ch_{-c} (E)$, expressing that E’s chance in the relevant circumstances with C exceeds its chance without C (Mellor, 1995: 167).

\textsuperscript{30} Lewis (2004b: 287) says, for example: ‘What is causation? As a matter of analytic necessity […] it is somehow a matter of counterfactual dependence of events (or absences) on other events (or absences).’
ings can suggest that we should think of cases of negative causation as being on par with positive—‘sparse’—cases. Mellor, for example, could have highlighted and emphasised more clearly (what is merely implied in passing on p. 165) that we should distinguish between true instances of ‘$\text{ch}_C(E) > \text{ch}_{-C}(E)$’ (where the bold face indicates that we are picking out facta, not merely facts, ibid.: 162) and true instances of ‘$\text{ch}_C(E) > \text{ch}_{-C}(E)$’. Instances of the former, when the relevant $C$ and $E$ obtain, correspond roughly to what I call SC—at least, in those cases where there is a connecting process between $C$ and $E$, which there normally is (cf. Mellor, 1995, Ch. 17).31

Instances of the latter, when at least one of the obtaining facts $C$ and $E$ is negative and thus fails to correspond to a factum ($C/E$), express, in my terminology, MAC. In later writings (e.g. Mellor 2004), Mellor drops the terminology of ‘facta’ and ‘facts’ entirely, and as a result the distinction between negative causation and positive (in my terminology) ‘sparse’ causation is blurred further. My suggestion is that once cases of negative causation are explicitly categorised as cases of MAC, philosophers will be far less likely to be distrustful of negative causation. Thus, although something like the SC/MAC distinction is made by philosophers like Lewis and Mellor (albeit within their preferred counterfactual/chance-raising analytic frameworks), it is not sufficiently highlighted and disambiguated by these philosophers. When these shortcomings are rectified, I think the prospect of the notion of ‘negative causation’ being accepted by critical-minded philosophers improves.

Incidentally, specifying that negative causation is a species of MAC helps us to fend off an objection to negative causation based on the Eleatic Principle (Mumford & Anjum, 2011: 145). According to the Eleatic Principle, to be is to have causal power (Plato, The Sophist, 247E). If absences are held to have causal power, the Eleatic Principle appears to rule that absences must be held to exist, which seems contradictory. Equipped with the SC/MAC distinction, a defender of negative causation who endorses the Eleatic Principle can retort that the Eleatic Principle should be interpreted as saying that to be (in a substantive, ontic, sparse sense) is to be capable of partaking in SC. Absences cannot partake in SC, so they do not exist (in a substantive ontic sense, a sense which does not rule out our truly saying things such as ‘there is an absence of cheese in my fridge—and this annoys me’).

In sum, the distinction between SC and MAC helps us to make sense of negative causation.32 This is clearly a good thing since negative causation is invoked in daily

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31 Thus, ‘SC’ and ‘$C \& E \& \text{ch}_C(E) > \text{ch}_{-C}(E)$’ are not equivalent notions. To start with, chance raising is not sufficient for SC (cf. Menzies, 1996). Moreover, processes of SC may in principle lower the chance of the effect, as Mellor’s own discussion of the classic example of the lucky golfer illustrates (Mellor, 1995: 165; cf. Salmon, 1984: 193–194). Thus, I do not endorse probability-raising as a necessary condition for SC to obtain, but I do think it plausible that sparse causes typically raise the probability of their effects (cf. Menzies, 1996). Mellor bites the bullet and maintains that if $C$ does not raise the chance of $E$, then $C$ does not cause $E$ even if $C$ and $E$ are connected by a transference process.

32 Note that the distinction between SC and MAC does not coincide with Ned Hall’s two concepts of causation (2004), although there are affinities. Hall contrasts ‘production’ with ‘counterfactual dependence’ (see also Lewis 2004b who contrasts so-called biff with counterfactual dependence). But MAC need not be reductively analysed in terms of counterfactual dependence, as I have pointed out above. Also, Hall does not rely on the sparse/abundant distinction in his discussion, and he explicitly says elsewhere that he conceives of counterfactual dependence as an ontic relation (see e.g. Paul & Hall 2013: 32–8). (However, in his 2004, Hall oscillates between an ontic and a truth-theoretic conception of counterfactual dependence;
life, in the sciences, and, importantly, in law. Defending it in terms of MAC does not as such require causal predicates or concepts to be reductively analysed in a certain way, or indeed reductively analysed at all. No doubt, the issue what – if anything – makes statements of negative causation true, when they are true (assuming now that they can be true), remains. But this is a further issue for discussion.33 Another worry is that once we have admitted negative causation, we will have to accept a super-abundance of such causation: for example, it will be true not only that the gardener’s failure to water the flowers caused their death, but that person a’s, person b’s, person c’s … failure to do the watering also caused their death (e.g. Beebee 2004: 295, 301). This may be a price we should pay (cf. Woodward, 2003: 88–91; Lewis 2004a: 101; Petersson 2019). The interesting cases – for example, the morally and legally relevant instances – will form a very small sub-class of the class of negative-causal truths.

5.2 Causation involving institutional properties

If institutional properties such as being President, being employed and having grade G in subject S are extrinsic and hence mere abundant properties, it makes little sense to think of them as being connectable by physical processes and partaking in SC (see Hansson Wahlberg 2019b, 2021 for details). But this consequence is not too alarming, because they can still figure as designated causes or effects in true causal sentences and thus be eligible to ‘partake’ in MAC.

Here is an illustration of the way institutional properties may succeed in partaking in MAC. To begin with, the following counterfactuals are, I assume, true, even if ‘President’ does not pick out a sparse property: ‘If James Comey had not initiated an additional investigation of Hillary Clinton’s private emails autumn 2016, Donald Trump would not have become President’; ‘If James Comey had initiated an additional investigation of Hillary Clinton’s private emails autumn 2016, Donald Trump would have become President’. Given that these counterfactuals are true (the second because its antecedent and consequent are actually true, Lewis 1973a) the following causal sentence is arguably also true, at least on a counterfactual analysis of causation of the kind discussed in Sect. 5.1: ‘James Comey’s initiation of an additional investigation of Hillary Clinton’s private emails autumn 2016 was a cause of Donald Trump’s becoming President’. Surely, if absences are allowed to figure as designated ‘relata’ in true causal sentences (as allowed by Lewis in his 2004a, 2004b), then institutional properties should also be allowed to do so.

But perhaps I am being a bit quick here. In his (1986b: 263–264), Lewis presented reasons – given a counterfactual analysis of causation – for disallowing ‘predomi-

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33 Mellor (1995, 2009/2012), but also Armstrong (2004a, 2004b) (although he is not a friend of negative causation), offer various attractive suggestions that do not involve negative immanent properties, events or facta, or unactual possible worlds. Woodward explicitly refuses to address the truthmaker question (e.g. 2014, 2015).
nantly extrinsic events’, involving extrinsic properties, as causal relata. He banned them to avoid being committed to saying things like ‘Socrates’s death instantaneously caused the widowing of Xanthippe’ (cf. Kim, 1974, Maudlin, 2002: 128) and ‘the widowing of Xanthippe caused the subsequent cooling of Socrates’s body’. In his (2004a: 101–102), Lewis apparently still endorsed these arguments (although he there allowed that absences can be causes and effects). However, I think the worry about instantaneous causation can be discharged by pointing out that the allegedly problematic cases in fact are instances of synchronic truthmaking: and truthmaking, being an internal relation between a truthmaker and a truth, is by no means a causal relation, even if the truth-value of the truth depends, counterfactually, on the existence of the truthmaker.\(^{34}\) In the example in question: before \(t\), ‘Xanthippe is a widow’ was false; but at \(t\), Socrates died, an event which, together with the institution of marriage\(^{35}\) (and perhaps widowhood), made the present-tensed ‘Xanthippe is a widow’ true. This sequence is simply an instance of mere Cambridge change, in the sense of Geach (1969: 71–72; see my 2021 for detailed discussion of cases like these). The fact that someone can become a widow (or employed, or President, etc.) ‘instantaneously’ in this sense does not, by itself, rule out that sentences of the following kind can be true on a counterfactual analysis of the sort sketched in 5.1: ‘\(a\)’s becoming a widow at \(t_1\) caused her to inherit money at \(t_2\).’\(^{36}\)

I see two lines of response to the concern that sentences such as ‘the widowing of Xanthippe caused the subsequent cooling of Socrates’s body’ come out as true on a counterfactual analysis which does not include a ban on predominantly extrinsic events as designated relata. The first response is simply to bite the bullet and maintain that such cases are indeed instances of causation. Someone adopting this response should quickly qualify her bullet-biting, however, by pointing out that the cases in question are merely instances of MAC: thus, it is not maintained, which would be absurd, that there is a process of SC from the ‘predominantly extrinsic event’ (which has no clear location in spacetime, even if the object that ‘has’ the mere abundant property has a definite location; see my 2021 for detailed discussion) to the subsequent physical event. No doubt, it might be retorted by a critic that a liberal

\(^{34}\) It is generally agreed that instances of internal relations are not instances of causal relations (cf. note 7 above). Truthmaking is arguably an internal relation, between a proposition, or a semantically interpreted sentence, and a (possibly complex) truthmaker (see e.g. Armstrong 2004: 9, 50; Heil 2012: 156, 160–162; my 2021). Such relata are wholly distinct; thus, I am not trying to evade Lewis’s concern here by claiming that the relevant relata ‘are in some sense not distinct’ (cf. Lewis, 1986b: 263). Rather, the claim is that counterfactual dependence embodying an internal relationship should not be deemed causal. Such a restriction on a counterfactual analysis of causation is, I submit, preferable to excluding ‘predominantly extrinsic events’ as designated relata in all causal sentences.

\(^{35}\) I.e., people accepting constitutive rules to the effect that \(x\) counts as married (to \(y\)) iff such and such conditions are met (Searle, 2010: 99).

\(^{36}\) Note that present-tensed truths about intrinsic properties are also made true synchronically by their truthmakers; and that their truth-values typically also depend counterfactually on the existence of their truthmakers. Hence, present-tensed truths about extrinsic properties are not at all special in this regard. (This fact is missed by Kim (1974); he seems to hold that mere Cambridge changes are somehow special and peculiar.) We do not hesitate to refer to intrinsic properties in causal statements just because present-tensed truths about their instantiations depend counterfactually on their truthmakers. Accordingly, instances of synchronic truthmaking of present-tensed truths about extrinsic properties should not stop us from invoking extrinsic properties as ‘relata’ in causal sentences.
view like this entails that there is in general a bizarre multitude of causes of physical events: in the case of the cooling of Socrates’s body, we have not only the death of Socrates (presumably a sparse cause; but see below Sect. 5.3), but also ‘the widowing of Xanthippe’, and arguably also ‘Plato becoming such that Socrates just died’, ‘stone a becoming such that Socrates just died’, etc. However, to this a defender of this line of response can reply that we do not typically speak of such ‘predominantly extrinsic events’ as causes of subsequent physical events for pragmatic reasons. That is, the defender can invoke Lewis’s own response to the worry about there being a superabundance of causal absences: ‘There are ever so many reasons why it might be inappropriate to say something true. It might be irrelevant to the conversation, it might convey a false hint [e.g., that SC is involved], […] and so on (Grice, 1975).’ (Lewis 2004a: 101)37

The second line of response is to maintain that ‘the widowing of Xanthippe caused the subsequent cooling of Socrates’s body’ is in fact not true because the scenario described fails to meet a plausible requirement on causation involving ‘predominantly extrinsic events’. The requirement, in a very rough form, is that the ‘occurrence’ of such an event (at any rate if the event is of an institutional kind, involving an institutional property) must be represented in the cognitive apparatus of some agent (or, in modern societies, in some IT system) where the representation affects the agent’s decision making and behaviour (computations and output), to earn the label ‘cause’ (i.e., ‘mere abundant cause’). On this more restrictive version of a counterfactual analysis of the kind described in Sect. 5.1, a claim of the following kind can very well be true: ‘a’’s becoming President at t caused b to do e at t’, where ‘e’ denotes some action involving some physical change (e.g., ‘e’ might denote an instance of celebrating, executing one of a’s instructions, etc.). The relevant claim is true if the following associated sentences are true: ‘a became President at t, b thought at t’ that a is president, and b did e at t’, and ‘had a not been President at t, then b would not have thought at t’ that a is President,38 and then b would not have done e at t’. But in the relevant Xanthippe example, no representation of the ‘predominantly extrinsic event’ affects the decision making of an agent in such a way that a decision is made which is such that, had the decision not been made, Socrates body would not have cooled. Thus, on this more restrictive conception, although it might be true to say ‘had Xanthippe not become a widow at t, Socrates’s body would not have cooled at t’, it will nevertheless be false to say ‘the widowing of Xanthippe caused the subsequent cooling of Socrates’s body’—the reason being that no mediating representation was involved.

37 Someone who favours a proportionality approach to causation (cf. Yablo, 1992a, 1992b; List & Menzies, 2009) can even argue that the ‘predominantly extrinsic events’ in question exclude the prior physical event as a cause: if being a widow is realisation insensitive (i.e., if ‘is a widow’ is truthmaking insensitive) but ‘died in such and such a way because of a poison acting in such and such a way’ is not, then the cooling of Socrates’s body was not caused by Socrates’s specific physical death but by Xanthippe’s becoming a widow (and similarly, arguably, for Plato’s becoming such that Socrates just died). However, I take this result to be a reductio ad absurdum of the proportionality approach. Certainly, we do not want to exclude the prior physical event as a cause of the cooling of Socrates’s body.

38 Ideally: no information about a putatively fulfilling the collectively accepted general rules about Presidency would have reached b.
I lean towards favouring the second line of response, or some version thereof, to Lewis’s concern. It may not be as straightforward as the first one, but I do not think it is an ad hoc response. It is, I think, intuitive (I have defended similar views elsewhere, on independent grounds – i.e., not in response to Lewis’s concern; see my 2020: 1374; 2021: 5857) and it is in line with standard theorising in social ontology (cf. Searle, 1995, 2001, 2010). Moreover, on the assumption of the sparse causal closure of the micro-physical realm, the response in effect requires that there are, fundamentally, micro-physical processes of SC that ‘implement’ or ‘realise’ the representations and the decision-making processes in question – micro-physical processes which are, moreover, connected (via further micro-processes) to earlier micro-physical events which are constituents of (at least some of) the truthmakers for the predominantly extrinsic truth in question, and to later micro-physical processes which underpin the physical effect at issue. Since such sequences of processes of SC take time (as mentioned in Sect. 2, processes of SC cannot propagate faster than the speed of light; and the relevant brain processes are evidently quite time consuming), we have a neat explanation of the intuition that effects of ‘predominantly extrinsic events’ (at least events of an institutional kind) must occur at times discernibly later than the time of the predominantly extrinsic event in question (relative to a frame of reference). The first line of response, by contrast, allows that effects can occur arbitrarily close in time (in a frame of reference) to the relevant ‘predominantly extrinsic event’ – even if the object ‘having’ the relevant extrinsic property is arbitrarily far away from the physical effect in question. It should be noted, though, that the second line of response nevertheless treats instances of causation involving ‘predominantly extrinsic events’ as cases of MAC: it is not claimed that the putative relata (e.g., ‘a’’s becoming President’ and ‘b doing e’) themselves are connected by processes of SC; at least one of the relata involves a mere abundant property.

Again, I use the counterfactual analysis here merely as an instructive example. Alternative accounts of causation such as Mellor’s or Woodward’s could be mobilised to save institutional causation in the form of MAC.

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39 I am thinking here of the role of mediating representations. Searle endorses an Aristotelian efficient- causation theory (Searle, 1983: 135; 2001: 41) involving (in my terms) some form of sparse downward causation (2001: 294).

40 One might even be able to construct examples that appear to involve backward causation (in the form of MAC): ‘pillow a’s becoming at t₁ such that Napoleon sat on it at t₁ (or n time units ago) caused a to be deformed at t₂’ (cf. Lewis, 1986b: 263). However, here a defender of the first line of response might simply dig in her heels and rule that effects must not occur before their causes, not even on the MAC-conception.

41 Interestingly, Woodward’s theory might have some trouble accommodating institutional properties as causes, even if not as effects. Woodward’s theory makes use of actual or hypothetical ‘experiments’ in which potential cause variables are resolutely ‘manipulated’ or ‘intervened on’ in some way (other variables being held fixed) with the purpose of discerning what changes occur to the potential effect variables. But one could hardly directly ‘manipulate’ (e.g. experimentally remove) an institutional property such as being President. At best, one could manipulate people’s attitudes about x’s being President (cf. Woodward’s 2015 discussion of ‘gender’ as a cause variable). However, even that would be problematic: it is not obvious how a population’s attitudes could be appropriately ‘manipulated’ or ‘intervened’ on in an actual or hypothetical ‘experiment’. In entertaining sudden changes in people’s attitudes (affecting the truth value of ‘a is [present tense] President’, assuming some form of ongoing acceptance is needed to keep the sentence true, cf. Searle, 1995: 45, 117), it would seem that Lewis’s notion of a ‘widespread miracle’ (Lewis, 1979) is preferable, a notion relying not on the possibility of experimental manipulations or interventions.
5.3 Physical macro-causation

The key distinction between SC and MAC also promises to resolve the generalised exclusion problem, for it enables us to reason as follows. When the tennis ball crashes into the window, all the SC occurs at the micro-level, among the relevant micro-particles, micro-properties, and micro-events (assuming sparse causal closure at the micro-level). The associated macro-phenomena, assuming irreducibility, are merely related by MAC. That is, there are macro-causal truths such as ‘the tennis ball causes the shattering of the window during the time interval \( t_1 - t_2 \)’, but these truths are not made true by some additional sparse causal processes over and above the sparse causal processes that go on at the micro-level. Rather, the macro-causal truths are made true by the sparse causal processes that occur at the micro-level. In other words, the latter processes serve as the truthmakers for the macro-causal truths in question. Thus, the salient macro-outcome in the example, the shattering of the window, is not over-determined by excessive and redundant processes of SC. Nor is the macro-causation, in the form of MAC, in any sense pre-empted by the sparse causal processes at the micro-level. On the contrary, the sparse causal processes at micro-level are what make macro-causal facts facts – that is, what make truths such as ‘the tennis ball causes the shattering of the window during the time interval \( t_1 - t_2 \)’ true.

In this connection it should be noted that even if all the SC occurs at the micro-level, we can still make full sense of scientists’ practice of establishing type-causal but simply on more or less abrupt changes in the relevant event structure (realised in the nearest possible world). Plausibly, Mellor is invoking ‘miracles’ in Lewis’ sense (modulo modal realism) when counterfactual and actual scenarios are contrasted (as in ‘\( \text{ch}_E > \text{ch}_E^{-(E)} \)’). Thus, it seems Mellor’s theory is more straightforwardly applicable to institutional properties qua causes than Woodward’s. This critique does not apply to manipulations of ‘physical absences’, because in such cases the hypothetical experiments presumably involve straightforward interventions like inserting something at the place of the absence (which may be realised by physical micro processes, see Sect. 5.3). It should be noted, though, that in some contexts Woodward appears to be willing, somewhat surprisingly, to interpret his hypothetical experiments in terms of something like Lewisian miracles (see Woodward 2003: 130–145).

42 Here I am influenced by Heil (2003: 45). However, if ordinary macro-causal sentences should be analysed or characterised in terms of counterfactuals (a view I am not committed to), then more should be said about exactly how the relevant counterfactuals can be made true by sparse causal processes at the micro-level. I intend to outline such an account in a future paper, but a few brief remarks are in order here. In the window example I take the following counterfactual about the sparse causal processes to be true: if the sparse causal processes at the micro-level had not occurred in the way they did, the window would not have shattered in the way it did. The truthmakers for this counterfactual can be the actual properties and processes involved. They need not involve events (or absences of such) in other possible worlds (cf. Mumford & Anjum, 2011: 150; Lewis 1986a: 22; 2004b: 287). Now, the relevant counterfactuals about the tennis ball in question, such as ‘if the ball had not hit the window the way it did, the window would not have shattered the way it did’, can likewise be made true by these actual micro-properties and processes, even though they are ostensibly about a macroscopic object. In general, the truthmaker(s) for a certain truth can be quite other than they naively appear to be. At least, this is so on a deflationary view of truth-making of the sort defended by Heil (2003), Armstrong (2004: 33) and Mellor (2009/2012) (see also my 2021). Compare: ‘\( a \) is famous’ is arguably made true by properties of people distinct from \( a \) (specifically, by what goes on in the minds of these people), not by a property had by \( a \), although the sentence at face value attributes a property to \( a \). In the window example the connection between the sentences and the truthmakers is tighter, since in that case the relevant truthmakers are (allegedly) ‘constituents’ or ‘proper parts’ of the macro-phenomena in question. If scenarios in close non-actual possible worlds have to be dragged in as truthmakers (pace Lewis 1986a: 22, 2004b: 287), I would still maintain that such scenarios need only involve sparse micro-processes or the lack of such.
relationships at the macro-level using randomised experiments and statistical tests (with alpha-levels etc.) of the sort described in standard textbooks on research methodology. What such tests establish are general patterns of MAC among ‘macro variables’, variables that may very well involve mere abundant properties (e.g. Woodward 2016). They do not as such establish SC occurring at the macro-level. (To establish the latter, scientists would presumably need to discover strongly emergent processes of SC, in which case the over-determination problem would admittedly reappear: for example, on a force-conception of SC, they would need to discover some new force, irreducible to the four fundamental forces known to physics: gravitational, electromagnetic, strong nuclear and weak nuclear forces. As far as I know, this has yet to happen; for relevant discussion, see Davies 2006, Greene, 2020.) Once this is appreciated, the supposed tension between ordinary, successful scientific practice and the generalised exclusion argument evaporates. We can accept the humdrum-style macro type-causal claims of scientists and continue to maintain that all the SC occurs at the micro-level.

6 Causal pluralism

This paper advocates, in effect, a form of causal pluralism: the view that there are different kinds or concepts of causation (Godfrey-Smith, 2009). Specifically, I have argued that we should distinguish between SC and MAC, since this allows us to resolve various notorious causal puzzles. Causal pluralism is, however, a somewhat unattractive thesis, ceteris paribus. The mainstream monistic view that there is only one kind of causation is more economic. Given this, is it reasonable to abandon causal monism in favour of causal pluralism?43

My answer is that it is. Causal pluralism is to be preferred because, if the arguments of this paper are sound, causal monism amounts to an error-theory of much causal discourse. So, other things are in fact not equal. The causal pluralism I advocate allows us to treat the causal discourse in question as true. Causal monism, by contrast, implicates a rejection of that discourse (cf. my 2019b).44 In Sect. 2, I argued that the most suitable sparse correlates available for the relational predicate ‘causes’ are generative processes, not ontic relations (since relations are not generative of, but dependent on, their relata). Thus, generative processes deserve to be called ‘instances of sparse causation’. But, as discussed above, in day-to-day life, legal contexts and the sciences we often speak of causal ‘relationships’ which do not involve generative processes at the level in question: statements of negative and institutional causation are recognisable examples, but I have argued that statements of macro-physical causation may very well fall into this category, too. Instead of maintaining that all of these statements are false, as an SC-monist would, it is more reasonable to hold that they express a predicate-nominalistic form of causation that does not correspond to processes of SC at the level in question: i.e., MAC. The resulting view is analogous to

43 Thanks to an anonymous reviewer for asking me to address this issue.

44 Unless some variety of instrumentalism or fictionalism is deliberately adopted. But then instrumentalistic or fictive causal concepts are in effect introduced – in which case causal monism is abandoned anyhow.
the widely endorsed notion that certain monadic predications can be true even though they fail to correspond to a sparse property and thus indicate the possession of (in the terminology of this paper) a ‘mere abundant property’ (see Sect. 1). It also parallels the widely accepted view that statements of change can be true even though they fail to pick out an intrinsic change in the subject and thus indicate the occurrence of a ‘mere Cambridge change’ (see Sect. 2, n. 9). The term ‘mere abundant causation’, in its application to mere predicate-nominalistic causation, usefully highlights structural similarities here with mere abundant properties and mere Cambridge change. I hope those similarities help to show that the nominalistic conceptualisation is not an ad hoc invention of mine, introduced simply for the purpose of saving the causal discourse in question, but is rather an instance of a general form of thinking about how descriptive discourse about the world can fail to correspond to ontic features or phenomena and yet be true.

Many philosophers have defended causal pluralism before me.45 But (with the arguable exception of Mellor 1995, Ch. 13; see note 8 and Sect. 5.1 above) they do not set off from the sparse/abundant distinction – a distinction which, as I have stressed, has proven useful elsewhere. Pluralists are typically also committed to specific analyses of the causal concepts on which they focus. The SC/MAC notions, by contrast, are flexible and quite noncommittal. It is perhaps worth repeating here that processes of SC can consist in a variety of physical phenomena, such as transference of some physical quantity, exertion of a force, the ‘passing around of a power’, and so on (see Sect. 2). The concept of MAC is compatible with a variety of analyses (albeit appropriately modified in some cases, as is required with Lewis’s counterfactual analysis), and is even compatible with non-reductivism or primitivism about causal talk (Sect. 5.1). This compatibility is, I think, a virtue of the framework defended in this paper – it is not a weakness. It means that the key notions of SC and MAC are not reliant on the success of particular physical-cum-metaphysical theories of generative processes and particular reductive analyses of causal talk.

7 Conclusions

I have argued that the principal problems associated with negative causation, causation involving institutional properties and physical macro-causation can all be handled by introducing a distinction between SC and MAC. This distinction is not ad hoc, as it builds on an already established distinction that has proved useful in other contexts. The resulting solutions are uniform, since they rely on one and the same distinction. They are also compatible with ordinary language and scientific experimental practice, and do not involve implausible physical and metaphysical claims. For these reasons, I think an investment in this form of causal pluralism pays off.

45 See Sect. 5.1 above for discussion and interpretation of Lewis and Mellor; and see note 32 above for additional key references; and see Godfrey-Smith (2009) for yet further references; in addition, the reader may want to consult Horgan (1989) and Hitchcock (2007) (thanks to an anonymous reviewer for the latter two references). Famously, Aristotle distinguished between four kinds of cause (e.g., in Metaphysics, Book Delta, I.).
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References

Armstrong, D. M. (1978a). Nominalism and Realism (Vol. 1 of Universals and Scientific Realism), Cambridge: Cambridge University Press
Armstrong, D. M. (1978b). A Theory of Universals (Vol. 2 of Universals and Scientific Realism), Cambridge: Cambridge University Press
Armstrong, D. M. (1997). A World of States of Affairs. Cambridge: Cambridge University Press
Armstrong, D. M. (2004a). ‘Going through the Open Door Again: Counterfactual versus Singularist Theories of Causation’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 445–457). London: The MIT Press
Armstrong, D. M. (2004b). Truth and Truthmakers. Cambridge: Cambridge University Press
Aronson, J. (1971). ‘The Legacy of Hume’s Analysis of Causation’. Studies in the History and Philosophy of Science, 2, 135–156
Beebee, H. (2004). ‘Causing and Nothingness’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 291–308). London: The MIT Press
Beebee, H., Hitchcock, C., & Price, H. (eds.). (2017). Making a Difference – Essays on the Philosophy of Causation. Oxford: Oxford University Press
Bigelow, J., & Pargetter, R. (1990). ‘Metaphysics of Causation’, Erkenntnis, 33(1):89–119
Bird, A. (2007). Nature’s Metaphysics – Laws and Properties. Oxford: Oxford University Press
Bird, A. (2016). ‘Overpowering: How the Powers Ontology has Overreached Itself’. Mind, 125, 341–383
Brenner, A. (2018). ‘Science and the Special Composition Question’. Synthese, 195, 657–678
Calosi, C. (2016). ‘Composition is Identity and Mereological Nihilism’. The Philosophical Quarterly, 66, 219–235
Collins, J., et al. (eds.). (2004). Causation and Counterfactuals. London: The MIT Press
Cotnoir, A. J., & Baxter, L. M. (eds.). (2014). Composition as Identity. Oxford: Oxford University Press
Davies, P. (2006). ‘The Physics of Downward Causation’. In P. Clayton and P. Davies (eds.), The Re-Emergence of Emergence (pp. 35–52). Oxford: Oxford University Press
Dowe, P. (2000). Physical Causation. Cambridge: Cambridge University Press
Dupré, J. (1993). The Disorder of Things. London: Harvard University Press
Ehring, D. (1997). Causation and Persistence. Oxford: Oxford University Press
Fair, D. (1979). ‘Causation and the Flow of Energy’. Erkenntnis, 14(3), 219–250
Gech, P. (1969). God and the Soul. London: Routledge
Godfrey-Smith, P. (2009). ‘Causal Pluralism’. in Beebee et al. (eds.), The Oxford Handbook of Causation (pp. 326–337). Oxford: Oxford University Press
Goodman, N. (1983). Fact, Fiction and Forecast, 4th edition, London: Harvard University Press
Greene, B. (2020). Until the End of Time – Mind, Matter, and Our Search for Meaning in an Evolving Universe. New York: Penguin Random House
Grice, H. P. (1975). ‘Logic and Conversation’. In J. L. Morgan (ed.), Syntax and Semantics (3 vol.). New York: Academic Press
Hall, N. (2004). ‘Two Concepts of Causation’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 225–276). London: The MIT Press
Hansson Wahlberg T., 2017, ‘Meso-level Objects, Powers, and Simultaneous Causation’, Metaphysica, 18(1): 107–125
Hansson Wahlberg T., 2019a, ‘Why the Social Sciences are Irreducible’, Synthese, 196: 4961–4987
Hansson Wahlberg T., 2019b, ‘Are there any Institutional Facts?’, in Hansson Wahlberg T. and Stenwall R. (eds.), Maurinian Truths, pp. 83–88, Lund: Media-Tryck.
Hansson Wahlberg, T., 2020, ‘Causal Powers and Social Ontology’, Synthese, 197: 1357–1377
Hansson Wahlberg T., 2021, ‘The Creation of Institutional Reality, Special Theory of Relativity, and Mere Cambridge Change’, Synthese, 198: 5835–5860
Heil, J. (2003). From an Ontological Point of View. Oxford: Oxford University Press
Heil, J. (2012). The Universe as We Find It. Oxford: Oxford University Press
Heil, J. (2016). ‘Causal Relations’, in Marmadoro and Yates (eds.), The Metaphysics of Relations, pp. 127–137, Oxford: Oxford University Press
Hitchcock, C. (2007). ‘Three Concepts of Causation’. Philosophy Compass, 2(3), 508–516
Horgan, T. (1989). ‘Mental Quausation’. Philosophical Perspectives, 3, 47–76
Ingthorsson, R. (2002). ‘Causal Production as Interaction’, Metaphysica, 3: 87–119
Kim, J. (1974): ‘Noncausal Connections’, Noûs, 8(1):41–52
Kim, J. (2005). Physicalism, or something near enough. Princeton, NJ: Princeton University Press
Lewis, D. (1973a). Counterfactuals. Oxford: Blackwell Publishing
Lewis, D. (1973b). ‘Causal Production as Interaction’, Metaphysica, 3: 87–119
Lewis, D. (1979). ‘Counterfactual Dependence and Time’s Arrow’. Noûs, 13, 455–476
Lewis, D. (1983). ‘New Work for a Theory of Universals’. Australasian Journal of Philosophy, 61, 343–377
Lewis, D. (1986a). On the Plurality of Worlds. Oxford: Blackwell Publishing
Lewis, D. (1986b). Philosophical Papers (II vol.). Oxford: Oxford University Press
Lewis, D. (2004a). ‘Causation as Influence’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 75–106). London: The MIT Press
Lewis, D. (2004b). ‘Void and Object’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 277–290). London: The MIT Press
List, C., & Menzies, P. (2009). ‘Nonreductive Physicalism and the Limits of the Exclusion Principle’. Journal of Philosophy, 106, 475–502
Marmadoro, A., & Yates, D. (eds.). (2016). The Metaphysics of Relations. Oxford: Oxford University Press
Maudlin, T. (2002). Quantum Non-Locality and Relativity, 2nd edition, Oxford: Blackwell Publishing
Mellor, D. H. (1991). ‘Properties and Predicates’. Matters of Metaphysics (pp. 170–182). Cambridge: Cambridge University Press
Mellor, D. H. (1995). The Facts of Causation. London: Routledge
Mellor, D. H. (2004). ‘For Facts as Causes and Effects’. in Collins et al. (eds.), Causation and Counterfactuals (pp. 309–323). London: The MIT Press
Mellor, D. H. (2009/2012). ‘Truthmakers for What?’, in Mind, Meaning, and Reality, pp. 96–112, Oxford: Oxford University Press
Menzies, P. (1996). ‘Probabilistic Causation and the Pre-emption Problem’. Mind, 105, 85–117
Merricks, T. (2001). Objects and Persons. Oxford: Oxford University Press
Moore, D. (2014). The Causal Exclusion Problem. New York: Peter Lang
Moore, M. S. (2009). Causation and Responsibility – An Essay in Law, Morals, and Metaphysics. Oxford: Oxford University Press
Mumford, S., & Anjum, R. L. (2011). Getting Causes from Powers. Oxford: Oxford University Press
Ney, A. (2009). ‘Physical Causation and Difference-Making’. British Journal for the Philosophy of Science, 60, 737–764
Paul, L. A., & Hall, N. (2013). Causation: A User’s Guide. Oxford: Oxford University Press
Petersson, B. (2019). ‘Too Many Omissions, Too Much Causation?’, in Hansson Wahlberg T. and Stenwall R. (eds.), Maurinian Truths, pp. 65–72, Lund: Media-Tryck
Reichenbach, H. (1958). The Philosophy of Space and Time. New York: Dover Publications
Russell, B. (1948). Human Knowledge: Its Scope and Limits. London: George Allen & UNWIN
Salmon, W. C. (1984). *Scientific Explanation and the Causal Structure of the World*. Princeton: Princeton University Press

Schaffer, J. (2000). ‘Causation by Disconnection’. *Philosophy of Science*, 67, 285–300

Schaffer, J. (2004a). ‘Two Conceptions of Sparse Properties’. *Pacific Philosophical Quarterly*, 85, 92–102

Schaffer, J. (2004b). ‘Causes need not be Physically Connected to their Effects: The Case for Negative Causation’. in Hitchcock C. (ed.), *Contemporary Debates in the Philosophy of Science* (pp. 197–216). Oxford: Blackwell Publishing

Schaffer, J. (2009). ‘On What Grounds What’. In D. Chalmers, et al. (eds.), *Metametaphysics* (pp. 347–383). Oxford: Oxford University Press

Schaffer, J. (2016). ‘The Metaphysics of Causation’, *The Stanford Encyclopedia of Philosophy* (Fall 2016 Edition), Zalta E. N. (ed.), https://plato.stanford.edu/archives/fall2016/entries/causation-metaphysics/

Searle, J. R. (1983). *Intentionality: An Essay in the Philosophy of Mind*. Cambridge: Cambridge University Press

Searle, J. R. (1995). *The Construction of Social Reality*. London: Penguin Books

Searle, J. R. (2001). *Rationality in Action*. London: The MIT Press

Searle, J. R. (2010). *Making the Social World: The Structure of Human Civilization*, Oxford: Oxford University Press

Shoemaker, S. (1980/1997). ‘Causality and Properties’, in Mellor D. H. and Oliver A. (eds.), *Properties*, pp. 228–254, Oxford: Oxford University Press

Sider, T. (2011). *Writing the Book of the World*. Oxford: Oxford University Press

Sider, T. (2014). ‘Consequences of Collapse’. In A. J. Cotnoir and Baxter L. M. (eds.), *Composition as Identity* (pp. 211–221). Oxford: Oxford University Press

Simons, P. (2016). ‘External Relations, Causal Coincidence, and Contingency’, in Marmodoro and Yates (eds.) *The Metaphysics of Relations*, pp. 113–126, Oxford: Oxford University Press

Stout, R. (1997). ‘Processes’, *Philosophy*, 72:19–27

van Inwagen, P. (1990). ‘Four-dimensional Objects’, *Noûs*, 24: 245–255

Woodward, J. (2003). *Making Things Happen – A Theory of Causal Explanation*. Oxford: Oxford University Press

Woodward, J. (2014). ‘A Functional Account of Causation; or, A Defense of the Legitimacy of Causal Thinking by Reference to the Only Standard That Matters – Usefulness (as Opposed to Metaphysics or Agreement with Intuitive Judgement)’. *Philosophy of Science*, 81, 691–713

Woodward, J. (2015). ‘Methodology, Ontology, and Interventionism’. *Synthese*, 192, 3577–3599

Woodward, J. (2016). ‘The Problem of Variable Choice’. *Synthese*, 193, 1047–1072

Wright, R. W. (2011). ‘The NESS Account of Natural Causation: A Response to Criticism’. In R. Goldberg (ed.), *Perspectives on Causation* (pp. 285–322). Oxford: Hart Publishing

Yablo, S. (1992a). ‘Cause and Essence’. *Synthese*, 93, 403–449

Yablo, S. (1992b). ‘Mental Causation’. *Philosophical Review*, 101, 245–280

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