Complex sentential operators refute Simplification of Disjunctive Antecedents

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Abstract There is a longstanding debate about the status of the principle Simplification of Disjunctive Antecedents (SDA), according to which a counterfactual with a syntactically disjunctive antecedent \((\phi \vee \psi) > \chi\) entails a conjunction of counterfactuals \(((\phi > \psi) \land (\psi > \chi))\). This principle is highly intuitive for most examples that have been considered, but it has also been claimed to be subject to empirical counter-examples. However, there is a promising account of the currently known counter-examples which has led a number of authors to suggest that SDA is empirically accurate principle after all. This short piece introduces new data involving sentential operators that impose both upper and lower bounds on confidence, frequency, etc., such as likely but not certain, there is an exactly n\% probability, and usually but not always. These examples show clearly that SDA is not logically valid. I also consider several other arguments for SDA and show that they are empirically invalid or otherwise not decisive. These data are not consider with strict conditional theories of counterfactuals or other accounts that validate SDA. They are consistent with a theory in which a strict Boolean reading of antecedent disjunctions is available, either alongside an SDA-supporting reading (as in Alternative/Inquisitive Semantics) or with SDA derived as a pragmatic inference.

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1 Simplification of Disjunctive Antecedents: Detractors and Defenders

Lewis's (1973) semantics for counterfactuals does not validate the principle that Nute (1975) labels ‘Simplification of Disjunctive Antecedents’ (SDA). Using > to represent the counterfactual connective, I will define SDA as the claim that counterfactuals with the form of (1a) entail (1b).

\[
\begin{align*}
(1) & \quad a. \ (\phi \vee \psi) > \chi \\
& \quad b. \ (\phi > \psi) \land (\psi > \chi)
\end{align*}
\]

(Note that the principle is sometimes given a stronger formulation according to which (1a) is equivalent to (1b). I will only be concerned with the weaker version, which is enough to generate the problems I will discuss.)

Nute (1975) and Fine (1975) object to Lewis’ semantics that SDA is intuitively valid in examples like (2) (slightly modified from Nute).

(2) If we were to have good weather this summer or the sun were to grow cold before the end of summer, we would have a bumper crop.

(3) a. If we were to have good weather this summer, we would have a bumper crop.

b. If the sun were to grow cold before the end of summer, we would have a bumper crop.

Plainly, it is reasonable to infer from (2) the conjunction of the conditionals in (3). Since (3b) is bizarre, the validity of (1) would provide a clear explanation of the bizarreness of (2), which Lewis’ theory does not predict in any straightforward way. SDA is much-discussed and has been explicitly endorsed by many (see, for example, Nute 1975; Ellis, Jackson & Pargetter 1977; Warmbröd 1981; Fine 2012; Starr 2014; Willer 2017). Note also that strict conditional accounts of counterfactuals (Warmbröd 1981; von Fintel 2001; Gillies 2007; Willer 2017, etc.) necessarily validate SDA.

Following up on the early discussion noted above, Loewer (1976) and McKay & Van Inwagen (1977) argue that SDA is not valid. McKay & Van Inwagen give the apparent counter-example in (4):

(4) a. If the sun were to grow cold before the end of summer, we would have a bumper crop.

b. The sun would grow cold before the end of summer.

c. It is necessary that the sun grow cold before the end of summer.

(4b) and (4c) are not particularly bizarre, but (4a) is. Since (4a) is bizarre, the validity of (1) would provide a clear explanation of the bizarreness of (4), which Lewis’ theory does not predict in any straightforward way. SDA is much-discussed and has been explicitly endorsed by many (see, for example, Nute 1975; Ellis, Jackson & Pargetter 1977; Warmbröd 1981; Fine 2012; Starr 2014; Willer 2017). Note also that strict conditional accounts of counterfactuals (Warmbröd 1981; von Fintel 2001; Gillies 2007; Willer 2017, etc.) necessarily validate SDA.

Following up on the early discussion noted above, Loewer (1976) and McKay & Van Inwagen (1977) argue that SDA is not valid. McKay & Van Inwagen give the apparent counter-example in (4):
(4) If Spain had fought with the Axis or the Allies it would have fought with the Axis.

While (5a) is harmless, (5b) seems to be a troubling entailment.

(5) a. If Spain had fought with the Axis it would have fought with the Axis.
   b. If Spain had fought with the Allies it would have fought with the Axis.

Examples with the form \((\phi \lor \psi) > \phi\), where \(\phi\) and \(\psi\) are incompatible, are frequently cited as evidence that SDA is not valid *tout court* (e.g., Nute 1980, 1984; Bennett 2003; Van Rooij 2006; Santorio 2017). However, there is a very promising explanation for this apparent failure of SDA (Warmbröd 1981; Starr 2014; Willer 2017; see also Fine 2012 for a related diagnosis). Suppose that *Spain fights for the Allies* is not relevantly possible. Suppose also, with Lewis (1973) and many others, that counterfactuals with impossible antecedents are vacuously true.

In that case, both counterfactuals in (5) are unobjectionable, since both are trivially true. So, if SDA is valid then (4) should simply imply that *Spain fights for the Allies* is not relevantly possible—i.e., that (6) is false.

(6) Spain might have fought with the Allies.

This prediction is correct. Far from being a refutation of SDA, then, McKay & Van Inwagen’s (1977) example (4) is beginning to look like surprising confirmation of SDA. This would be a relief for many, since SDA is extremely plausible in most cases, and since strict conditional accounts of counterfactuals—which validate SDA—have regained popularity in recent years.

2 Complex operators show that SDA is not generally valid

However, this clever defense of SDA does not extend to examples with certain complex operators in the consequent.

(7) If Spain had fought with the Axis or the Allies it’s likely, but not certain, that it would have fought with the Axis.

If SDA were valid, (7) would entail both of the counterfactuals in (8).

(8) a. If Spain had fought with the Axis it’s likely, but not certain, that it would have fought with the Axis.
   b. If Spain had fought with the Allies it’s likely, but not certain, that it would have fought with the Axis.

(7) is sensible, but both of the purported entailments in (8) are trivially false. So, SDA cannot be valid in general. The problem extends to other sentential operators that impose both an upper and a lower bound on probability, frequency, generality, etc. For example, (9) clearly does not have the unsatisfiable entailments (9a) or (9b). Likewise, SDA would generate bizarre inferences for (10) and (11).

(9) [Jim likes odd numbers, but is indifferent among them. Betting on the roll of a die, he chose 5.] If Jim had bet on 1 or 3, there is an exactly 50% probability that he would have bet on 3.
   a. If Jim had bet on 1 there is an exactly 50% probability that he would have bet on 3.
   b. If Jim had bet on 3 there is an exactly 50% probability that he would have bet on 3.

(10) If it were to rain or snow in New Mexico, it would usually—but not always—rain.
   a. If it were to rain in New Mexico, it would usually—but not always—rain.
   b. If it were to snow in New Mexico, it would usually—but not always—rain.

(11) If a classical musician switched to playing jazz or hip-hop she would normally—but not necessarily—switch to playing jazz.
   a. If a classical musician switched to playing jazz she would normally—but not necessarily—switch to playing jazz.
   b. If a classical musician switched to playing hip-hop she would normally—but not necessarily—switch to playing jazz.
These observations do not refute a more complex theory in which counterfactuals with syntactically disjunctive antecedents are, for principled reasons, semantically ambiguous between a reading which validates SDA and one which does not (e.g., Alonso-Ovalle 2009; Ciardelli, Zhang & Champollion to appear; Santorio 2017). In these theories, two distinct interpretations are generated, and we can reasonably assume that the stronger, SDA-validating interpretation is preferred by default except when it is implausible or contradictory. This would be sufficient to explain why SDA is usually compelling, without rendering it valid in general.

The data just noted are also consistent with the hypothesis that SDA is not valid under any interpretation, but occurs as a pragmatic inference in many contexts (e.g., Loewer 1976; Nute 1980; Bennett 2003; Franke 2011). However, it does refute a theory on which SDA is valid *tout court*, such as Nute 1975 or an unadorned strict conditional theory of counterfactuals (e.g., von Fintel 2001; Gillies 2007; Willer 2017).

Incidentally, the same problems apply to the *prima facie* plausible application of SDA to indicative conditionals. While indicative SDA is extremely plausible for (12), none of (13)-(15) entail the conditionals that indicative SDA would assign them.

(12) If you eat sea cucumber or dung beetles you’ll get a stomachache.

(13) [Jim like odd numbers, but is indifferent among them. We don’t know how he bet.]
   If Jim bet on 1 or 3 there is an exactly 50% probability that he bet on 3.

(14) If it rained or snowed in New Mexico last week, it’s likely—but not certain—that it rained.

(15) If a person is driven by starvation to eat either dirt or insects, they usually—but not always—choose to eat insects.

This suggests that indicative conditionals may also default to an interpretation that licenses SDA—but this is due to semantic ambiguity or pragmatic enrichment, as we would expect from Alternative/Inquisitive Semantics or from an implicature-based account.

3 A pragmatic account of anomalous readings

Can the counter-examples to SDA in (7)-(11) be dismissed somehow as being a (semantically) special case due to the fact that material in the antecedent is repeated in the consequent as the argument of the sentential operator in question (cf. Nute 1980; Warmbröd 1981; Ciardelli 2016: fn.2)? This is not a very appealing strategy, unless it is supplemented by an explanatory theory of how the relevant re-interpretation is computed, and why it would be invoked when and only when this particular kind of partial syntactic matching between antecedent and consequent occurs. In general, what we would expect if SDA is valid is that all of the examples in (7)-(11) should simply be semantically anomalous.

However, the point remains that we are owed an explanation of why SDA-violating readings are more difficult to perceive when the antecedent is not repeated as a disjunct (perhaps embedded) in the consequent. After all, the original problematic around (2) (*If we were to have good weather this summer or the sun were to grow cold before the end of summer, ...*) was to explain why the sentence is anomalous. If a Boolean reading is always available, it seems odd that we do not simply make use of the plausible interpretation when the SDA-supporting reading is not plausible. After all, this is what general principles of charity in interpretation would seem to dictate. Assuming Lewis’ semantics, the result should be a reading that is simply equivalent to (3a).

This puzzle is even more troubling when we consider the upper- and lower-bounding operators that we saw in (7)-(11), since the SDA-supporting reading is not just implausible but semantically inconsistent. Consider, for example, a variant of Nute’s (1980) famous example. Assume that Hitler would have been pleased if Spain had entered the war on the Axis side, but not if Spain had entered on the Allied side. It is fairly difficult (though perhaps not impossible) to understand (16) in the sensible, SDA-violating way paraphrased below. This is surprising given that the other reading is incoherent, and particularly so when it is (by assumption) common knowledge that Spain would have been much more likely to enter on the Axis side.

(16) If Spain had fought with the Axis or the Allies it’s likely, but not certain, that Hitler would have been pleased. “If Spain had fought with the Axis or the Allies it’s likely, but not certain, that it would have fought with the Axis and as a result Hitler would have been pleased”
However, Nute (1980) points out that the relevant interpretation is much more accessible when there is an obvious conversational motivation for using a disjunction in the antecedent. This is especially clear if we consider a dialogic variant of his example:

(17)  
(a. **Bill**: If Spain had fought with the Axis or the Allies it’s likely, but not certain, that it would have fought with the Axis.

b. **Mary**: Right. So, if Spain had fought with the Axis or the Allies it’s likely, but not certain, that Hitler would have been pleased.

The fact that the intended interpretation emerges more smoothly in (17) suggests that the strong preference for SDA in such examples has to do with conversational pragmatics.

Here is a brief suggestion that agrees with Loewer 1976; Nute 1980 on this point, but makes less use of *ad hoc* semantic or pragmatic assumptions. The only semantically consistent interpretation of (16) is one in which the antecedent is treated as a Boolean disjunction. But then, if it is also common ground that (17a) is true, the only obvious reason to utter (16) is to convey that Hitler would have been pleased if Spain had joined the Axis. So why (to paraphrase Grice (1989)) would a speaker use that rigamarole when there is a much simpler, more direct, and no less polite way to convey her intended message—namely, *Hitler would have been pleased if Spain had joined the Axis?* To make the speaker’s conversational move intelligible, we have to supply a context like (17) where the choice of phrasing serves some purpose (here, to make the train of reasoning explicit or something of this sort).

I suggest that this type of reasoning accounts for the infelicity of (16) out of the blue. As Lauer (2013: §9) discusses in detail, if it is not possible for a listener to recover a conversational rationale for an apparent violation of the maxim of Manner, infelicity generally results. (Lauer calls these “Need-a-Reason implicatures”.) As a result, manner implicatures of this type are generally not cancellable: (16) remains pragmatically odd even though it has a semantically coherent interpretation with a Boolean disjunction in the antecedent. In contrast, the additional content in the dialogue in (17) provides sufficient motivation for the unusual conversational move of asserting the Boolean reading of (16). As a result, this move is not bizarre in the dialogue in (17). Note that, if this reasoning succeeds, it explains why puzzle cases for SDA nearly always include repetition of material in the antecedent in the consequent. These are the (or, at least, the most straightforward) cases where the SDA reading is ruled out as semantically anomalous regardless of conversational pragmatics or the content of common ground. In many other cases, both readings are anomalous—the SDA reading as conflicting with common ground, and the Boolean reading as conflicting with general principles of conversational pragmatics.

4 Negated conjunctions in the antecedent

Another argument that has been made in favor of the semantic validity of SDA is that negated conjunctions seem to validate SDA-like inferences. For example, (18) strongly suggests the truth of both (19a) and (19b) (Nute 1980; Starr 2014; Willer 2017).

(18) If Nixon and Agnew had not both resigned, Ford would not have become president.

(19)  
(a. If Nixon had not resigned, Ford would not have become president.

b. If Agnew had not resigned, Ford would not have become president.

However, the reasonableness of these inferences seems to be a special feature of example (18). Indeed, Ciardelli et al. (to appear) have recently shown experimentally that in some scenarios participants accept SDA-like inferences at much lower rates with negated conjunctions than with disjunctions. They asked participants to consider a situation where a light is off iff two switches are either both up or both down. Right now both are up. As we would expect, Ciardelli et al.’s (to appear) participants endorsed (20a) and (20b) at high rates.

(20)  
(a. If Switch A were not up, the light would be off.

b. If Switch B were not up, the light would be off.

They also endorsed (21) at high rates—consistent with an interpretation that licenses SDA—but most participants declined to endorse the classically equivalent (22).
If Switch A or Switch B were not up, the light would be off.

If Switch A and Switch B were not both up, the light would be off.

The fact that (20a), (20b), and (21) were accepted at high rates while (22) was largely rejected suggests that the first three are (on the salient, SDA-supporting interpretation of (21)) in the expected entailment relation. (22) is the odd man out. This is what we would expect if counterfactuals with disjunctive antecedents differ from negated conjunctions in that the former validate SDA on one interpretation, while the latter never validate SDA—as Ciardelli et al. (to appear) argue. The reasonableness of the inference from (18) to (19a) and (19b) seems to be due to our knowledge of the rules of presidential succession, and not to the semantics of counterfactuals with negated conjunctions in the antecedent.

References

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