

## Simplification is not scalar strengthening\*

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**Abstract** We show that Simplification of Disjunctive antecedents is not a scalar inference. The argument exploits information-sensitive modals, like epistemic *probably* and deliberative *ought*. When items of this sort are the main modal of a conditional, we can have that: (a)  $\lceil$ if A or B, MODAL C $\rceil$  is true; (b) the basic meaning computed via classical semantics for conditionals and disjunction is false. This combination is impossible on any scalar account of Simplification: scalar inferences are strengthenings, hence the output of scalar inferences must entail the basic meaning of a sentence. We suggest an account of Simplification based on alternative semantics, and show how this account can be made compatible with old and new counterexamples to Simplification.

**Keywords:** conditionals, simplification of disjunctive antecedents, scalar implicature, free choice, information sensitivity.

### 1 Introduction

Simplification of Disjunctive Antecedent (‘Simplification’ for short) is the inference from a conditional with a disjunctive antecedent to the ‘simplified’ conditionals whose antecedents are the individual disjuncts. A typical example of Simplification is in (1), which involves *would*-conditionals.

- (1) If it rained or snowed, the game would be cancelled.
  - a.  $\rightsquigarrow$  If it rained, the game would be cancelled.
  - b.  $\rightsquigarrow$  If it snowed, the game would be cancelled.

Simplification appears to be a sound inference. But accounts that treats Simplification as semantically valid run into problems. The validity of Simplification is incompatible with two other widely held principles about conditionals. In particular, as I explain in §2, Simplification cannot be a valid inference on a standard possible worlds semantics for conditionals based on comparative closeness, in the style of Stalnaker, Kratzer, and Lewis.

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In the face of this difficulty, the literature has gone in two opposite directions. Some theorists abandon standard intensional semantics in favor of frameworks that exploit more fine-grained notions of meaning (usually, truthmaker or inquisitive semantics). Other theorists preserve standard possible worlds semantics for conditionals, but try to recapture Simplification as a kind of scalar inference. In outline, the idea is to treat Simplification as an optional effect that is triggered by the same mechanisms that generate standard scalar implicatures, like the inference from (2a) to (2b).

- (2) a. Maria ate some of the cookies  
b.  $\rightsquigarrow$  Maria ate some but not all of the cookies.

The goal of this paper is to put forward a conclusive argument against the scalar account. The argument exploits information-sensitive modals, like epistemic *probably* and deliberative *ought*. When items of this sort are the main modal of a conditional, we can have the following combination: (a) a conditional  $\lceil$ if A or B, MODAL C $\rceil$  has a true reading; (b) the basic meaning of the same conditional is false. This combination is simply impossible on any scalar account of Simplification. On any theory of scalar inferences, whether semantic or pragmatic, scalar inferences strengthen the basic meaning of a sentence. But information-sensitive modals show precisely that the Simplification-producing reading is not always a strengthening of the standard possible worlds meaning of a conditional.

The upshot is that Simplification is not a scalar inference, and the only route available for a theory of Simplification is the semantic one.

I proceed as follows. In §2, I set up some background about Simplification and scalar implicature. In §3, I give the argument against scalar theories of Simplification. In §4, I consider how the scalar theorist might resist the argument. In §5, I show how semantic accounts of Simplification can account for one of the data points that appear to favor a scalar account, i.e. the fact that Simplification disappears in a restricted range of cases.

## 2 Background: Simplification and Scalar Implicature

### 2.1 Simplification and possible worlds semantics for conditionals

Simplification of Disjunctive Antecedents is the following inference pattern:

**Simplification of Disjunctive Antecedents**  
If A or B, MOD C  $\models$  If A, MOD C, If B, MOD C

(For discussion of Simplification see, among many, Fine 1975; McKay & Van Inwagen 1977; Alonso-Ovalle 2009; Ciardelli, Zhang & Champollion 2018.) Sim-

plification is validated by virtually all types of conditionals in natural language, independently of the choice of the main modal. For a few examples: sentences (3)–(5) show that Simplification occurs in bare indicatives like (3), counterfactuals like (4), and conditionals whose main modal is a probability adverb like (5).

- (3) If it rained or snowed, the game was cancelled.  
 a.  $\rightsquigarrow$  If it rained, the game was cancelled.  
 b.  $\rightsquigarrow$  If it snowed, the game was cancelled.
- (4) If it had rained or snowed, the temperature would have fallen.  
 a.  $\rightsquigarrow$  If it had rained, the temperature would have fallen.  
 b.  $\rightsquigarrow$  If it had snowed, the temperature would have fallen.
- (5) If it rained or snowed, probably it was windy too.  
 a.  $\rightsquigarrow$  If it rained, probably it was windy too.  
 b.  $\rightsquigarrow$  If it snowed, probably it was windy too.

Unfortunately, Simplification is hard to capture in classical frameworks for the semantics of conditionals (such as the ones developed by [Stalnaker 1968](#), [Lewis 1973](#), [Kratzer 1986, 2012](#)). The reason is that the validity of Simplification is incompatible with two other logical principles that are commonly assumed to hold for at least some central types of conditionals. These principles are:

**Failure of Antecedent Strengthening**  $\text{If } A, \text{ MOD } C \not\models \text{If } A^+, \text{ MOD } C$  (with  $A^+ \models A$ )  
**Substitution**  $\text{If } A, \text{ MOD } C \models \text{If } A', \text{ MOD } C$  (with  $A \models A'$ )

Let me quickly review the arguments in support these principles.

Substitution says that clauses that are logically equivalent are substitutable in the antecedents of conditionals. This property is vindicated by any semantics that is intensional, i.e. any semantics that treats clauses that are true and false in the same set of worlds as equivalent.

Failure of Antecedent Strengthening says that the inference from a conditional  $\lceil \text{If } A, \text{ MOD } C \rceil$  to a conditional with a stronger antecedent  $\lceil \text{If } A^+, \text{ MOD } C \rceil$  is invalid. The observation that Antecedent Strengthening fails is at the basis of modern literature about conditionals (and in particular, counterfactuals). The data produced in its support typically involve Sobel sequences, i.e. sequences of conditionals like (6):

- (6) a. If it rained, the game would still happen.  
 b. If it rained and the stadium exploded, the game would be called off.

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The two conditionals in (6) appear to be consistent. Yet, if Antecedent Strengthening was valid, (6a) should entail *If it rained and the stadium exploded, the game would still happen*, which is incompatible with (6b).<sup>1</sup> Hence Antecedent Strengthening appears to be invalid for *would*-conditionals like those in (6).<sup>2</sup>

Possible worlds semantics for conditionals aim just at capturing the failure of antecedent strengthening in an intensional setting. It's useful to give a concrete example of a semantics for conditionals in this mold. The basic idea is that a conditional  $\lceil \text{If } A, \text{ MOD } C \rceil$  quantifies over the closest  $A$ -verifying worlds to the actual world, and asserts that all those worlds are  $C$ -verifying worlds.

Formally, the semantics appeals to a relation of comparative closeness between worlds, symbolized as ' $\preceq_w$ '.  $\preceq_w$  compares worlds with respect to their closeness to a benchmark world  $w$ :  $w' \preceq_w w''$  says that  $w'$  is closer to  $w$  than  $w''$ . The basic function of  $\preceq_w$  is singling out a set of worlds that verify the antecedent and that at the same time are 'maximal', i.e. are such that no other world is more similar to  $w$  than they are. Conditionals quantify over the maximal set of worlds so individuated. Using, as is standard, ' $\llbracket$ ' and ' $\rrbracket$ ' for the interpretation function, here are schematic truth conditions:<sup>3</sup>

- (7)  $\llbracket \text{If } A, \text{ MOD } C \rrbracket^{\preceq, w} = \text{true}$  iff  
 for all  $w' \in \max_{\preceq_w}(\{w': \llbracket A \rrbracket^{\preceq, w'} = \text{true}\})$ ,  $\llbracket C \rrbracket^{\preceq, w'} = \text{true}$   
 (where  $\max_{\preceq_w}(\{w': \llbracket A \rrbracket^{\preceq, w'} = \text{true}\})$  is the set of closest  $A$ -worlds)

Semantics like those in (7) can be taken as a template for the semantics of a variety of conditional sentences. Following the basic line of thought in [Kratzer 1986](#), we can predict the difference between conditionals of different flavors by assuming that context supplies different relations of comparative closeness.

Now, the semantics in (7) validates Failure of Antecedent Strengthening and Substitution. The former is validated because different antecedents may quantify over different sets of closest worlds. In particular, if the closest  $A$ -worlds do not include  $A \wedge B$ -worlds, we can have that  $\lceil \text{If } A, \text{ MOD } C \rceil$  is true while  $\lceil \text{If } A \wedge B, \text{ MOD } C \rceil$  is false. The latter is validated because the semantics is intensional, and

1 At least, assuming the principle of Conditional Non-Contradiction: if  $A$  is possible,  $\text{If } A, \text{ MOD } C \wedge \text{If } A, \text{ MOD } \neg C \vDash \perp$ .

2 A number of recent theories of counterfactuals adopt a strict conditional semantics, which does vindicate Antecedent Strengthening, and relocate the explanation for the nonmonotonicity observed in (6) in discourse dynamics. See [von Stechow 2001](#); [Gillies 2007](#) for discussion. For current purposes, these accounts are still problematic. Since they do recognize a level of meaning at which Antecedent Strengthening fails, they do not explain why the inference from a counterfactual with a disjunctive antecedent to a 'simplified' counterfactual appears valid.

3 This is an approximation to both of Stalnaker and Lewis's accounts. For Stalnaker, the ordering singles out, for each world  $w$ , a unique world  $w'$  that is closest to it. Lewis rejects the so-called limit assumption, i.e. the assumption that there is a  $\preceq_w$ -maximal set of antecedent worlds.

hence clauses that denote the same possible worlds propositions are semantically equivalent.

Unfortunately, as I mentioned, Simplification is incompatible with the joint validity of Failure of Antecedent Strengthening and Substitution.<sup>4</sup> So the semantics in (7), as well as any variant of it that is used in the literature, fails to validate Simplification.

The attempts at addressing the problem are divided into two camps. One camp (see, among others, [Fine 2012](#), [Santorio 2018](#), [Ciardelli et al. 2018](#)) opts for a non-classical semantics and denies Substitution. Accounts in this camp generally exploit a more fine-grained notion of meaning than classical truth conditions, like those provided by truthmaker semantics and inquisitive semantics. The second camp preserves a classical semantics for conditionals, including Failure of Antecedent Strengthening and Substitution. Accounts in this camp (see, among others, [Klinedinst 2009](#), [Franke 2011](#), [Bar-Lev & Fox 2017, 2020](#)) try to explain data like (3)–(5) as produced via a scalar inference.

Scalar accounts are the target of the next sections of the paper. It is useful to show how they work; I turn to this in the next paragraphs.

## 2.2 Scalar implicature

A typical example of a scalar implicature is in (8).

- (8) Mary talked to Alma or Bella.  
 $\rightsquigarrow$  *Mary talked to exactly one of Alma and Bella*

The inference in (8) is due to a mechanism of meaning enrichment, which goes beyond the basic meaning of a sentence. It is controversial whether this mechanism is semantic or pragmatic in nature.<sup>5</sup> Luckily, for current purposes the choice between pragmatic and semantic accounts of implicature is unimportant. The argument I present in this paper applies to both families of account. At the same time, it's useful to put on the table a concrete account of implicature: I choose to illustrate a semantic account, and in particular the account recently proposed by [Bar-Lev & Fox 2017, 2020](#).

<sup>4</sup> In particular: Simplification and Substitution jointly entail Antecedent Strengthening. A condensed version of the proof:

$$\text{If } A, \text{ MOD } C \models \text{If } ((A \wedge B) \vee (A \wedge \neg B)), \text{ MOD } C \models \text{If } A \wedge B, \text{ MOD } C$$

<sup>5</sup> For some references on pragmatic and semantic accounts of scalar implicature, see, besides [Grice 1975](#), [Sauerland 2004](#), [Fox 2007](#), [Chierchia, Fox & Spector 2008](#).

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According to semantic accounts, scalar implicatures are produced by the presence of a covert exhaustivity operator, usually referred to as ‘EXH’.

(9) EXH[Mary talked to Alma or Bella]

On a par with mechanisms like focus, EXH operates on alternatives to a sentence, which are characterized as syntactic objects that can be obtained from the sentence itself by performing a series of replacements and, possibly, deletions.<sup>6</sup>

On classical semantic accounts, EXH strengthens the basic meaning of a sentence by conjoining with it the negation of a set of alternatives that are *innocently excludable* (IE). The resulting meaning for EXH is in (10).

(10)  $\llbracket \text{EXH}[\phi][\text{Alt}_\phi] \rrbracket = \llbracket \phi \rrbracket \wedge \forall p : p \in \text{IE}(\text{Alt}_\phi) \llbracket \neg p \rrbracket$

The characterization of innocent exclusion is somewhat technical, but the basic idea is simple. Roughly, an alternative to a sentence  $S$  is innocently excludable iff (a) it is consistent with  $S$  and (b) its negation does not entail another alternative in the set. For an example, consider again (8). Its alternatives are in (11), and the strengthened (‘exhaustified’) meaning is in (12).

(11) 
$$\left\{ \begin{array}{ll} \text{Mary talked to A or B} & (A \vee B) \\ \text{Mary talked to A} & A \\ \text{Mary talked to B} & B \\ \text{Mary talked to A and B} & (A \wedge B) \end{array} \right\}$$

(12)  $\llbracket \text{EXH}[A \text{ or } B] \rrbracket = \llbracket A \text{ or } B \rrbracket \wedge \neg \llbracket A \text{ and } B \rrbracket$

*Mary talked to Alma and Bella* is the only innocently excludable alternative in (11). Hence the strengthened meaning of (8) is given by the basic meaning of the sentence, plus the negation of this alternative. This yields exactly the strengthened meaning we observe.

### 2.3 Bar-Lev and Fox’s Innocent Inclusion algorithm

The Innocent Exclusion (IE) algorithm captures a wide array of scalar effects, but falls short of an account of some other effects, like so-called free choice readings of disjunction and Simplification itself.<sup>7</sup> To capture these effects, Bar-Lev and Fox propose to supplement the IE algorithm with a second algorithm, which they dub ‘Innocent Inclusion’ (II).

<sup>6</sup> For discussion about alternatives, see a.o. [Katzir 2007](#) and [Fox & Katzir 2011](#). Notice that how alternatives should be characterized is an orthogonal question to how the mechanism for computing implicatures functions.

<sup>7</sup> The classical reference for free choice is [Kamp 1973](#). For recent discussion see, among many others, [Fox 2007](#), [Chierchia et al. 2008](#), [Chierchia 2013](#).

On Bar-Lev and Fox's proposal, EXH doesn't only operate on innocently excludable alternatives. In addition, it conjoins with it some other alternatives (without negation), i.e. the ones that are *Innocently Includable*. Innocently Includable (II) alternatives are the alternatives that are in all maximal subsets of alternatives that can be conjoined consistently with the prejacent and with the negation of IE alternatives. Simplifying somewhat, you can think of Innocently Includable alternatives as the ones that are considered by the IE algorithm, are not excluded, and that can be conjoined with the prejacent of EXH without generating contradictions with the result of Innocent Exclusion.

Below is the new meaning of the exhaustivity operator. Notice that it is strictly stronger than the previous one.

$$(13) \quad \llbracket \text{EXH}[\phi][\text{Alt}_\phi] \rrbracket = \llbracket \phi \rrbracket \wedge \forall p : p \in \text{IE}(\text{Alt}_\phi) \llbracket \neg p \rrbracket \wedge \forall q : q \in \text{II}(\text{Alt}_\phi) \llbracket q \rrbracket$$

How does this affect the predictions of the theory? The predictions for simple examples like (8) are unchanged. In that case, the alternatives that are not IE turn out not to be II. (Since *Mary talked to Alma* and *Mary talked to Bella* are, together, inconsistent with the negation of *Mary talked to Alma and Bella*.) But the new algorithm produces differences in other cases. Conditionals with disjunctive antecedents are exactly a case in point.

For illustration, consider:

$$(14) \quad \text{If Mary talked to Alma or Bella, she would talk to Claudia too.}$$

The alternatives to (14) are:

$$(15) \quad \left\{ \begin{array}{ll} \text{If Mary talked to A or B, she would talk to C} & (A \vee B) > C \\ \text{If Mary talked to A, she would talk to C} & A > C \\ \text{If Mary talked to B, she would talk to C} & B > C \\ \text{If Mary talked to A and B, she would talk to C} & (A \wedge B) > C \end{array} \right\}$$

In this case, we get the following results. (a)  $(A \wedge B) > C$  is innocently excludable, and hence its negation is conjoined with the basic meaning of (14).<sup>8</sup> (b)  $A > C$  and  $B > C$  are innocently includable. Hence they are also conjoined with the basic meaning of (14). As a result, we get that the strengthened meaning of (14) is:

$$(16) \quad \llbracket \text{EXH}[\text{If Mary talked to Alma or Bella, she would talk to Claudia too}] \rrbracket = \llbracket (A \vee B) > C \rrbracket \wedge \neg \llbracket (A \wedge B) > C \rrbracket \wedge \llbracket A > C \rrbracket \wedge \llbracket B > C \rrbracket$$

Hence the theory predicts that (14) entails, on its strengthened meaning:

- $$(17) \quad \begin{array}{l} \text{a. If Mary talked to Alma, she would talk to Claudia too.} \\ \text{b. If Mary talked to Bella, she would talk to Claudia too.} \end{array}$$

As a result, Bar-Lev and Fox's account predicts Simplification as a scalar inference.

<sup>8</sup> This prediction is controversial, though this is irrelevant for current purposes.

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## 2.4 In favor of the scalar theory: Simplification is optional

One important argument in support of the scalar theory is that Simplification is an optional effect. This was initially pointed out by McKay & Van Inwagen 1977, who present the well-known example in (18). If Simplification was semantically valid, (18) would entail (18a), which feels contradictory. Yet (18) is a perfectly consistent sentence, and there is no intuition that it entails (18a).<sup>9</sup>

- (18) If Spain had fought with the Axis or the Allies, it would have fought with the Axis. (McKay and VanInwagen 1977)
- a.  $\not\rightarrow$  If Spain had fought with the Allies, it would have fought with the Axis.

A theory that treats Simplification as an optional effect is well-placed to explain why (18) is judged consistent. The scalar theorist will suggest that the scalar inference is not processed in this case, since it would lead to a contradiction, and the meaning we hear for (18) is the basic meaning, which does not entail (18a)

In summary, there seem to be two main arguments in support of the scalar theory. (a) It manages to predict Simplification while holding on to a standard, intensional possible worlds semantics for conditionals; (b) it correctly predicts the optionality of Simplification. In the next sections, I suggest that, despite these advantages, the scalar theory should be abandoned.

## 3 Against the scalar theory

In this section, I present the argument against the scalar account of Simplification. The argument relies on particular examples, but it's useful to start laying out the general strategy.

### 3.1 Basic form of the argument

Let us use  $\llbracket A \rrbracket_c$  to denote the basic meaning (i.e., the meaning before scalar strengthening) of a sentence  $A$  at  $c$ . Let us also use  $\llbracket A \rrbracket_c^+$  be the meaning resulting from applying scalar strengthening to  $A$  at  $c$ . (As I stressed in §2, for current purposes it doesn't matter whether scalar phenomena operate via semantic or pragmatic mechanisms.) Now, every standard account of scalar phenomena satisfies the following principle.

<b>Persistence.</b> For all $c$ , $\llbracket A \rrbracket_c^+ \models \llbracket A \rrbracket_c$
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<sup>9</sup> See also Lassiter 2018 for similar arguments concerning *probably*-conditionals.

Persistence says that the augmented meaning that results from computing the scalar effects of a clause A entails the basic meaning of A. In other words, Persistence says that scalar phenomena produce a (possibly trivial) *strengthening* of a sentence.

Persistence seems so obvious that it's hardly worth pointing out. It is also supported by empirical and conceptual considerations. On the empirical side: standard examples of scalar implicature satisfy it. For a couple of simple illustrations, consider (19) and (20).

- (19)  $\llbracket \text{Sarah talked to some students} \rrbracket^+ =$   
Sarah talked to some but not all students  $\models$  Sarah talked to some or all students
- (20)  $\llbracket \text{Jeff failed syntax or logic} \rrbracket^+ =$   
Jeff failed exactly one of syntax or logic  $\models$  Jeff failed syntax or logic or both

On the conceptual side: all theories of scalar phenomena descend from Grice's pioneering work on pragmatics (Grice 1975). Grice characterizes scalar phenomena as pragmatic inferences that increase the information conveyed by an utterance, driven by the Maxim of Quantity. Of course, a number of accounts of scalar effects are nongricean in several ways. But they retain the basic insight that scalar effects aim at optimizing the information conveyed by assertions.

Persistence concerns all sentences in the language, independently of their form. For current purposes, it's worth emphasizing a special consequence of Persistence, which concerns conditionals.

**Conditional Persistence (CP).**

For all  $c$ ,  $\llbracket \text{If } A \text{ or } B, \text{ MOD } C \rrbracket_c^+ \models \llbracket \text{If } A \text{ or } B, \text{ MOD } C \rrbracket_c$

Conditional Persistence plays a key role in the argument against the scalar theory. The argument goes as follows:

- (P1) If Simplification is a scalar effect, then (via Conditional Persistence), for all conditionals  $\lceil \text{If } A \text{ or } B, \text{ MOD } C \rceil$  and for all contexts  $c$ , the simplified meaning of  $\lceil \text{If } A \text{ or } B, \text{ MOD } C \rceil$  in  $c$  entails  $\llbracket \text{If } A \text{ or } B, \text{ MOD } C \rrbracket_c$ .
- (P2) For some conditionals  $\lceil \text{If } A \text{ or } B, \text{ MOD } C \rceil$  and for some contexts  $c$ , the simplified meaning of  $\lceil \text{If } A \text{ or } B, \text{ MOD } C \rceil$  in  $c$  doesn't entail  $\llbracket \text{If } A \text{ or } B, \text{ MOD } C \rrbracket_c$ .
- (C) Simplification is not a scalar effect.

(P1) merely states that, if Simplification is a scalar phenomenon, Conditional Persistence applies to it (and hence the simplified meaning of a conditional entails the basic meaning). Moreover, (C) obviously follows from the premises. So the controversial element in the argument is (P2), i.e. the claim that, for some conditionals and some

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contexts, the simplified meaning of the conditional does not entail its basic meaning. The rest of this section is devoted to establishing (P2).

### 3.2 Counterexamples to Conditional Persistence

To establish (P2), we need a conditional  $\lceil$ If A or B, MOD C $\rceil$  and a context  $c$  such that:

- (a) the simplified meaning of  $\lceil$ If A or B, MOD C $\rceil$  in  $c$  is true;
- (b) the basic meaning of  $\lceil$ If A or B, MOD C $\rceil$  in  $c$  is false.

Below are two such cases. As the reader will see, these cases crucially build on the literature on information-sensitive modals, including epistemic adjectives like *likely*, comparative probability operators like *it is more than 50% likely that*, and deliberative *ought*. I briefly talk below about how these data interact with the data already in the literature.

**Example #1: *probably* conditionals** Consider (21) and (22), as uttered in the scenario below:

Alice threw a six-sided die. Before her throw, Bob bet that the outcome would be a 3 or a 4. We don't know the outcome, but we hear two reports. Mary says that the die landed on 2, 3, or 4; Sue says that it landed on 3, 4, or 5. We have no idea whether the reports are accurate.

- (21) If Mary's report is accurate or Sue's report is accurate, probably Bob won.
- (22) If Mary's report is accurate or Sue's report is accurate, it is more than 50% likely that Bob won.

Here is a first data point: (21) and (22) have a true reading in the scenario. (This reading also appears to be the most prominent reading, though I don't need this claim to run the argument.) This is just the Simplification reading, on which (21) and (22) are heard as equivalent to (or at least, entail) the conjunction of the two simplified conditionals in, respectively, (23) and (24).

- (23) a. If Mary's report is accurate, probably Bob won.  
b. If Sue's report is accurate, probably Bob won.
- (24) a. If Mary's report is accurate, it is more than 50% likely that Bob won.  
b. If Sue's report is accurate, it is more than 50% likely that Bob won.

What about the basic meanings of (21) and (22)? It is impossible to probe directly intuitions about the basic meaning of (21) and (22). Aside from special cases like (18), we cannot reliably access intuitions about the basic meaning of conditionals with disjunctive antecedents, since we invariably hear the Simplification reading. But we can use conditionals with antecedents that are equivalent to the basic meaning of the antecedent of (21) and (22), and that don't involve disjunction.<sup>10</sup> The following two conditionals have antecedents that are contextually equivalent to those of (21) and (22):

- (25) If the die landed on a number between 2 and 5, probably Bob won.
- (26) If the die landed on a number between 2 and 5, it is more than 50% likely that Bob won.

The second data point is that (25) and (26) are clearly false. There appears to be no reading on which they are true. Hence (on the assumption that the truth conditions of (25) and (26) are the same as the truth conditions of the basic readings of (21) and (22)) we have, in the context above:

- (a) the simplified reading of (21) and (22) is true;
- (b) the basic reading of (21) and (22) is false.

Hence (P2) is true. Some conditionals can be true on their simplified reading, and false on their basic, nonsimplified reading. *Probably*-conditionals and the like are a case in point.

**Example #2: deliberative *ought*-conditionals** Consider now:

Alice threw a six-sided die. You are offered a bet on even or on odd (you pick which one). The bet pays \$50 if you win, and costs \$75 if you lose. You hear two reports. Mary says that the die landed on 2 or 4; Sue says that it landed on 3 or 5. We have no idea whether the reports are accurate.

- (27) If Mary's report is accurate or Sue's report is accurate, you ought to bet.

Also in this scenario, (27) has a true reading, which entails the two simplified conditionals in (28).

- (28) a. If Mary's report is accurate, you ought to bet.
- b. If Sue's report is accurate, you ought to bet.

<sup>10</sup> These conditionals also have to not include existential quantification, since Simplification also applies to the latter. For relevant data, see e.g. van Rooij 2006.

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As before, we cannot probe directly intuitions about the non-simplified reading of (27), but we can consider a sentence that is equivalent to it, given the context. (29) plays such a role, and it is false.

(29) If the die landed on a number between 2 and 5, you ought to bet.

So we have, in summary:

(a) the simplified reading of (27) is true;

(b) the basic reading of (27) is false.

Hence, again, the simplified reading of (27) cannot be the result of a scalar inference.

Before moving on, let me make a comment about the judgments that I have been appealing to. My examples employ so-called information-sensitive modals, i.e. modals whose modal base involves reference to subjects' information. These modals have been the target of much recent debate. In particular, a number of writers have claimed that these modals display a new kind of information-sensitivity—sometimes called 'serious information dependence'—which is incompatible with a classical Kratzer-style semantics for modals (see, among many, Kolodny & MacFarlane 2010, Yalcin 2010, Cariani, Kaufmann & Kaufmann 2013, Charlow 2013, Carr 2015).<sup>11</sup> The judgments that I am invoking are not neutral with respect to this debate. As I notice below, my argument exploits exactly the judgments that establish that *probably* and *ought* are seriously information dependent. I take it that, at this stage in the debate, these judgments have become established in the literature.<sup>12</sup>

### 3.3 Why complex conditionals?

The examples of the previous section show that, for some conditionals of the form  $\lceil \text{If } A \text{ or } B, \text{ MOD } C \rceil$ , the simplified meaning doesn't entail the basic meaning. But, for any sentence  $S$ , the scalar strengthening of  $S$  entails the basic meaning of  $S$ . So Simplification cannot be the result of scalar strengthening.

If this is correct, one may wonder why we need conditionals with modals like *probably* and deliberative *ought* to make the point. Why can't we see the problem by looking at simpler sentences, like bare epistemic conditionals and counterfactuals?

<sup>11</sup> In particular, classical semantics for *probably* and *ought* vindicate the inference:

$$\text{if } p, \text{ probably/ought } q \models \text{if } p^+, \text{ probably/ought } q \text{ (with } p^+ \text{ stronger than } q)$$

Semantics that implement serious information dependence invalidate this inference.

<sup>12</sup> This seems clear at least for probability operators. For a defense of the classical theory of deliberative *ought*, see von Fintel 2012.

The answer is that there is a confound. Bare epistemic conditionals and counterfactuals, in virtue of the semantics of their main modals, satisfy the following principle:<sup>13</sup>

**Or** If A, MOD C, If B, MOD C  $\models$  If A or B, MOD C

Or is validated by any semantics for conditionals that is based on a notion of comparative closeness. Intuitively, the reason is the following. Suppose that both the closest A-worlds are C-worlds and the closest B-worlds are C-worlds. Now, the closest  $A \vee B$ -worlds have to be a (possibly trivial) subset of the set including the closest A-worlds and the closest B-worlds. But all the worlds in the latter set are C-worlds, hence the closest  $A \vee B$ -worlds are also C-worlds.

With Or in place, it's clear why we cannot see the failure of entailment from simplified to basic readings. The simplified reading of  $\ulcorner$ If A or B, MOD C $\urcorner$  entails  $\ulcorner$ If A, MOD C $\urcorner$  and  $\ulcorner$ If B, MOD C $\urcorner$ . The latter two, via Or, entail the basic meaning of  $\ulcorner$ If A or B, MOD C $\urcorner$ . So, for conditionals that vindicate Or, we have an independent route to securing the entailment from simplified to basic readings. But bare conditionals and counterfactuals do vindicate Or. Hence we cannot see the failure of the simplified-to-basic entailment using these conditionals.

Conversely, Or fails just for conditionals whose main modal is seriously information dependent. It may be that *If A, probably C* and *If B, probably C* are true, yet *If A or B, probably C* is false. Similarly for deliberative *ought*. Hence in these cases the confound generated by Or disappears, and we are able to appreciate the failure of entailment from simplified to basic readings.

#### 4 Resistance strategies

Can the scalar theorist resist the conclusion? The argument is very simple. Assuming that §3 has established (P2), the only option for the scalar theorist is to deny the first premise.

(P1) If Simplification is scalar strengthening, then (via Conditional Persistence) the simplified meaning of  $\ulcorner$ If A or B, MOD C $\urcorner$  entails its basic meaning.

This amounts to deny that, by applying scalar mechanisms to a sentence, we invariably strengthen it. In term of Bar-Lev and Fox's theory, this amounts to denying that  $\text{EXH}[\phi]$  entails its prejacent. (The new entry for EXH is in (30).)

$$(30) \quad \llbracket \text{EXH}[\phi] \llbracket \text{Alt}_\phi \rrbracket \rrbracket = \llbracket \phi \rrbracket \wedge \forall p : p \in \text{IE}(\text{Alt}_\phi) \llbracket \neg p \rrbracket \wedge \forall q : q \in \text{II}(\text{Alt}_\phi) \llbracket q \rrbracket$$

<sup>13</sup> I borrow the label 'Or' from Kraus, Lehmann & Magidor 1990. I should note that some semantics for counterfactuals invalidate Or: some examples include the semantics in Ciardelli et al. 2018 and the one in Santorio 2019.

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This proposal, in a way, grants my main claim in the paper: Simplification is not scalar *strengthening*, because scalar inferences in general are not strengthening inferences. But it still preserve the general idea that Simplification is a kind of scalar inference.

I don't have the space here to evaluate this proposal in full. But I want to raise two worries about it, one theoretical and one empirical.

The theoretical worry is that granting that EXH[ $\phi$ ] does not entail  $\phi$  changes our understanding of scalar phenomena. Both pragmatic and semantic accounts of implicature originate from a broadly Gricean idea: scalar phenomena are driven by the goal of optimizing the amount of information conveyed by an assertion. In particular, scalar inference extract extra information from an assertion, via the manipulation of appropriate alternatives. This picture must be dropped if we allow that EXH[ $\phi$ ] may not entail  $\phi$ . But then how should we think of scalar inferences?<sup>14</sup>

The empirical worry is that, if it can be that EXH[ $\phi$ ] does not entail  $\phi$ , we should see this failure in a variety of environments. For example, (31a) should have the reading specified in (31b):

- (31) a. Mary talked to Alma or Bella.  
b.  $\llbracket$ EXH[Mary talked to Alma or Bella] $\rrbracket$  = true iff Mary didn't talk to both  
(and possibly talked to *neither*)

This, of course, is not attested. The only cases where this failure appears to happen are conditionals with information-dependent modals. Unless further evidence is found, it seems preferable to preserve a traditional account of scalar inferences, and put Simplification in a different theoretical basket.

In sum, the only way for the scalar theorist to resist the data seems to be to deny that exhaustified clauses invariably need to entail their prejacent. This is both theoretically and empirically costly. On the theoretical side, it appears to undermine the standard picture of scalar phenomena as a mechanism for optimizing the information conveyed by a sentence. On the empirical side, it commits the scalar theorist to the possibility of readings on which EXH[ $\phi$ ] does not entail  $\phi$ , for any sentence  $\phi$ . Both problems seem daunting. At the very least, they suggest that much more work is needed before a scalar theory of Simplification is viable.

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<sup>14</sup> Bar-Lev & Fox 2020 suggest an alternative picture: scalar phenomenon involve considering a set of alternatives to the sentence uttered and deciding, as much as possible, which one are true and which ones are false. In this picture, the prejacent might just be 'pruned away' from the set via consideration of relevance/context dependence. This may be the beginning of an alternative picture. But more should be said about what constrains the selection of alternatives. If the prejacent is not among the alternatives considered by EXH, one may worry that a theory of what EXH[ $\phi$ ] says is ultimately entirely determined via considerations of relevance and context dependence. Thanks to Danny Fox (p.c.) for clarifications here.

## 5 Making Simplification optional in a semantic setting

The argument in §3 establishes that the only viable option for predicting Simplification goes via a semantic route. As I mentioned in §2, there are a number of proposals in this vein; I will not rehearse the details here. But these proposals face the challenge of recapturing some of the data motivating the scalar account. In particular, remember that Simplification appears to be optional, as shown by (18).

- (18) If Spain had fought with the Axis or the Allies, it would have fought with the Axis. (McKay and VanInwagen 1977)  
 ↯ If Spain had fought with the Allies, it would have fought with the Axis.

In the last section, I show how semantic accounts of Simplification can predict these data. Importantly, the suggestion is neutral between different accounts, and can be combined with truthmaker semantics as well as inquisitive semantics. The material in this section builds on §6 of Santorio 2018, though there are some minor differences.

The key idea is that Simplification is linked to distributivity. In particular, the existence of simplified and non-simplified readings in conditionals mirrors the existence of (respectively) distributive and collective readings in the nominal domains. In both cases, the existence of the two readings can be predicted by postulating the presence or absence of a covert distributivity operator.<sup>15</sup> In turn, this account builds on analogy between the semantics of conditionals and the semantics of plural descriptions.<sup>16</sup> I start by reviewing distributivity for plural descriptions, and then discuss the application to conditionals.

### 5.1 Plural descriptions

Most theories of plurals take plural expressions to denote pluralities (or ‘plural individuals’). For current purposes, I take pluralities to be sets of atomic individuals.<sup>17</sup> Hence plural terms denote sets of individuals: e.g., *Alice and Bob* denotes the set

15 Similar operators are postulated in inquisitive semantics; in particular, the operator that ‘flattens’ inquisitive alternatives can be seen as an anti-distributivity operator.

16 The analogy between descriptions and conditionals is not new: see, among others, von Stechow 1997, Bittner 2001, Schein 2003, Schlenker 2004. But on these accounts conditionals work like plural descriptions of *worlds*, while on the view that I’m envisaging here conditionals are plural descriptions of *propositions*.

17 Pluralities are sometimes understood as sets, and sometimes as mereological sums of individuals. The *locus classicus* for the introduction of the sum approach is Link 2002; see also Landman 1989. Set-type approaches are presented by Hoeksema 1983 and Schwarzschild 1996, among others (though Schwarzschild uses a kind of nonstandard set theory). The sum approach seems dominant nowadays; I use the set approach for ease of exposition. For some useful overviews about the semantics of plurals, see Winter & Scha 2015, Nouwen 2016.

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$\{a, b\}$  containing the atomic individuals Alice and Bob. Plural predicates denote sets of sets: e.g., *boys* denotes the set of all sets of boys (equivalently, the powerset of the denotation of the singular *boy*).

Plural descriptions are treated as referring to the largest plurality<sup>18</sup> of individuals that satisfies the predicate appearing in the description:

$\llbracket \text{The } \phi \rrbracket = \text{the (plural) individual } i \text{ s.t. } i \text{ is the unique maximal individual of which } \phi(i) \text{ is true.}$

Hence, if Alph, Bob, and Chad are all and only the boys within the domain of quantification, we have:

$$(32) \quad \llbracket \text{The boys} \rrbracket = \{a, b, c\}$$

Plural descriptions admit of both distributive and collective readings. These are illustrated by, respectively, (33) and (34):

$$(33) \quad \begin{array}{l} \text{The boys carried a backpack} \\ \approx \text{For each of the boys, he carried a backpack} \end{array}$$

$$(34) \quad \begin{array}{l} \text{The boys carried a piano together} \\ \approx \text{All of the boys jointly carried a piano} \end{array}$$

Compositionally, it is usually assumed that the distributive reading involves an optional distributivity operator, DIST, that is adjoined to the predicate. Roughly, the distributivity operator takes as argument a property and a plurality of individuals, and says that the property is true of each individual that is a part of the plurality. Schematically:

$$(35) \quad \llbracket \llbracket \text{The } F\text{s} \rrbracket \text{ DIST} \llbracket G\text{s} \rrbracket \rrbracket = \\ \text{true iff } \forall x: x \text{ is atomic and } \llbracket F\text{s} \rrbracket(x) = 1, \llbracket G\text{s} \rrbracket(x) = 1$$

Let me now explain how a formally analogous idea can be implemented for conditionals.

## 5.2 Conditionals and distributivity

As a starting point, I assume that *if*-clauses denote not a single proposition, but rather a set of propositions. There are a number of proposals with this result, exploiting alternative semantics (Alonso-Ovalle 2009), truthmaker semantics of various stripes (Fine 2012, Santorio 2018), and inquisitive semantics (Ciardelli et al. 2018). All that I say here is neutral between these accounts.

<sup>18</sup> More precisely, they are treated as referring to the maximal plurality of individuals satisfying the predicate. ‘maximal’ may be understood as ‘largest’ (see Sharvy 1980, Link 2002) or as ‘most informative’ (see von Stechow, Fox & Iatridou 2014). This difference is irrelevant for my purposes.

I assume the existence of an optional distributivity operator  $\text{DIST}_\pi$ . This operator is analogous to  $\text{DIST}$ , but it operates over propositions.  $\text{DIST}_\pi$  takes as arguments a function from propositions to truth values (i.e. the denotation of the consequent of a conditional) and a set of propositions, and says that the function maps each proposition in the set to true. Schematically:

$$(36) \quad \llbracket [\text{If } A] \text{ DIST}_\pi[C] \rrbracket = \text{true iff } \forall p: p \in \llbracket \text{if } A \rrbracket, \llbracket C \rrbracket(p) = \text{true}$$

$\text{DIST}_\pi$  is what generates Simplification. For an example of how this works, consider again (1) and suppose we parse it as involving a distributivity operator, as in (37):

$$(37) \quad \llbracket \text{If it rained or snowed} \rrbracket \text{ DIST}_\pi \llbracket \text{would [the game be cancelled]} \rrbracket$$

The *if*-clause denotes the set of propositions  $\{\text{rain}, \text{snow}\}$ . The distributivity operator makes it the case that these propositions are combined pointwise with the consequent of the conditional. The resulting truth conditions are:

$$(38) \quad \forall p \in \{\text{rain}, \text{snow}\} \forall w' \in \max_{\leq w}(p), \text{ the game is cancelled in } w'$$

In words, (37) says that, for all propositions  $p$  in the set  $\{\text{rain}, \text{snow}\}$ , the closest  $p$ -worlds to the world of evaluation are worlds where the game is cancelled.

Hence Simplification readings are the conditional analog of distributive readings of plural descriptions. Conversely, readings of conditionals where Simplification is absent are the analog of collective readings. I assume that, in these cases,  $\text{DIST}_\pi$  is absent. So a sentence like (18) is parsed as follows, schematically:

$$(39) \quad \llbracket \text{If Axis or Allies} \rrbracket \llbracket \text{would [fight with the Axis]} \rrbracket$$

Given the lack of distributivity operator, the set of propositions denoted by the antecedent is fed directly as an argument to the main modal. In turn, the modal takes the disjunctive closure of the propositions in the set. (See below for the lexical entry.) As a result, for (18) we obtain exactly the same truth conditions as on classical accounts.

$$(40) \quad \forall w' \in \max_{\leq w}(\llbracket \text{Axis or Allies} \rrbracket), \text{ Spain fights with the Axis in } w'$$

Let me make some formal details explicit. The distributivity operator  $\text{DIST}_\pi$  takes as argument a set of propositions and quantifies over singletons of propositions within that set. (The quantification is over singletons rather than over the propositions themselves for type-theoretic reasons—this way, the input argument to the modal is of the same type whether  $\text{DIST}_\pi$  is present or not.) This is the lexical entry (I use ‘P’ as a type for sets of propositions):<sup>19</sup>

$$(41) \quad \llbracket \text{DIST}_\pi \rrbracket^{\leq, w} = \lambda \Phi_{\langle st, t \rangle}. \lambda S_P. \forall p \in S, \Phi(\{p\}) = 1$$

<sup>19</sup> As pointed out in Santorio 2018, we might want to build a homogeneity presupposition in the meaning of the distributivity operator. I skip this step for simplicity here.

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The entry for modals are standard, aside from one detail. Modals take as argument a set of propositions, and extract a unique proposition from the set by taking the disjunctive closure of all its members. Below is a sample entry for *would*; other modals work analogously.

$$(42) \quad \llbracket \text{would} \rrbracket^{\leq, w} = \lambda S_p. \lambda p. \forall w' \in \max_{\leq, w}(\bigvee S) = 1, p(w') = 1$$

When  $\text{DIST}_{\pi}$  is present, the disjunctive closure operation has no effect, since the argument of modals is a singleton. When  $\text{DIST}_{\pi}$  is absent, the disjunctive closure operation returns the disjunction of the propositions in the set denoted by the *if*-clause.

### 5.3 Evaluation

This account presented in this section manages to predict the optionality of Simplification in a semantic setting. Moreover, it does so by appealing to a tool that is already present in the literature, namely a distributivity operator analogous to the one used in semantics for plurals. One question remains unaddressed though. An account that ties Simplification to the presence or the absence of an optional operator seems to predict that the simplified and the non-simplified reading should be both available for all conditionals. But, as pointed out in §2, this is not quite correct. The Simplification reading is a strong default, and Simplification-free readings are only easily available when the Simplification reading would give rise to a contradictory, or at least a very odd entailment (as in (18)). One reason why the Simplification reading might be preferable is that, as we have seen, in standard cases it is strictly stronger, and hence more informative, than the non-Simplification reading. Yet (a) as this very paper has emphasized, this doesn't cover all cases, and (b) a preference for stronger readings doesn't seem enough to explain why Simplification is such a strong default. So something more should be said. I must leave this issue to further work.

## 6 Conclusion

This paper has shown that Simplification is not a scalar inference. Scalar inferences are strengthenings: the proposition that result from performing scalar inferences on A entails the basic meaning of A. But, in some cases, Simplification does not result in a strengthening. When information-sensitive modals like *probably* and deliberative *ought* are the main modal of a conditional, we can have that: (a)  $\ulcorner$ if A or B, MODAL C $\urcorner$  has a true reading; (b) the basic meaning of the conditional is false. Attempts at rescuing the scalar theory, at least without further argument, appear far-fetched. Thus semantic accounts of Simplification appear to be on the right track.

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