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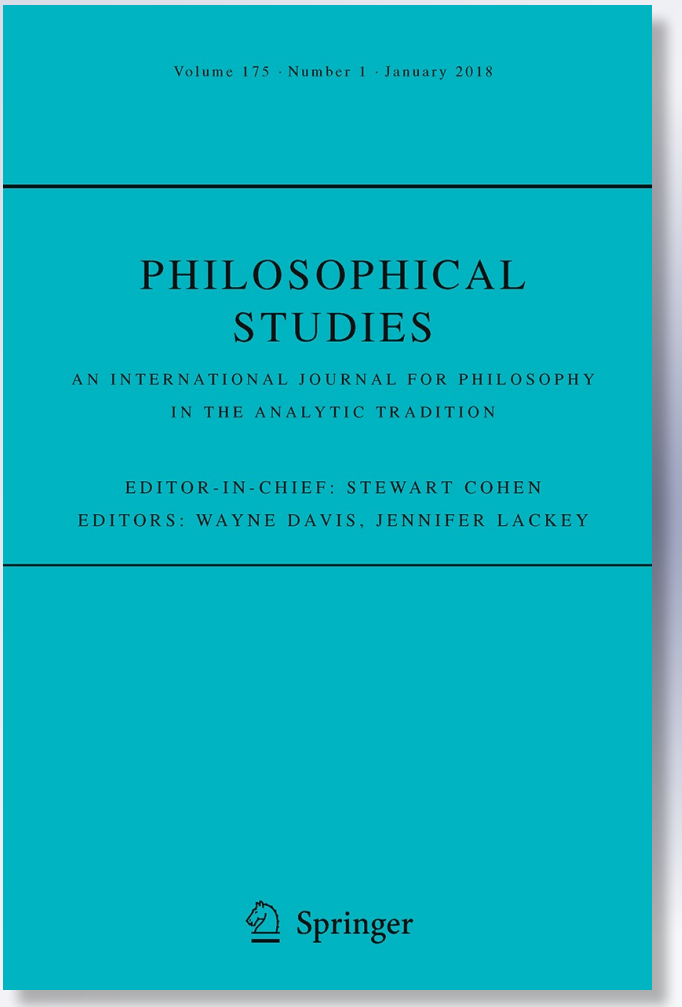

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Counterfactual antecedent falsity and the epistemic sensitivity of counterfactuals

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Abstract Why do utterances of counterfactual conditionals typically, but not universally, convey the message that their antecedents are false? I demonstrate that two common theoretical commitments–commitment to the existence of *scalar implicature* and of *informative presupposition*—can be supplemented with an independently motivated theory of the presuppositions of competing conditional alternatives to jointly predict this information when and only when it appears. The view works best if indicative and counterfactual conditionals have a closely related semantics, so I conclude by undermining two familiar arguments for a nonunified semantics of indicative and counterfactual conditionals.

Keywords Conditionals · Counterfactual antecedent falsity · Presuppositional implicature · Adams · Oswald–Kennedy example · Gibbard · Riverboat example

1 Introduction

This paper provides a detailed pragmatic solution to the problem of counterfactual antecedent falsity. I argue that counterfactual antecedent falsity in English counterfactuals is a species of scalar implicature that I label *presuppositional implicature*. This argument works best if indicative and counterfactual conditionals can be given a deeply unified semantics, so I also undermine some traditional reasons for thinking a unified semantics is impossible: Gibbard's riverboat example

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and Adams' Oswald–Kennedy examples. This gives us reason to think that counterfactuals show the same epistemic sensitivity observed in indicative conditionals.

Many conditional utterances bear the message that their antecedents are false. For example, consider the discourses that begin with utterance (1a) followed by either (1b) or (1b'):

(1) (a) I heard that the party was boring.
(b) If John had gone, it would have been fun.
(b') If John went, it was fun.

(1b), unlike (1b'), can impart that John did not go to the party if the context is previously silent about whether John went to the party. (1b) is a past counterfactual conditional; (1b') is a past indicative conditional. In this paper I will argue that the information of antecedent falsity arises from the speaker's choice of (1b) over (1b'). (Throughout this paper I will use feminine pronouns (*s*he) for *s*peakers who generate implicatures and masculine pronouns (*h*e) for *h*earers who draw implicatures. Exceptions are made when quoting passages from other authors.)

In this paper I restrict attention to the message of antecedent falsity attending utterances of English past counterfactuals; that is, counterfactuals where both clauses refer to possible past events. I am agnostic regarding whether these claims can be extended to past counterfactuals in other languages or to English counterfactuals about the present or future. In the rest of this document I will usually shorten 'past counterfactual' to just 'counterfactual'. So (2b) and (2b') are not counterfactuals as I am using the term here, since both discuss potential nonpast events. I limit attention to (past) counterfactuals in order to keep my task manageable; past counterfactuals are a sufficiently large and important class of conditionals that the theory remains interesting so restricted. Moreover, there is a good reason for excluding (2b) and (2b') from the class of conditionals to be analyzed. The data regarding (1b) is clear: even in a context that entails nothing about who was at the party, (1b) can impart that its antecedent is false. The data regarding (2b) and (2b') is less clear: does either impart that John will not go to the party? Does it impart that the speaker thinks it is unlikely that John will go to the party? Or does the speaker merely wish to distance herself, in some context-sensitive manner, from the possibility that John goes to the party? Given this lack of clarity, I set aside so-called "future-less-vivid" conditionals like (2b') (Iatridou 2000) and their "'were'ed up' counterparts" (DeRose 2010) like (2b).

(2) (a) I think the party will be boring.
(b) If John were to go, it would be fun.
(b') If John went, it would be fun.

The term 'counterfactual' is problematic, but so is its main alternative, 'subjunctive' (Lewis 1973, Chap. 1.1), (Lycan 2001, Chap. 7), (Bennett 2003, Chap. 1). 'Counterfactual conditional' is problematic because it suggests that having a false antecedent is a necessary condition for being a counterfactual. But some conditionals that are typically considered counterfactuals have true antecedents:

(3) If he had taken arsenic, he would have shown exactly the symptoms that he in fact showed. So he likely took arsenic (Bayfield 1890; Anderson 1951).

Here I will argue that the information of antecedent falsity is an implicature, and hence cancellable. (3) is an example of cancellation. Thus antecedent falsity is not a necessary condition on counterfactuality, but rather a defeasible implicature. 'Counterfactual' is a misnomer only when the implicature does not attend the utterance. I will not say more about what counterfactuals are or how (past) counterfactuals should be distinguished from indicative or other conditionals. I will take the distinction to be sufficiently familiar from the literature.

Two arguments from the literature show that the information of counterfactual antecedent falsity is neither an entailment nor a presupposition of the counterfactual. A counterfactual like (3) can be used to argue for the truth of its antecedent. If (3) entailed that its antecedent were false, the conclusion of the argument would contradict the premise, which it does not. If the conditional presupposed that its antecedent were false, the conclusion could not be true while the premise is.

Second, counterfactuals can be premises in non-question begging arguments for the falsity of their antecedents.

(4) This was done with a stiletto. But if the butcher had done it, he would have used a cleaver. So we can rule out the butcher.

As Stalnaker writes, the antecedent of the conditional premise here cannot be presupposed false because "if it were the speaker would be blatantly begging the question by presupposing, in giving his argument, that his conclusion was true" (Stalnaker 1975, p. 277).

So entailment and presupposition are ruled out. This paper argues that the information of counterfactual antecedent falsity arises as a scalar implicature–more precisely, as a presuppositional implicature.

The paper is structured as follows. In Sect. 2 I examine two existing accounts of the implicature of antecedent falsity. Section 3 introduces some technical background and motivates the mechanism, presuppositional implicatures, that will be used to derive the counterfactuality implicature. Section 4 introduces and defends an account of the presuppositions of conditionals that can generate the desired implicature. Section 5 responds to several objections to the view, along the way developing an argument that counterfactuals are not less epistemically sensitive than indicative conditionals. Section 6 concludes.

Throughout the paper I will use lower case Greek letters as variables for propositions, with numeric subscripts as necessary. Propositions will be understood as sets of possible worlds. I reserve ϕ for conditional antecedents and ψ for consequents; I reserve π for the proposition presupposed by some sentence.[1] Exceptions will be made in quoting and discussing other authors.

[1] For simplicity I'll sometimes write as though sentences bear presuppositions, though an alternative account might attribute presuppositions to utterances or to the speakers who make those utterances. Some discussion appears in Sect. 3.1.

2 Two existing accounts of the implicature

In this section I will outline and criticize two existing accounts of the implicature of counterfactual antecedent falsity, from Iatridou (2000) and Ippolito (2003). This rather technical negative section can be skipped without undermining the readability of the positive views advanced later.

2.1 Iatridou's account of the implicature

Iatridou's account depends on the semantics she provides for counterfactuals, which is compositional below the level of the proposition, analyzing the semantic contribution of the morphological components (in particular, tense) that distinguish counterfactuals from other conditionals. On her theory, tense may be interpreted in either the domain of times or the domain of worlds. If interpreted in the domain of times, it takes a time as argument and returns the set of times that excludes the given time. She argues that tense may indicate only past or present times ('will' is treated as modal). So if the argument of a past tense operator operating in the domain of times is the present time, then the set of times returned is the set of all past times. Of course, other features of the sentence may serve to further constrain the temporal interpretation of a past tense sentence.

When interpreted in the domain of worlds, past tense takes a world as argument and returns the set of worlds that excludes that world. So if the argument is the actual world, it returns the set of nonactual worlds. Again, other features of the sentence may further narrow the set of worlds being talked about by the sentence.

(1b), "If John had gone, it would have been fun", contains two past tense operators in the antecedent which appear superficially as a past perfect. One is interpreted in the domain of worlds, ensuring that we are discussing nonactual possibilities; the other is interpreted in the domain of times, ensuring that we are talking about past possibilities.

This theory of tense can then be integrated into a standard semantics for counterfactuals (on which, roughly, a counterfactual $\phi \Box\!\!\rightarrow \psi$ is true at w iff ψ is true at all the best worlds where ϕ is true; see Lewis (1973). The two layers of tense determine that the topic of the antecedent is a set of past, nonactual possibilities. The nontensed propositional content of the antecedent, p, adds that the topic of the antecedent is the set of past, nonactual possibilities where p is true. The semantics for counterfactuals determines that the counterfactual is true if and only if the best possibilities that are the topic of the antecedent are all worlds where the consequent is true.

In using two layers of past tense, the speaker of (1b) leaves the actual world out of the set of worlds being discussed. From the fact that the speaker chose to not talk about the actual world, hearers may infer that the actual world is not a world where that possibility is actual. Iatridou compares her account with the implicature associated with (5b):

(5) a. What do you think about Peter and Ian?
b. Well, I like Ian.

(5b) generates the cancellable implicature that the speaker doesn't like Peter. But that has not been asserted. That's inferred because the speaker has neglected to talk about Peter. Similarly, in (1b), the speaker has neglected to talk about the actual world when talking about worlds where p is true, and so the audience infers that the actual world is not a p-world.

Because the pragmatics is provided only in sketch, it is somewhat difficult to criticize. However, the account depends critically on her semantics, and there are serious challenges for the semantics she provides. Iatridou's semantics invalidates modus ponens. I begin by describing a toy model on which modus ponens is invalidated, and then provide a general recipe for creating counterexamples to modus ponens.

Consider a model with just three worlds: the actual world @, and nonactual worlds w and w'. Suppose w and w' are equally similar to @. Suppose it is true at all three worlds that the butcher did it. At @, he used a cleaver. In w, he used a stiletto. In w', he used an axe. Consider an utterance, in @, of the counterfactual,

(6) If the butcher had done it, he would have used a stiletto or an axe.

This utterance is true in @ in this model on Iatridou's semantics. For the topic of the antecedent is a set of past, nonactual possibilities where the butcher did it. That is, the antecedent specifies worlds w and w'; @ is excluded because it fails to be nonactual. Now, in each of w and w', it is true that the butcher used a stiletto or an axe.

So (6) is true in @, and has a true antecedent. Since the butcher used neither a stiletto nor an axe in @, modus ponens is invalid.

More generally, we can construct a counterexample to modus ponens for any proposition true at the world of utterance for any model where no two worlds make all the same propositions true. Let ϕ be any proposition that is true in a world @ of a model. Let $w_1, w_2, ..., w_n$ be the closest worlds to @ where p is true, excluding @. Let ψ_1 be a proposition that is true at w_1 but false at @; let ψ_2 be a proposition that is true at w_2 but false at @, ..., let ψ_n be a proposition that is true at w_n but false at @. Then consider the counterfactual (7).

(7) $\phi \Box\!\!\rightarrow (\psi_1 \vee \psi_2 \vee ... \vee \psi_n)$.

The disjunction $(\psi_1 \vee \psi_2 \vee ... \vee \psi_n)$ is true at every best antecedent world excluding the actual world. So an utterance of (7) (with appropriate values filled in for the variables) is predicted to be true at @. But p is true at @, and $(\psi_1 \vee \psi_2 \vee ... \vee \psi_n)$ is false at @. So modus ponens is invalid.

It is the exclusion of the actual world from the evaluation worlds that both generates these undesirable predictions about (6) and (7) and enables Iatridou's derivation of the implicature of antecedent falsity. If we want a derivation of the implicature that does not make those predictions we cannot accept Iatridou's account.

2.2 Ippolito's account of the implicature

Ippolito (2003) offers an account of the implicature of antecedent falsity observed in mismatched past conditionals like (8b). On Ippolito's account, the implicature of antecedent falsity arises from competition between (8b) and the alternative (8a):

(8) (a) If Bill came to the party tomorrow, it would be fun.
(b) Bill is dead. If he had come to the party tomorrow, it would have been fun.

On Ippolito's semantics, one layer of tense in the antecedent of (8b) constrains accessible worlds to those that were accessible at a contextually salient past time t_2. If its presuppositions are satisfied, (8b) is true iff the best worlds where Bill comes that were accessible at t_2 are all worlds where the party is fun. (8a) lacks the extra layer of past tense; accessible worlds are all those accessible at the utterance time t_c. If its presuppositions are satisfied it is true iff the best worlds where Bill comes that are accessible at t_c are all worlds where the party is fun. The only difference in the truth conditions is in the time constraint on accessibility.

Ippolito argues that both (8a) and (8b) presuppose that the presuppositions of their antecedents are consistent with the conversants' shared beliefs[2] at the time of the constraint on accessibility. That is, (8b) presupposes that the presuppositions of the antecedent are consistent with the conversants' shared beliefs at past time t_2 while (8a) presupposes that the presuppositions of the antecedent are consistent with the conversants' shared beliefs at the utterance time. She assumes that the set of conversants' shared beliefs never gets larger as time goes on, but sometimes gets smaller. This creates the possibility that the presupposition of (8a) is strictly logically stronger than the presupposition of (8b), and precludes the possibility that the presupposition of (8b) is strictly logically stronger than the presupposition of (8a), since t_2 must be prior to t_c.

Following Musan (1997), Ippolito holds that most predicates presuppose that their subjects exist or are alive. So (8b) presupposes that 'Bill exists or is alive' is consistent with conversants' shared beliefs at t_2, where t_2 is prior to t_c. (8a) presupposes that 'Bill exists or is alive' is consistent with conversants' shared beliefs at t_c. The latter presupposition cannot be weaker than the former but can be stronger.

Ippolito appeals to *Maximize Presupposition!*, a principle proposed in Heim (1991), to argue that the use of (8b) when the presuppositionally stronger (8a) was available generates the information that the speaker thinks that the presuppositionally stronger alternative carries misinformation–namely, that the presuppositions of the antecedent are consistent with conversants' shared beliefs at the time of utterance. *Maximize Presupposition!* requires that speakers make their utterances as strong, presuppositionally, as possible. The derivation is as follows. Where K is a knowledge operator, π stands for the presuppositions of the antecedent, t_c is the

[2] Ippolito employs Stalnaker's technical theory of context and common ground; since this paper does not introduce that theory until Sect. 3.1, I present Ippolito's theory using the less technical notion "shared belief".

utterance time, t_1 is earlier than t_c, c_{t_c} is the set of the conversants' shared beliefs at t_c and c_{t_1} is the set of the conversants' shared beliefs at t_1:

a. Speaker presupposed: $\pi \cap c_{t_1} \neq \emptyset$
b. Speaker didn't presuppose: $\pi \cap c_{t_c} \neq \emptyset$
c. So: $\sim K(\pi \cap c_{t_c} \neq \emptyset)$
d. So: $K \sim (\pi \cap c_{t_c} \neq \emptyset)$
e. $\equiv K(\pi \cap c_{t_c} = \emptyset)$ (Ippolito 2003 p. 173)

The speaker presupposes, weakly, that the presuppositions of the antecedent are consistent with conversants' shared beliefs at a time prior to the utterance time. She fails to presuppose the stronger alternative (b), that the presuppositions of the antecedent are consistent with conversants' shared beliefs at the utterance time. Since the imperative to maximize presupposition is in place, the hearer will infer (c), that the speaker does not know that the presuppositions of the antecedent are consistent with the conversants' shared beliefs at the utterance time. From the assumption that the speaker knows what the shared beliefs are, it follows (d) that the speakers knows that the presuppositions of the antecedent are inconsistent with those shared beliefs. This is equivalent to (e).

Ippolito's proposal faces two problems. First, the implicature derived is that the speaker knows that the additional information carried by the presupposition of the stronger alternative is inconsistent with the conversants' shared beliefs. But under the assumption that all participants in a conversation know what their shared beliefs are and what is/isn't consistent with them, then if the additional information is inconsistent with their shared beliefs, it follows that every participant already knew that. So Ippolito's pragmatic derivation cannot generate the information of antecedent falsity as new information.

Let me spell the objection out in more detail. Distinguish two cases: in the first case, the falsity of the antecedent of a conditional like (8b) is a shared belief of all participants in the conversation prior to utterance of the conditional. In this case, we do not need *Maximize Presupposition!* or any other pragmatic principles to help add the information that the antecedent is false to the conversants' shared beliefs. For that belief is already shared.

In the second case, the falsity of (8b)'s antecedent is not a shared belief of all participants in the conversation before it is uttered. But in that case, under the assumption that the speaker knows what the conversants' shared beliefs are and what is/isn't consistent with them, hearers will not draw the inference from (b) to (c), that the speaker does not know that the presuppositions of the antecedent are consistent with the conversants' shared beliefs. For the antecedent is consistent with the conversants' shared beliefs, and everyone knows that. It follows that the presuppositions of the antecedent are consistent with the conversants' shared beliefs: if (1) it is possible that both the conversants' shared beliefs and the antecedent of the conditional are true, and (2) the antecedent of the conditional is true only if its presuppositions are true, then (3) it is possible that the conversants' shared beliefs and the presuppositions of the antecedent are true. That is, the presuppositions of the antecedent are consistent with the conversants' shared

beliefs. So again, assuming that the speaker knows what the conversants' shared beliefs are and what is/isn't consistent with them, hearers cannot reasonably infer that the speaker does not know that the presuppositions of the antecedent are consistent with the conversants' shared beliefs.

A problem remains even if we give up the assumption that speakers know what the conversants' shared beliefs are and what is/isn't consistent with them. For as I have shown, the presuppositions of the antecedent are then also consistent with the conversants' shared beliefs. So the step from (c) to (d) will not follow. The speaker cannot know that the presupposition of the antecedent is inconsistent with conversants' shared beliefs. For that proposition is in fact consistent with conversants' shared beliefs.

This argument shows that Ippolito's mechanism cannot derive the information of antecedent falsity as new information. Perhaps it was not her intention to do so: perhaps she was only interested in cases where conversants' shared beliefs entail antecedent falsity prior to utterance of the counterfactual. But since the task of my paper is to explain why utterances of counterfactuals sometimes generate the message that their antecedents are false as new information, I cannot use Ippolito's mechanism. However, the account I will offer draws on Ippolito's work in several ways.

This concludes our negative discussion. The next section briefly describes tools that will be used in the positive proposal offered and defended in Sects. 4 and 5.

3 Common ground, presupposition, implicature, and presuppositional implicatures

This section is structured as follows. Section 3.1 quickly introduces the theoretical framework that I will be relying on. I use this framework because it is worked out in detail. I have some misgivings about that semantic framework (outlined in (Leahy 2014)), and I hope that the claims of this paper could be developed in alternative frameworks if they are developed in sufficient detail. Section 3.2 briefly describes a textbook account of scalar implicature, while Sect. 3.3 briefly describes how this mechanism can account for information generated from scalar competition between competing presuppositional contents, not only competition between competing asserted contents.

3.1 Theoretical framework

Say that proposition χ is common ground amongst a group of people just in case all members of the group presuppose that χ and believe that all other members of the group also presuppose that χ. A person presupposes a proposition if she finds it useful to take that proposition for granted or pretend to take it for granted in order to facilitate communication (Stalnaker 1975). As von Fintel (2008) puts it, presuppositions are the "propositions that the participants in that conversation at that time mutually assume to be taken for granted and not subject to (further) discussion" (p. 137). Propositions are analyzed as sets of possible worlds; common grounds are

analyzed as sets of propositions. The intersection of a common ground is called the context set for that common ground. The context set contains all the possible worlds where every proposition in the common ground is true. A common ground entails a proposition χ just in case every world in its context set is a member of χ.

Having a conversation is a matter of changing the common ground; other conversational purposes like sharing information are explained in terms of how certain speech acts change the common ground. For example, to make an assertion is to recommend adding a new proposition to the common ground. If that recommendation is accepted, then the new proposition becomes a member of the common ground. If the common ground did not already entail that proposition, the context set becomes smaller, more informative, since fewer possibilities are consistent with that set. Thus we model how assertions add information to a conversation in terms of how assertions change the common ground and context set.

Some utterances can only be interpreted in contexts where certain presuppositions are already in place. If an utterance that expresses proposition χ requires that the context set entails π, I will say that that utterance has *asserted content* χ and *presupposed content* π.

Since the proposition expressed by an utterance with presupposition π can only be added to common grounds that entail π, utterances with presuppositions that interlocutors know to be false create breakdowns in communication. The classic example is from Strawson (1950):

(9) The king of France is wise.

Communication breaks down because to utter (9) is to imply, in "a very special and odd sense of 'imply"' (p. 330), that there is a king of France. This special sense of *implication* is what we now call *presupposition*. Utterances of (9) presuppose that there is a king of France. But the audience knows that there is no king of France; the common ground does not entail that there is a king of France, and so (9) can't be added to that common ground. This explains the breakdown of communication.

On the other hand, consider a common ground that does not entail π, and an utterance with asserted content χ and presupposed content π. If the audience is open to accepting π into the common ground (for example, because they were previously unopinionated as to whether π), the common ground must first be updated with π, to allow the interpretability of χ. This process has come to be known as *accommodation*.

Consider the difference between (9) and (10), which indirectly informs any audience member who didn't already know that the speaker owns a Porsche.

(10) Sorry I'm late. My Porsche got stuck.

(10) presupposes that the speaker owns a Porsche, while (9) presupposes that France has a king. An utterance of (9) results in a breakdown because the audience is unwilling to accommodate its presupposition, which they know is false. An utterance of (10) does not display this feature, and so we can imagine the proposition expressed by (10) being accepted into the common ground, though its presupposition must also be

accepted into the common ground. When interpreting an utterance requires accommodation, the utterance is said to have an *informative presupposition*.

With this brief introduction, I move on to a brief reminder of some pragmatic facts that I will integrate with this account of informative presupposition to generate an account of presuppositional implicatures.

3.2 Scalar implicatures

Grice's maxim of quantity requires speakers to be as informative as required for the purposes of conversation. If a speaker chooses a less informative option when a relevantly more informative option was available, and the more informative option would not have incurred any other pragmatic costs, then hearers may wonder why the speaker chose the less informative option. If the right assumptions are in place, the hearer will infer that the speaker believes that the extra information conveyed by the logically stronger alternative is false.

(11) a. "Did John wash the dishes?"
b. Some of them.
b'. All of them.

(11b) and (11b') provide an example. Suppose a speaker chooses (11b) in response to (11a). Assuming that there were dishes to wash, (11b') entails (11b). But if (11b') is true, it is a more informative answer to the question. Should a speaker choose (11b) over (11b'), the questioner might recognize that (11b') would have been more informative. One good explanation for the speaker's choice may be that the speaker believes that (11b') is false. So the hearer may infer that (11b') is false.

Levinson (1983) characterizes this reasoning as follows. A Horn scale (Horn 1973) is an ordered set $E = \langle e_1, e_2, \ldots, e_n \rangle$ of lexical items of the same grammatical category. If A is a sentence frame and e_x is a member of E and $A(e_x)$ is a grammatical sentence, then $A(e_y)$ is a grammatical sentence for every e_y in E. That is, if any member of a scale can fill in a place in a sentence frame, so can every other. Finally, the sentence that results from filling in a sentence frame with an earlier member of the scale always logically entails every sentence that results from filling in that sentence frame with a later member of the scale, but not vice versa. To speak in shorthand, earlier members of the scale are strictly logically stronger than later members of the scale. For example, <all, most, some> is a Horn scale.[3]

Given a sentence frame and a scale whose members can fill in that frame, the unique set of *alternatives* are defined as the set of sentences that result from filling in the sentence frame with some member of the scale.

If a speaker utters a sentence using a weak member of a Horn scale, her utterance is logically weaker than some alternatives. If the stronger alternatives are relevant

[3] To be careful, I should note that this holds if quantifiers presuppose that their quantifier domains are not empty.

and the speaker could have chosen them, she would now be in violation of the maxim of quantity. Assuming that she is being co-operative, hearers may infer that she was not in a position to assert any stronger alternative than the one she chose. In some contexts, the hearer will assume that she could not utter a stronger alternative because they were all false.

Implicatures are known to be *cancellable*: they do not always attend utterances of weak alternatives. There are at least two types of cancellation. Sometimes implicatures fail to arise because stronger alternatives are not relevant. For example, if we need two additional lawn chairs for our garden party, I might assert (12).

(12) Go ask the Smiths. They have two chairs.

I might know that the Smiths have four lawn chairs, so I could have made a stronger assertion. But in this context (12) will not implicate that the Smiths do not have more than two lawn chairs, though it would in other contexts.

Second, sometimes stronger alternatives are relevant, but the information that stronger alternatives are false does not attend weaker utterances because there are other viable explanations for the speaker's choice. Perhaps the stronger alternatives would be rude, or maybe the speaker is explicitly ignorant about whether the stronger alternative is true or not. When explanations like these are available, hearers need not infer that the stronger alternative is false.

A terminological note: 'cancellation' is used broadly to cover all cases where an implicature that attends an utterance in some context does not attend utterance of the same sentence in the current context. It needn't be the case that the implicature first arises and is subsequently eliminated.

3.3 Presupposition and scalar implicature: presuppositional implicature

In this section I integrate the accounts of presupposition and implicature to generate a theory of presuppositional implicature. The view will only be sketched here; a fully detailed account appears in Leahy (2016). The view is a modification of Schlenker (2012).

The maxim of quantity requires speakers to be as informative as is required for the purposes of conversation; apparent violations of this requirement yield scalar implicatures as described in Sect. 3.2. But we know now that utterances can be informative via two vectors: asserted and presupposed content, as shown in Sect. 3.1. The maxim of quantity does not tell us to choose one of these vectors over the other, nor should it. The maxims of conversation arise from "basic rational considerations and may be formulated as guidelines for the efficient and effective use of language in conversation to further co-operative ends" (Levinson 1983, p. 101). Sometimes the best balance between effectiveness and efficiency will require putting all novel information into asserted content; other times some information is best placed in presupposed content.

This reveals the possibility of a distinct sort of scalar implicature. In standard examples of scalar implicature, asserted contents are strictly ordered by logical strength and presupposed contents are equivalent. But what if the asserted contents

are equivalent–or equivalent in context–and the presuppositions are ordered by logical strength? Prima facie, it seems that combining a commitment to informative presuppositions with a Gricean maxim of quantity that supports scalar implicatures predicts implicatures in this situation as well.

Consider a fanciful example (13). Suppose a has heard that b found an alien and is nursing it back to health, but knows nothing else about the alien.

(13) a. How is the alien doing?
b. It's getting better. All of its eyes are open now.
π: The alien has eyes.
Assertion: All eyes are open now.
b'. It's getting better. Both of its eyes are open now.
π: The alien has exactly two eyes.
Assertion: All eyes are open now.

In this context, utterance (13b) generates the information that the alien does not have exactly two eyes (cf. Percus 2006, note 24). This cannot be accounted for as a standard scalar implicature from competition between the asserted contents of (13b) and (13b') because those asserted contents are equivalent in any context in which the presuppositions of both are satisfied. However, the two differ in their presupposed content: (13b) presupposes that the alien has eyes while (13b') presupposes that the alien has exactly two eyes. If the speaker of (13b) had instead uttered (13b'), she would have been more informative (via informative presupposition). Since she chose to be less informative, hearers will draw the inference that the additional information conveyed by the presuppositionally stronger alternative is false (if they make sufficient additional assumptions). Thus it is inferred that the alien does not have exactly two eyes.[4]

I now describe this mechanism roughly; see Leahy (2016) for more precision. Start by defining *presuppositional scale* as an ordered set of lexical items $E = \langle e_1 \ldots e_n \rangle$ such that if A is a sentence frame and $A(e_x)$ is a well formed formula for any member e_x of E, then $A(e_y)$ is a well formed formula for every member e_y of E. Moreover, the presuppositions that the members of E trigger in any sentence frame A are strictly ordered by logical strength. The presuppositions triggered by early members of the scale logically entail the presuppositions triggered by all later members of the scale, and never vice versa. Presuppositional scales are variants of Horn scales.

If E is a presuppositional scale, e_x is a member of E, and A is a sentence frame, then the presuppositional alternatives of $A(e_x)$ are all the sentences that result from substituting a member of E in the place of e_x in $A(e_x)$. Note that the presuppositions of all these alternatives will be strictly ordered by logical strength.

For now, I will explain how presuppositional implicatures work when alternatives differ in the informativeness of their presuppositions but are identical

[4] It might be added that (13b) conveys the stronger message that the alien has more than two eyes. Perhaps this additional information is generated from the use of the plural. I will not address this question here.

in the informativeness of their assertions. This is a simplification; there may also be implicatures generated from alternatives that differ in the logical strength of both assertion and presupposition.

We define 'identity of asserted content' relative to a context. Two sentences S and S' have identical asserted content in context C if and only if both are defined in C and both are true at all the same worlds in C.

Note that (13b) and (13b') do not have identical asserted contents in the context above when question (13a) is posed. We have stipulated that a knows nothing about the alien except that b has found it and is nursing it back to health. Hence it cannot be common ground how many eyes the alien has, or whether it has eyes at all. While the presuppositions of both (13b) and (13b') might be readily accommodated, neither is satisfied in this context. So the sentences' asserted contents are undefined in the context, which means they cannot have identical asserted contents in this context. Moreover, if the speaker chooses (13b) over (13b'), her assertion does not employ 'both'. So the presupposition of (13b') is never satisfied; no context arises in the dialogue where (13b) and (13b') have identical asserted contents. In order to make sure that (13b) and (13b') have, in some sense, the same asserted content, I also define 'potential contextual equivalence'. Two sentences S and S' are potential contextual equivalents in a context C just in case S and S' have identical asserted contents in the context C' that would arise from accommodating any presuppositions of S and S' that are not satisfied in C. While (13b) and (13b') do not have identical asserted contents in the context above, they are potential contextual equivalents.

Suppose a speaker utters (13b). If the speaker had been in a position to say (13b') instead, she would now be in violation of the maxim of quantity since she didn't require the audience to accommodate that the alien has exactly two eyes. If the hearer assumes that the speaker is not in violation of the maxim of quantity, he may infer that she was not in a position to say (13b'). But the reason why she is not in a position to say (13b') cannot arise from a difference in their asserted contents, since they are potential contextual equivalents in this context. So it must arise from the difference in their presupposed contents. The speaker must not be in a position to require the audience to accommodate that the alien has exactly two eyes. One good explanation for why the speaker chose not to require accommodation is that the speaker believes that the additional presupposed content is false.

In this subsection we saw how implicatures can be generated from the presuppositions of competing alternatives. In the next section I use this mechanism to generate the implicature of counterfactual antecedent falsity.

4 The presuppositions of conditionals

Conditionals seem to bear presuppositions. Suppose (14) and (15) are discourses that begin with assertion of the (a) examples, and a second speaker then produces either the (b) or (b') example. The (b) utterances, unlike the (b') utterances, seem not to have taken the (a) utterances properly into account.

(14) (a) John didn't go.
(b) # If John went, it was fun.
(b') If John had gone, it would have been fun.
(15) (a) John went.
(b) # If John had gone, it would have been fun.
(b') If John went, it was fun.

Different authors (Stalnaker 1975; Karttunen and Peters 1979; von Fintel 1997) have offered competing explanations for these data in terms of presupposition failure. I will not evaluate existing accounts; discussions appear in von Fintel (1997) and Leahy (2011). In Sect. 4.1 I describe and motivate a new account of conditional presuppositions. Section 4.2 shows how combining my account of conditional presuppositions with an account of presuppositional implicature generates the implicature of antecedent falsity. Section 4.3 explains why the information of antecedent falsity sometimes fails to appear. I argue that these are cases of implicature cancellation.

4.1 The presuppositions of conditionals

I hold that indicative conditionals presuppose that their antecedents are epistemically possible[5] for their utterers. $\diamond_s\phi$ in (π-I) should be read as "ϕ is epistemically possible for (speaker) s". Counterfactual conditionals have no presupposition (indicated in (π-C) using notation for the empty set: Ø).

(π-I) Indicative Presupposition: $\diamond_s\phi$
(π-C) Counterfactual Presupposition: Ø

Note that my account does not determine presuppositions for "Future Less Vivid" (16), "Present subjunctive" (17), and "were'd up indicative" (18) conditionals.

(16) If John went (tomorrow), it would be fun.
(17) If John was there (now), it would be fun.
(18) If John were to go (tomorrow), it would be fun.

This is not an innovative proposal. It is a candidate formalization of the nonformal proposal in Stalnaker (1975, 2014), though I don't extend my claims to conditionals like (16)–(18). Karttunen and Peters (1979) endorse my proposal for indicative conditionals. Related suggestions appear in Schlenker (2004).

It has been objected that it is unusual to treat counterfactual morphology as triggering no presupposition, while indicative morphology triggers a presupposition. Kai von Fintel writes, "From a cursory exploration of a number of languages, one would think that the subjunctive mood is the marked construction, with indicative being the unmarked default. This being the case, we might prefer an analysis that

[5] This will be modified slightly below.

does not connect the indicative with any specified meaning but assigns some particular meaning to the subjunctive" (von Fintel 1997, p. 32).

My view is not unique in the literature, however. Karttunen and Peters (1979, p. 8) write that the difference between subjunctive and indicative conditionals may be "due to some feature of indicative conditionals lacking in their subjunctive counterparts". Stalnaker (1975, p. 276) writes, "I take it that the subjunctive mood in English and some other languages is a conventional device for signalling that presuppositions are being suspended". My account agrees with these views. Moreover, Schlenker (2005) argues that the subjunctive is the unmarked construction in French.[6]

Furthermore, there are two distinctions at work here: markedness versus unmarkedness and presupposition triggering versus no presupposition triggering. Stalnaker's remark suggests we should not assume that these distinctions coincide. It may be that the marked form, the subjunctive, needs to be marked exactly because it serves to indicate that what is normally presupposed (that the worlds the speaker cares to distinguish between are all in the context set) is not presupposed by utterances so marked.

I want to comment on the interpretation of '$\diamond$' in (π-I). Above I said it should be read as epistemic possibility, but that isn't quite right. There are propositions that we know, but sometimes find it useful to act as if we don't know for the purposes of conversation. On the other hand, there are propositions that we believe false but find it useful, for the purposes of conversation, to act as though we know those propositions. In what follows, I will call a proposition epistemically possible for speaker s iff it is consistent with the set of propositions that the speaker knows, as modulated by her purposes in the conversation at hand. So, for example, if a speaker doesn't know whether χ but finds it useful to act as though she knows that χ, then a proposition γ is epistemically possible for her iff it is consistent with the set of propositions she knows plus χ.

This account explains the data in (14)–(15). (14b) is infelicitous because it suffers presupposition failure. (14b') is felicitous because its weaker presupposition is satisfied. (15b') is felicitous because its presupposition is satisfied. (15b) is infelicitous because it presuppositionally implicates that John did not go, contradicting (15a). This is demonstrated in the next subsection.

4.2 Counterfactual antecedent falsity derived as presuppositional implicature

My proposal explains the information of counterfactual antecedent falsity as a presuppositional implicature. The presuppositions of competing conditionals are asymmetrically ordered by logical strength, and the presupposition of the counterfactual is logically weaker. Suppose a conversation opens with (19a), and the context is silent about whether anyone thinks John went. Then a speaker says (19b) instead of the presuppositionally stronger alternative (19b'):

[6] Schlenker does not extend this claim to French conditionals; still, treating subjunctive as an unmarked construction is not my innovation.

(19) a. I heard the party was no good.
b. If John had gone, it would have been fun.
b'. If John went, it was fun.

If the speaker could have said (19b') instead of (19b), she would be in violation of the maxim of quantity since she didn't require the audience to accommodate that John's having gone is possible for her. If the hearer assumes that the speaker is co-operative, he may infer that she could not have said (19b'). But the reason why she couldn't say (19b') cannot arise from a difference in asserted content, since they are potential contextual equivalents in this context. (The claim that these sentences are potential contextually equivalent is defended in Section 5.2.) So it must arise from the difference in their presupposed contents. One good explanation for why the speaker chose not to have the audience accommodate is that she believes that the extra information is false. That is, the antecedent is not epistemically possibile for her; she has ruled out the possibility that John went.

4.3 Implicature cancellation

Any account of the message of counterfactual antecedent falsity must also explain why that information sometimes fails to arise. I now demonstrate that the proposed derivation of counterfactual antecedent falsity explains why the implicature is sometimes cancelled.

There are two main cases of counterfactuality implicature cancellation: Anderson-style cases (20) and cases of explicit ignorance (21) (cf. Edgington 2008 p. 4).

(20) If he had taken arsenic, he would have shown exactly the symptoms that he in fact showed. So he likely took arsenic.
(21) If the prisoner had escaped through the window, the flowers below would have been trampled. Let's go check.

In both cases, the relationship between the counterfactual and its past indicative alternative is unusual. In Anderson cases, the past indicative is infelicitous (22). In the explicit ignorance cases, the counterfactual and past indicative are interchangeable (23). In neither case does the speaker who chooses the counterfactual fail to choose a more informative indicative option. Consequently, the speaker who chooses (20) over (22) or (21) over (23) does not risk violating the maxim of quantity, simply because factors conspire so that the past indicative is not a more informative competitor. The task that remains is to say why, in these cases, the past indicative fails to be a more informative competitor.

(22) # If he took arsenic he showed just exactly the symptoms that he in fact showed.

(23) If the prisoner escaped through the window, the flowers below got trampled. Let's go check

In the case of (22) the answer is relatively straightforward: (22) is not a more informative competitor because it is not a competitor, because it is infelicitous.[7] (23) is not more informative than (21) in this context because the context already satisfies (23)'s presupposition. Remember, presuppositional implicatures can only generate new information in contexts that do not satisfy the presupposition of the presuppositionally stronger alternative. By comparison, if a context already entails that the alien has exactly two eyes, an utterance of 'All the alien's eyes are open' will not generate the implicature that the alien does not have exactly two eyes. In this context, 'Both the alien's eyes are open' is not more informative than 'All the alien's eyes are open'. In parallel, in a context that entails that ϕ is an open possibility for s, an indicative conditional that presupposes that $\diamond_s\phi$ cannot have an informative presupposition, and so a speaker cannot exploit a possibility of informative presupposition to generate presuppositional implicatures.

5 Objections

5.1 Do indicatives presuppose antecedent possibility?

Some find my account of the presupposition of indicative conditionals problematic (Starr 2014 p. 1025, note 10; Gillies 2004 p. 585). Gillies writes,

> A plausible pragmatic constraint on indicatives is that they carry a presupposition that their antecedents might be true. [...] But the pragmatic constraint on indicatives can be cancelled; some indicatives have antecedents the belief in which would require us to revise our epistemic states. The well-known example due to Ernest Adams (1970) illustrates this fact: I believe that Oswald killed Kennedy, but I also believe the indicative conditional *If Oswald didn't kill Kennedy, then someone else did.*

Following Stalnaker (2014, p. 177), I propose that in uttering an indicative conditional whose antecedent contradicts our beliefs, the common ground is temporarily revised to eliminate the inconsistency "for the purposes of the discussion". Karttunen and Peters (1979 page 8), note 5 make a similar claim. When we consider *If Oswald didn't kill Kennedy, then someone else did*, we admit the possibility that our belief that Oswald killed Kennedy is mistaken. Thus we revise our common ground to one that is consistent with Oswald not having killed Kennedy, but is otherwise minimally different from the previous common ground. This temporarily revised common ground is then used to evaluate the conditional.

As von Fintel puts it, "the common ground of a conversation at a given time is the set of propositions that the participants in that conversation at that time mutually

[7] A further question is why (22) is infelicitous; that question is addressed in Leahy (2011).

assume to be taken for granted and not subject to (further) discussion" (von Fintel 2008, p. 137). When we consider 'If Oswald didn't shoot Kennedy, someone else did', then we are not presupposing that Oswald shot Kennedy; we are treating that possibility as subject to discussion (and we are discussing it).

By contrast, when we evaluate 'If Oswald hadn't killed Kennedy, someone else would have', we do not broaden our common ground. Following Stalnaker (1975, p. 276), the subjunctive marking of this sentence indicates that what is normally presupposed (that the worlds the speaker cares to distinguish between are all in the context set) is not now being presupposed. The speaker is instead drawing distinctions amongst worlds that are outside the context set.

5.2 Are indicatives and counterfactuals potential contextual equivalents when they need to be?

My potential contextual equivalence requirement suggests that indicative and counterfactual conditionals will have an intimately related semantics. But many authors have denied that past indicative and counterfactual conditionals have similar semantics. Two classic grounds for this denial are Gibbard's riverboat example and Adams' Oswald–Kennedy examples. In this section I will put those examples in a broader context, which undermines their ability to motivate a semantic distinction between indicative and counterfactual conditionals.

First I want to note a semantic relationship between future indicative, past indicative, and counterfactual conditionals. Part of this relationship has been widely noted (e.g., Strawson 1986; Jackson 1987; Edgington 2004), but the full pattern has not been widely discussed.

Modifying Edgington's example, on Thursday a psychic tells your friend about your flight on Friday:

(24) If she takes that flight, she'll be killed

You miss your flight and it crashes. When you learn this on Saturday morning you say "She was right–if I had taken that flight, I would have been killed". Let's examine this from the psychic's perspective. Suppose she doesn't learn anything that makes her change her mind. How will she express the same belief on Saturday? That depends on how her epistemic state has changed in the interim. There are three ways her beliefs can change: she may come to believe that you took the flight, that you did not take the flight, or neither. If she comes to believe that you took it then she is committed to you having been killed. She will no longer qualify her assertion with an if-clause. If she learns that you didn't take it and wishes to reassert (24) on Saturday, she says (25). If she does not learn whether you took the flight, and wishes to reassert (24) on Saturday, she says (26).

(25) If she had taken that flight, she would've been killed
(26) If she took that flight, she was killed

We can represent this situation in a diagram, where the vertical axis represents time (increasing toward the bottom) and the horizontal axis represents the two possible

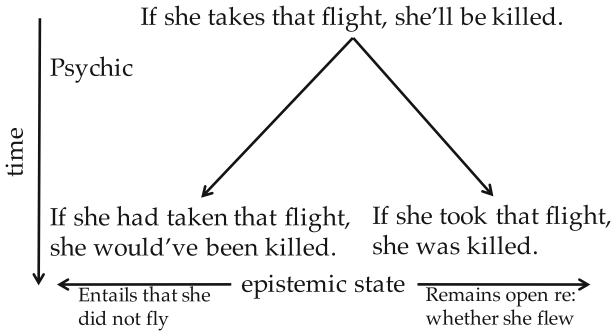

Fig. 1 The Psychic

changes in her epistemic state that require conditionals to "express the same belief" as (24) at later times (Fig. 1).

Now consider Gibbard's riverboat example-anomolous version. Sly Pete and Mr. Stone are playing poker on a riverboat. Stone has bid up to the limit. Pete can either match the bid (call) or fail to match the bid and lose his bet (fold). Pete's helper, Zack, sees Stone's cards and signals their contents to Pete. A friend of mine, Jack, sees both hands. He sees that Pete's hand is a loser. Stone gets suspicious and has the room cleared. Some time later Zack slips me a note that says,

(27) If Pete called, he won.

Jack slips me a note that says,

(28) If Pete called, he lost.

Both utterances are sincere, and (Gibbard maintains) a sincere utterance is false only if the speaker is mistaken about something germane. Neither speaker is mistaken about something germane, so neither utterance is false. If Zack and Jack both express propositions, they both express true propositions. But then there has to be some parameter that varies. Speaker epistemic state is the most obvious candidate. This has motivated some authors (e.g., Stalnaker 2014) to advocate for the epistemic sensitivity of past indicative conditionals like (27) and (28).

Two comments about this example: first, this argument for the epistemic sensitivity of past indicatives (27) and (28) equally well establishes the epistemic sensitivity of future indicatives like (29) and (30):

(29) (Zack) If Pete calls, he'll win.
(30) (Jack) If Pete calls, he'll lose.

If Zack and Jack slip me their notes immediately after leaving the room, before Pete acts, they must write these sentences. Both utterances are sincere, and a sincere utterance is false only if the speaker is mistaken about something germane. Neither speaker is mistaken about something germane, so neither utterance is false. If both utterances express propositions, they both express true propositions. But then there has to be some parameter that varies, such as speaker epistemic state.

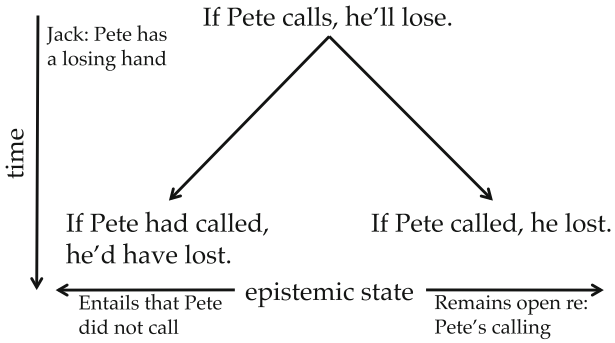

Fig. 2 Jack's conditionals

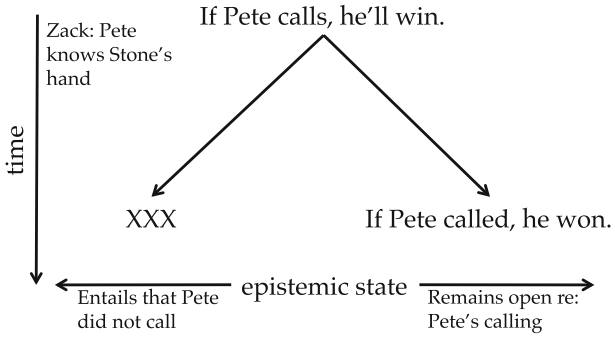

Fig. 3 Zack's conditionals

Second, this argument for the epistemic sensitivity of indicatives does not equally well establish the epistemic sensitivity of counterfactuals, but this is due to an unusual feature of the epistemic structure of the example. Consider Figs. 2 and 3, which represent Jack and Zack's possible conditional utterances.

On leaving the room, Jack says (30), while Zack says (29). Later, if they do not learn whether Pete called, they use the past indicatives (28) and (27). If they learn that Pete didn't call, Jack says (32). But Zack does not say (31). Rather, due to some special features of his epistemic state, Zack changes his mind. Earlier, he knew that Pete knew Stone's hand, and would call only if his hand was better. While Zack was not mistaken about anything germane, he was uninformed about something germane. When he learns that Pete did not call, he learns that Pete had a losing hand. With this knowledge, he no longer endorses his earlier utterance (29).

(31) (Zack) If Pete had called, he would have won.
(32) (Jack) If Pete had called, he would have lost.

But this doesn't mean that we should deny epistemic sensitivity to counterfactuals. First we should check other examples that lack this special feature of Zack's epistemic state. Consider an example from Stalnaker (2014). The election has three candidates: Wilson, Heath, and Thorpe. I have incontrovertible evidence that Heath

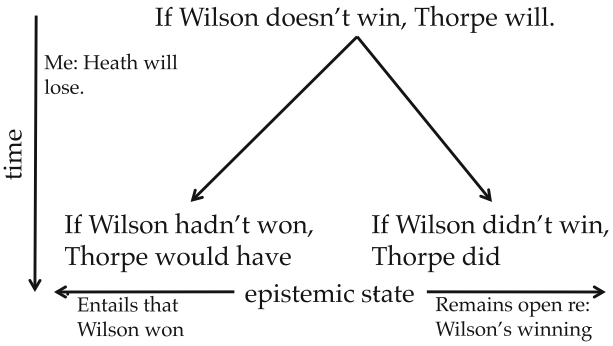

Fig. 4 Heath will lose

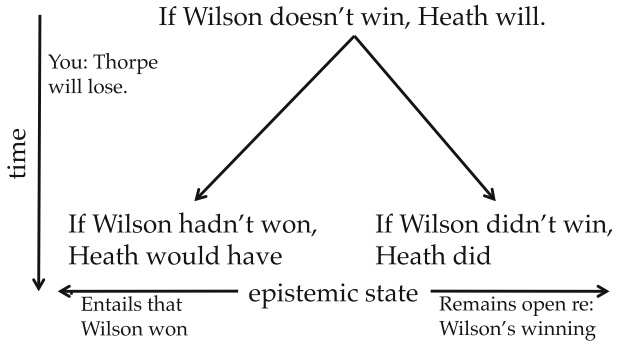

Fig. 5 Thorpe will lose

will lose; you have incontrovertible evidence that Thorpe will lose. Some possible conditional utterances are represented in Figs. 4 and 5.

In this example, if I learn that Wilson won I may sincerely utter (33); similarly, you may sincerely utter (34).

(33) If Wilson hadn't won, Thorpe would've.
(34) If Wilson hadn't won, Heath would've.

A sincere utterance is false only if the speaker is mistaken about something germane; neither speaker is mistaken about something germane, so neither utterance is false. If we both express propositions, we both express true propositions. But then some parameter must vary. Speaker epistemic state is an obvious candidate.

The fact that Zack does not endorse (31) on learning that Pete did not call should not stop us from advocating the epistemic sensitivity of counterfactuals. It's a special feature of that example that on learning that Pete did not call, Zack learns a relevant fact that he was previously uninformed about.

Let's turn now to the Oswald–Kennedy examples. Start with two simple cases. Bill knows that no one other than Oswald will kill Kennedy; the FBI told him that all possible assassins but Oswald are secured. Before the assassination Bill might

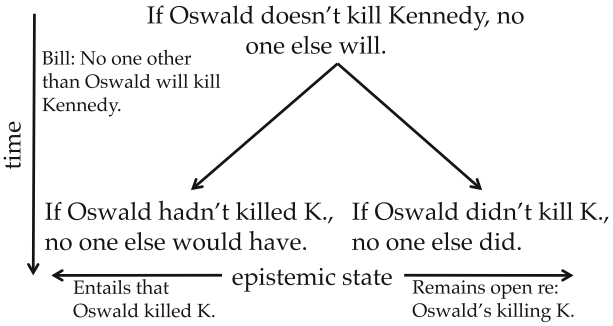

Fig. 6 Bill's conditionals

say (35). If he doesn't learn whether Oswald killed Kennedy and he wants to restate his earlier judgement, he say (36). If he learns that Oswald did it and wants to restate, he says (37). These are represented in Fig. 6.

(35) If Oswald doesn't kill Kennedy, no one else will.
(36) If Oswald didn't kill Kennedy, no one else did.
(37) If Oswald hadn't killed Kennedy, no one else would have.

Sue knows that Kennedy will be killed, but nothing else relevant. Before the assassination she says (38). If she doesn't learn whether Oswald killed Kennedy and she wants to restate her earlier judgement, she says (39). If she learns that Oswald did it and wants to restate her earlier judgement, she says (40).

One might object: "If Sue's knowledge that Kennedy would be killed was derived from the fact that Oswald would kill Kennedy, then she should not endorse (40)." Note that this argument applies just as well to Sue's earlier assertion (38). If it is acceptable for her to endorse the future indicative on learning that Oswald will kill Kennedy (say, because she is even more confident in the information that Kennedy will be killed), then it is equally acceptable for her to later endorse the counterfactual on learning that Oswald killed Kennedy. The future indicative and the counterfactual stand or fall together, if we are careful not to equivocate over epistemic states.

These possibilities are represented in Fig. 7.

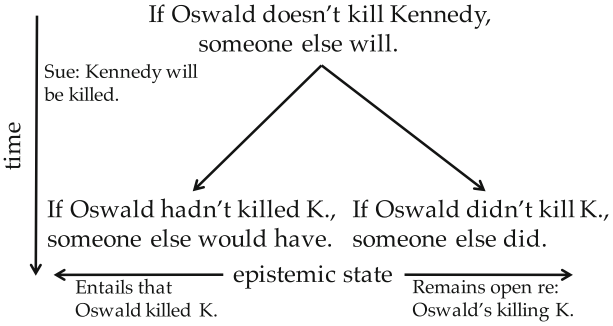

Fig. 7 Sue's conditionals

(38) If Oswald doesn't kill Kennedy, someone else will.
(39) If Oswald didn't kill Kennedy, someone else did.
(40) If Oswald hadn't killed Kennedy, someone else would have.

Now let's turn to the interesting case: our actual epistemic state. In this epistemic state, the one Adams was attending to in developing his example, we accept "If Oswald hadn't killed Kennedy, no one else would have" but reject "If Oswald didn't kill Kennedy, no one else did". How is this possible?

In Sect. 5.1 I argued that when we consider an indicative conditional with an antecedent we think is false, we minimally revise the common ground to be consistent with the antecedent. Consequently, the epistemic state that is used to evaluate the conditional changes. But when we consider a counterfactual with an antecedent that we think is false, then no revision of the common ground is required, and the epistemic state used to evaluate the conditional stays the same.

Call an epistemic state Sue-like just in case it entails that Kennedy was killed, and does not entail that no one other than Oswald killed Kennedy. Call an epistemic state Bill-like just in case it entails that no one other than Oswald killed Kennedy, and does not entail that Kennedy was killed. Our actual epistemic state is neither Sue-like nor Bill-like, since it entails both 'No one other than Oswald killed Kennedy' and 'Kennedy was killed'. The counterfactual 'If Oswald hadn't killed Kennedy, no one else would've' can be evaluated relative to this epistemic state. But 'If Oswald didn't kill Kennedy, no one else did' cannot; our epistemic state must first be temporarily revised to admit the possibility that Oswald didn't kill Kennedy. The epistemic state still includes that Kennedy was killed, and so 'No one other than Oswald killed Kennedy' is removed.[8] The resulting epistemic state is Sue-like. So when we accept the counterfactual and reject the indicative, we do so relative to different epistemic states. This is equivocation. Suppose we keep the epistemic state fixed. This requires that we interpret the counterfactual relative to a Sue-like epistemic state (since the indicative is not interpretable otherwise). But in Sue-like epistemic states we accept that if Oswald hadn't killed Kennedy, someone else would've (witness Fig. 7).

[8] Why do we remove 'No one other than Oswald killed Kennedy' and not 'Kennedy was killed'? Perhaps because we are more confident that Kennedy was killed than we are that no one other than Oswald killed Kennedy. But it could be otherwise. If we are more confident that no one other than Oswald killed Kennedy than we are that Kennedy was killed, then to treat the possibility that Oswald didn't kill Kennedy as subject to discussion, we eliminate 'Kennedy was killed' from our epistemic state and preserve 'No one other than Oswald did it'. That is, we move to a Bill-like epistemic state. From that point my argument will run in parallel to the one given in this paragraph, though of course the judgements about which conditionals we accept and which we reject will be switched.

6 Conclusions and future directions

Throughout the course of this paper I have offered an account of the presupposition of conditionals, a derivation of the implicature of counterfactual antecedent falsity, and an attack on arguments against a unified semantics of indicative and counterfactual conditionals. I conclude with some comments on open questions and directions for further research.

First, I must develop a semantics for indicative and counterfactual conditionals that supports my claims regarding potential contextual equivalence. I have shown that some existing arguments against such a semantics are inconclusive, but my account will not be complete until an acceptable semantics has been developed in detail.

Second, the account of the presuppositions of various kinds of conditionals is incomplete here. There is an account for indicative and counterfactual conditionals, but not of those subjunctive conditionals that are not counterfactual. I have resisted developing such an account as I have not found satisfying data regarding any non-presupposed or entailed message regarding the antecedent of a noncounterfactual subjunctive. In short, I don't know what there is to be explained in the case of noncounterfactual subjunctives, and pending a clear explanandum I will not offer any explanans.

Third, I need to establish why the information of antecedent falsity associated with future-oriented would-have conditionals like (41) are particularly difficult to cancel. First note that future oriented would-have conditionals only seem felicitous in contexts that entail that their antecedents are false:

(41) John is dead. If he had come to the party tomorrow, it would have been fun.

Should I say that these examples presuppose that their antecedents are false? Or should I maintain that these examples implicate that their antecedents are false, but that the implicature is particularly difficult to cancel or even uncancellable? This is a question for future research.

Finally, we need to establish what happens to the presuppositional implicatures associated with counterfactuals when they are embedded under various operators. A preliminary discussion of these issues appears in Leahy (2015), but a full analysis is yet to be conducted.

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