COUNTERFACTUAL ANTIPRESUPPOSITIONS AND LOCAL MAXIMIZE PRESUPPOSITION*

BRIAN LEAHY
Zukunftskolleg and Departments of Linguistics and Philosophy, University of Konstanz

1 Introduction: Counterfactual Antecedent Falsity

(1) If John had come to the party, it would have been fun.

(1) is a counterfactual conditional. Utterances of counterfactual conditionals are typically accompanied by the information that their antecedents are false. But what is the source of that information? Two arguments show that this information is neither an entailment nor a presupposition of the counterfactual. First, counterfactual conditionals can be used to argue for the falsity of their antecedents without begging the question, as in (2). This would be impossible if the first premise presupposed or entailed the conclusion. Second, counterfactual conditionals may be uttered when their antecedents are known to be true; the utterer of (3) does not suggest that no one has heard Demosthenes.

(2) If the butcher had done it, he would have used a cleaver. But this wasn't done with a cleaver, so it wasn't the butcher (Stalnaker, 1975).

(3) If a man had heard Demosthenes, could he have forgotten it? (Bayfield, 1890).

From this data we infer that the information of antecedent falsity is an implicature, and this paper will examine two problems for an account of how that implicature is generated that was offered in Leahy (2011). The implicature is generated when a speaker chooses to use a counterfactual like (4B') instead of its past indicative competitor (4B). But what exactly is a counterfactual conditional? A general theory is not available. We can say the following. Counterfactual conditionals are uniquely in competition with "past indicative" conditionals. That is, there are contexts where one may choose to use either the counterfactual or the past indicative, but where there is no competing non-counterfactual subjunctive. Provisionally, a past indicative is an indicative conditional whose antecedent and consequent both refer to events in the past, as in (4B).

*I would like to thank audiences at MOSS 2 and University of Göttingen, Maribel Romero, Jacopo Romoli, and an anonymous referee.

(4) A: Was Mary's party any good?
B: If John went, it was fun.
B': If John had gone, it would have been fun.
C: * If John went, it would be fun.

(4B') and (4C) are both sometimes called 'subjunctive conditionals'. In this example, (4B') is an available alternative to (4B), but (4C) is not. What I am calling 'counterfactual conditionals' are those which compete with past indicatives. Some people think that counterfactual conditionals are a subclass of subjunctive conditionals, but I will be silent on this question for now. Non-counterfactual subjunctive conditionals like (5) do not always behave the same as counterfactual conditionals with respect to the implicature of antecedent falsity, and so fall outside the domain of this paper.

(5) If you invited/were to invite me to the party, I would happily attend.

As mentioned, this paper discusses two problems for account of the implicature of antecedent falsity offered in Leahy (2011). One problem arises from the parallel problem of counterfactual consequent falsity: utterances of counterfactual conditionals just as well seem to bear the information that their consequents are false. Again, this seems to be neither an entailment nor a presupposition. There are good reasons to prefer a unified account of counterfactual antecedent and counterfactual consequent falsity. But we will see that the account proposed in (Leahy, 2011) cannot be straightforwardly extended to the problem of counterfactual consequent falsity.

We also examine the problem of counterfactual antecedent falsity in embedded counterfactuals. Do utterances of embedded counterfactuals still bear the information that their antecedents are false? We will see that there are conditions under which the account in (Leahy, 2011) fails to account for the observational data.

This paper proposes a common solution to both of these problems. Its structure is this: in the next section I describe the mechanism of antipresuppositions. While accounts appear in (Percus, 2006), (Schlenker, 2006), (Chemla, 2008), and (Sauerland, 2008), I will focus on Chemla's proposal. In section 3 I will present an account of the presupposition of conditionals, and show that the account provided generates the antipresupposition of counterfactual antecedent falsity. Section 4 introduces some problematic data for this account regarding utterances of counterfactuals embedded under 'no' and then discusses an inconclusive remedy to this problem. Section 5 introduces the problem of counterfactual consequent falsity and demonstrates why the account offered in Leahy (2011) cannot be straightforwardly extended to account for both problems.

Section 6 introduces an alternative mechanism, local maximize presupposition, that resolves both issues. The section begins with a discussion of local maximize presupposition as proposed by Singh (2011). It then shows how maximizing presupposition locally is able to generate the implicatures of both antecedent and consequent falsity. Then it shows how maximizing presupposition locally does, despite a surprising challenge, generate the desired antipresuppositions for counterfactuals embedded under 'no'. Section 7 concludes.

2 Antipresuppositions

In this section I will provide an overview of the mechanics of antipresuppositions.

In Artikel und Definitheit (1991), Heim explains the infelicity of (6) by appeal to a proposed Gricean maxim, "Maximize Presupposition".

(6) # I interviewed a father of the victim.

(7) I interviewed the father of the victim.

For given that everyone knows that everyone has exactly one father, (6) and (7) make the same contribution to every context. The infelicity of (6) is then explained by the injunction to maximize presupposition when the presuppositionally stronger (7) is an available alternative.

But if Maximize Presupposition is a Gricean maxim, we should be able to exploit it to generate implicatures. And that is in fact observed: B's utterance in (8) imparts the message that B does not have a girlfriend.

(8) A: Why won't Betty kiss you?
B: She thinks I have a girlfriend.

(9) Alternative: She knows that I have a girlfriend.

For (8b) has been asserted when (9) is a salient, available, presuppositionally stronger alternative. If conditions are right, the audience will draw the implicature that the speaker doesn't believe that the stronger presupposition is felicitous, and may further conclude that the speaker believes that the stronger presupposition is false. In the remainder of this section I present the formal apparatus of antipresuppositions as developed in Chemla (2008).

We start with scales of presupposition triggers: that is, ordered sets such that the presupposition triggered by later members of the set are strictly logically stronger than the presupposition triggered by earlier members of the set. Chemla offers data that support the existence of the following scales: <a, the>, <each, the>, <all, both>, <believe, know>, <Ø, again>, <Ø, too>. Suppose a sentence S_1 is constructed using an early member of a lexical scale. Suppose that an alternative sentence S_2 can be constructed by replacing the early member of the lexical scale with a later member, *without changing the assertion* of S_1. Then, given Maximize Presupposition, it will be inferred that S_2 is infelicitous because the constraints on its presupposition are not met. (Note that these are sufficient conditions, though perhaps not necessary. Possible weakenings–most importantly, on the requirement that the alternative make the same assertion–are discussed in Percus (2006).)

Chemla then argues that a sentence S with presupposition π can be felicitously uttered by a speaker s only if:

1. s believes that π is true ($B_s[\pi]$);
2. s is an authority about π ($(Auth_s[\pi])$);
3. π is not crucial for the current purpose of the conversation.

[1] is a variant on a condition that is familiar from traditional scalar implicatures (cf. (Horn, 1972), (Gazdar, 1979)). A speaker's utterance of a weak sentence compared to an alternative is a reason to believe that the speaker does not believe that the extra information bourne by the stronger alternative is true, *ceteris paribus*. However, if the extra information bourne by the stronger alternative is presuppositional in nature and not already entailed by the common ground, we must also consider the possibility that the speaker would not be accommodated. Thus we need condition [2]. A speaker can not felicitously use a presupposition-bearing alternative in a context that does not entail that presupposition when her audience would be unwilling to accommodate that presupposition.

Condition [3] will not concern us here. It exists to explain the data presented in (10) ((21) in Chemla):

(10) Context: There is a disagreement about the number 319; Mary is known to have very good mathematics skills. Someone just said that 319 is a prime number.
a. *No, Mary knows that it's not.
b. No, it's not.
c. No, Mary believes that it's not.

When a proposition p is under discussion, one cannot felicitously presuppose p.[1] Since this condition is always satisfied in the cases that concern us here, we will henceforth ignore it.

So if a speaker makes an utterance using a relatively weak member of a scale, her audience may infer that she does not think the stronger assertion would be felicitous. As we are ignoring condition [3], this means that either the speaker does not believe the presupposition, or she does not believe that she would be accommodated: $(\sim B_{\mathrm{s}}(\pi) \vee \sim B_{\mathrm{s}}(Auth_{\mathrm{s}}(\pi)))$. Then the desired information follows given three assumptions:

4. Authority: the speaker believes she is an authority w.r.t. π: $B_{\mathrm{s}}[Auth_{\mathrm{s}}[\pi]]$
5. Competence: the speaker has a belief about whether π: $B_{\mathrm{s}}[\pi] \vee B_{\mathrm{s}}[\sim\pi]$
6. Reliability: the speaker may be trusted in her beliefs: $(B_{\mathrm{s}}[\pi]) \rightarrow \pi$

For beginning with $(\sim B_{\mathrm{s}}[\pi] \vee \sim B_{\mathrm{s}}[Auth_{\mathrm{s}}[\pi]])$, the authority assumption eliminates the second disjunct, leaving us with $\sim B_{\mathrm{s}}[\pi]$. The competence assumption strengthens this to $B_{\mathrm{s}}[\sim\pi]$, and the reliability assumption converts this to $\sim\pi$.

Note that Chemla's felicity conditions [1]–[3] are introduced as necessary conditions, while the structure of the argument requires that they are sufficient conditions. I cannot address this problem here; I will simply assume that whatever further conditions are required for joint sufficiency are always satisfied in the cases at hand. A complete analysis will justify this assumption by spelling out the relevant sufficient conditions.

This section concludes with some illustrations. In uttering (8B), the speaker conspicuously fails to utter an alternative with the stronger factivity presupposition, i.e., that the speaker has a girlfriend. From this the audience may infer that either the speaker doesn't believe that she has a girlfriend or that the speaker doesn't believe that she would be taken as an authority about whether she has a girlfriend. If the audience assumes that the speaker takes herself to be an authority, he may conclude that she does not believe that she has a girlfriend. The competence assumption–that she has an opinion on the matter–yields the stronger conclusion that the speaker believes that she does not have a girlfriend. If the hearer takes the speaker to be reliable on the matter, he may conclude that she does not have a girlfriend.[2]

By way of further illustration, we may note that the corresponding implicature need not arise from the assertion of (11):

(11) *Context: Bill needs a quarter.*
Sue (looking through her purse): I think I have a quarter in here somewhere.

[1] That is, one cannot presuppose p without generating further pragmatic effects, such as implicating that there is no real room for debate on the issue. This might be the case, for example, if (10a) read, "No, even MARY, the class fool, knows it's not", which does presuppose the proposition under discussion and generates a rather bellicose implicature that the discussion is unsound (Chemla (2008)), p. 153-154.

[2] In the above, as elsewhere, I treat the *s*peaker (*s*he) as feminine, and the *h*earer (*h*e) as masculine.

Here the implicature of the complement's falsity will not arise if the competence assumption fails: that is, if Sue suspects, but does not fully believe (in the sense required by the competence assumption), that she has a quarter in her purse.

3 Conditional Presupposition and Counterfactual Antecedent Falsity as Antipresupposition

3.1 The Presuppositions of Conditionals

In this section I argue that counterfactual antecedent falsity can be generated as an antipresupposition from an independently motivated account of the presuppositions triggered by various competing conditional constructions. In order for the presuppositions of conditionals to generate antipresuppositions, they must be strictly orderable in terms of logical strength, so as to constitute a scale. If antecedent falsity is to arise as antipresupposition from the assertion of a counterfactual conditional, then the presupposition of counterfactuals must be logically weaker than the presupposition of its indicative alternatives.

Indicative conditionals display some of the behaviours traditionally associated with presupposition triggers. In particular, while they do not assert that their antecedents are consistent with the common ground, it seems that the consistency of the antecedent with the common ground is a precondition on the well-formedness of an indicative conditional. Consider the following dialogue:

(12) A: John didn't come to the party.
B: # If John went to the party, it was fun.

B's indicative conditional strikes A as infelicitous in this context, and A might infer that B thinks the context is other than A thinks it is. And the critical question seems to be whether B takes that context to include A's utterance. It seems reasonable for A to double-check whether B heard her assertion. This suggests that indicative conditionals presuppose that their antecedents are consistent with the common ground, or perhaps with the speaker's knowledge or beliefs.

Several accounts of the presupposition triggered by various conditional forms exist ((Stalnaker, 1975), (Karttunen and Peters, 1979), (von Fintel, 1997)). These are discussed in detail in Leahy (2011). Here it may suffice to point out that no existing account other than the one provided here is capable of generating the target antipresupposition.

I maintain that indicative conditionals presuppose that their antecedents are epistemically possible. Counterfactual conditionals like (1) have no presupposition. This is in line with Stalnaker's claim that "the subjunctive mood in English and some other languages is a conventional device for indicating that presuppositions are being suspended" ((Stalnaker, 1975), p. 276). As a reminder, I am silent about the presupposition of non-counterfactual, non-indicative conditionals.

(13) Presuppositions of conditionals:
Indicatives: $\diamond_{\text{epis}}$ A
Counterfactuals: Ø

I will henceforth neglect the subscript, and take $\diamond$A to be interpreted as 'A is epistemically possible'. Several objections to proposals along these lines are raised in (von Fintel, 1997); these are discussed at length in (Leahy, 2011).

3.2 Counterfactual Antecedent Falsity as Antipresupposition

Suppose someone says (14) instead of the presuppositionally stronger (15):

(14) If John had come, it would have been fun.

(15) If John came, it was fun.

The utterance of the presuppositionally weaker (14) will cause the hearer to infer that the speaker doesn't believe that the stronger presupposition would be felicitous. That means: $\sim B_s[\diamond A] \vee \sim B_s[Auth[\diamond A]]$. The desired implicature follows if we also assume the speaker is competent and reliable and takes herself to be an authority:

1. Authority assumption: $B_s[Auth[\diamond A]]$ then entails $\sim B_s[\diamond A]$
2. Competence assumption: $B_s[\diamond A] \vee B_s[\sim \diamond A]$ then entails $B_s[\sim \diamond A]$
3. Reliability assumption: $B_s[\sim \diamond A] \rightarrow \sim \diamond A$ then entails $\sim \diamond A$

Here we've generated as antipresupposition a somewhat stronger result than we wanted. We wanted to generate the antipresupposition that $\sim A$, but we've ended up instead with $\sim \diamond A$. This is not problematic: if we assume that speakers believe what they implicate, that they are reliable (as we have already assumed), and that their reliable beliefs are knowledge, then the two are equivalent.

4 Conditional Antipresuppositions and Projection

This account of the implicature of antecedent falsity is open to a serious objection from the perspective of recent work on presupposition projection.[3] For suppose, as predicted by Heim (1983), a.o., that presuppositions project universally under 'no'. If that is the case, (16) is predicted to presuppose that it is epistemically possible that each of these 10 students took the exam. In that case, an utterance of the presuppositionless (17) is predicted to generate the antipresupposition that the presupposition of the competing indicative is false; that is, that there is a student amongst the 10 who is known not to have written the exam. But this is too weak: the message that attends an utterance of (17) is that all of these 10 students are known not to have written the exam.

(16) None of these 10 students passed if they took the exam.

(17) None of these 10 students would have passed if they had taken the exam.

However, if, as suggested by (Beaver, 2001), a.o., presupposition projection under 'no' is existential, then my account makes the right predictions. For in that case, (16) should presuppose that it is epistemically possible that at least one student took the exam, and so an utterance of (17) should antipresuppose that it is not epistemically possible that even one student took the exam.

So my account will work if projection of the indicative conditional presupposition under 'no' is existential, not universal. From a theoretical perspective, there are arguments for both possibilities. I will not engage that debate here. But there is recent empirical evidence (Chemla, 2009) that presupposition projection under 'no' is universal, and I wish to discuss that evidence here. I will show that Chemla's data does not entitle us to conclude that the conditional presupposition projects universally under 'no'.

[3] This point was raised by a reviewer for MOSS, whose input I gratefully acknowledge.

In the following I will present only the portion of Chemla's data that is relevant to the discussion at hand. Chemla's subjects, when asked whether a sentence containing a presupposition trigger under 'no' supported the corresponding universal inference, responded that it did over 80% of the time. For example, subjects were asked whether "None of these 10 students knows that his father is going to receive a congratulation letter" suggests that "The father of each of these 10 students is going to receive a congratulation letter". They were given the option to respond either 'yes' or 'no'. The existential inference was similarly tested: subjects were also asked whether "None of these 10 students knows that his father is going to receive a congratulation letter" suggests that "The father of at least one of these 10 students is going to receive a congratulation letter". Further, in addition to the factive verb 'know', the presuppositions triggered by definite descriptions and change of state verbs were also tested. Thus the pairs of environments <None, Each> (checking the universal inference) and <None, At least one> (checking the existential inference) were paired with each of three presupposition triggers to see if subjects accepted both the universal and the existential inferences, as predicted by universal projection, or if subjects accepted only the existential inference, as predicted by existential projection.

Because subjects accepted both the universal and existential inferences (in both cases in the neighbourhood of 80% of the time), Chemla concludes that "these results strongly support the hypothesis that...presuppositions project universally rather than existentially when triggered from the scope of the quantifier 'no"' (p. 310).

However, he also notes that there is variation in robustness that depends on the type of presupposition trigger. For he also tested how presuppositions project when triggered from other pairs of environments, such as <Less than 3, Each>, <Less than 3, (At least) 3>. For example, subjects were asked whether "Less than 3 of these 10 students knows that his father is going to receive a congratulation letter" suggests that "The father of each of these 10 students is going to receive a congratulation letter" and whether it suggests that "The father of at least 3 of these 10 students is going to receive a congratulation letter". He found a significant interaction between the type of presupposition trigger and the environments. Subjects accepted the universal inference triggered by factive verbs under 'no' about 95% of the time; they accepted the universal inference triggered by definite descriptions under 'no' about 90% of the time; and they accepted the universal inference triggered by change of state verbs under 'no' about 70% of the time. Under 'Less than 3' a different pattern emerged. Subjects accepted the universal inference triggered by factive verbs under 'Less than 3' about 60% of the time; they accepted the universal inference triggered by definite descriptions under 'Less than 3' about 60% of the time; and they accepted the universal inference triggered by change of state verbs under 'Less than 3' about 60% of the time. So it seems that which trigger-type is at work makes a difference to acceptance rates of the universal inference under 'no' but does not make a difference to acceptance rates of the universal inference under 'Less than 3'.

Chemla points out that if we compare only the pairs of environments <No, Each> and <No, At least one>, we no longer find a significant interaction between the environment and the type of trigger. The same holds if we compare only the environments <Less than 3, Each> and <Less than 3, At least one>. That is, if we hold fixed the embedding environment and check the acceptance rates of universal vs. existential inferences, we do not find that trigger-type makes a difference. Therefore Chemla is entitled to the conclusion that presuppositions project universally under 'no', and that these conclusions "apply uniformly to every trigger" (p. 312).

However, these data suggest we should refrain from generalizing these conclusions to presupposition triggers that were not tested. While there is no significant interaction between trigger-type and environment when we restrict attention to the environments <No, Each> and <No, At least one>, there is still variation across trigger-types in the acceptance rates for the universal presupposition under 'no'. The lack of interaction enables us to apply Chemla's conclusion to the tested triggers (change of state verbs, definite descriptions, and factive verbs), but the variation across trigger types within the environment <No, Each> should make us careful about extending these conclusions to trigger-types that were not tested.

I conclude that Chemla's experimental data do not establish that the presupposition of indicative conditionals projects universally under 'no'. Of course this does not establish that projection is existential; that will remain an open issue in this paper. We now move on to a second and independent problem for the proposal.

5 Counterfactual Consequent Falsity

The data that was used to introduce the problem of counterfactual antecedent falsity can be amended to introduce a parallel problem of counterfactual consequent falsity.[4] First, utterances of counterfactual conditionals like (1) are typically attended by the information that their consequents are false. Second, this information is neither a presupposition nor an entailment of the counterfactual. In the case of counterfactual antecedent falsity this was established by two examples: counterfactual modus tollens and Anderson-style examples, which are a special case of counterfactual inference to the best explanation. The modus tollens example (2) is useful here: if the counterfactual premise entailed or presupposed that its consequent was false, the categorical premise would be redundant. Since the categorical premise is not redundant, the counterfactual premise does not entail or presuppose that its consequent is false.

Second, counterfactual conditionals can be used in inferences to the best explanation, as in (18). Inferences to the best explanation are instances of affirming the consequent; this has been shown to be a reasonable inference when (a) the counterfactual used in the inference is true or likely; (b) the consequent of the counterfactual is unlikely if its antecedent is not true; and (c) the antecedent is not antecedently too unlikely.

(18) If he had escaped through the window, the flowers below would have been trampled, as we have all seen they were. Perhaps he escaped through the window.

Since inference to the best explanation requires the truth of the consequent, and these inferences are sometimes reasonable, these counterfactuals cannot presuppose or entail the falsity of their consequents.

Next, it is plausible that indicative conditionals presuppose that their consequents are possible. Consider the following dialogue:

(19) A: The party was boring.
B: # If John went the party was fun.

B's indicative conditional strikes A as infelicitous in this context, and A might infer that B thinks the context is other than A thinks it is. And the critical question seems to be whether B takes

[4] Malte Zimmerman recommended I examine this possibility.

that context to include A's utterance. It seems reasonable for A to double-check whether B heard her assertion. This suggests that indicative conditionals presuppose that their consequents are consistent with the common ground, or perhaps with the speaker's knowledge or beliefs.

Furthermore, it is plausible that counterfactual conditionals lack this presupposition. Again we might follow Stalnaker in the claim that the special morphology attached to counterfactual conditionals is a conventional device for indicating that presuppositions are being suspended. If all of the above holds, then the derivation of counterfactual consequent falsity can proceed exactly as does the derivation of counterfactual antecedent falsity. For example, from the utterance of presuppositionally silent (4B') (If John had gone, it would have been fun) instead of (20), which presupposes the possibility that the party was fun ($\diamond_{\text{epis}_s}$C), it may be inferred that the speaker doesn't believe that the stronger presupposition would be felicitous.

(20) If John went, it was fun.

Following Chemla's system, that means: $\sim B_s[\diamond_{\text{epis}_s} C] \vee \sim B_s[Auth_s[\diamond_{\text{epis}_s} C]]$. Again, counterfactual consequent falsity follows on three assumptions:

1. Authority: $B_s[Auth_s[\diamond_{\text{epis}_s} C]]$ entails $\sim B_s[\diamond_{\text{epis}_s} C]$
2. Competence: $B_s[\diamond_{\text{epis}_s} C] \vee B_s[\sim \diamond_{\text{epis}_s} C]$ entails $B_s[\sim \diamond_{\text{epis}_s} C]$
3. Reliability: $B_s[\sim \diamond_{\text{epis}_s} C] \rightarrow \sim \diamond_{\text{epis}_s} C$ entails $\sim \diamond_{\text{epis}_s} C$

This proposal faces a problem, however. For if we want to address both the problem of counterfactual antecedent and consequent falsity by this method, it seems that the global presupposition of an indicative conditional must be $(\diamond_{\text{epis}_s} A \& \diamond_{\text{epis}_s} C)$. The presupposition of a counterfactual is still $\emptyset$; so we will derive as antipresupposition $\sim(\diamond_{\text{epis}_s} A \& \diamond_{\text{epis}_s} C)$ when we want to derive $(\sim \diamond_{\text{epis}_s} A) \& (\sim \diamond_{\text{epis}_s} C)$. So we can't solve both problems by this mechanism. Furthermore, it seems that neither the problem of counterfactual antecedent falsity nor the problem of counterfactual consequent falsity is more fundamental than the other. So we cannot legitimately choose to solve one rather than the other, and so it seems that we don't have an adequate solution to either problem.

6 A Unified Solution: Local Maximize Presupposition

6.1 What is Local Maximize Presupposition?

Both of these problems can be addressed by a single strategy.[5] (Singh, 2011) offered independent evidence that *maximize presupposition!* needs to be checked in local contexts of embedded constituents. His account explains the infelicity of (21), from (Percus, 2006):

(21) #Everyone with exactly 2 students assigned the same exercise to all his students.

(22) Everyone with exactly 2 students assigned the same exercise to both his students.

Sentences of the form All $[\phi][\psi]$ presuppose that everything that satisfies the restriction satisfies the presupposition of the nuclear scope. So (22) presupposes that everyone with exactly 2 students has exactly 2 students: a tautology. Since (21) has no presuppositionally stronger competitor, its infelicity can't be explained by appeal to a (global) antipresupposition.

[5]Thanks to Jacopo Romoli, who recommended I explore this avenue to address problem of embedded antipresuppositions.

Singh's solution is that 'Maximize Presupposition' should be checked in the local contexts of embedded constituents. To this end Singh offers a novel formulation of 'Maximize Presupposition'. For contrast, consider a Standard or Global formulation of *Maximize Presupposition!*:

> (Standard MP) If ϕ, ψ are contextually equivalent alternatives, and the presuppositions of ϕ are stronger than those of ψ and are met in the context of utterance c, then one must use ϕ (Singh (2011), p. 152).

This formulation cannot explain the infelicity of (21) for the reasons spelled out above. The following formulation fares better:

> (Local MP) Check that MP is satisfied for each S embedded in ϕ in S's local context c' ((Singh, 2011), p. 157).

It is not entirely clear what the occurrence of 'MP' in the definiens of Local MP refers to. We may bar the threat of circularity in Local MP by integrating Local MP with features of Standard MP, resulting in the following reformulation.

> (Local MP*) If (a) ϕ is an embedding sentence and (b) S and S' are sentences and local-contextually equivalent alternatives for a given embedded position in ϕ, and (c) the presuppositions of S are stronger than those of S' and are met in the local context c, then one must use S over S'.

Adopting Local MP, which I reformulate as Local MP*, allows Singh to address Percus' problem. Take the logical form of (21) to be as in (23):

(23) $\forall x_i$[x_i has exactly 2 students][x_i assigns the same exercise to all of x_i's students]

The local context for x_i *assigns the same exercise to all of* x_i*'s students* is c+x_i *has exactly 2 students*. In this context the presupposition of the alternative x_i *assigns the same exercise to both of* x_i*'s students* is met. This alternative presupposition is presuppositionally stronger and equivalent in this context, and so required by (Local MP*).

Before we proceed, a problem must be addressed. Chemla's formulation of *Maximize Presupposition!* is: "Among a set of alternatives, use the felicitous sentence with the strongest presupposition" ((Chemla, 2008), p. 142). In contrast with *Local MP**, Chemla's formulation does not require that alternatives are contextually equivalent. Chemla requires that (8B) and (9) are alternatives. He argues that they are contextually equivalent, but adds that even if they are not contextually equivalent, that "would just be an indication that the constraint [of contextual equivalence] should be relaxed" (p. 146).

Is contextual equivalence necessary for the operation of *Maximize Presupposition!*? If it is, then there will be problems in the application of Chemla's proposal. For now I simply assume that it is not. But a full discussion would require that we establish that Maximize Presupposition can be operative amongst alternatives that are not contextually equivalent. Alternatively, for the purposes of the proposal at hand, we could assume that the constituents of a counterfactual conditional and its indicative competitor are local-contextually equivalent in the cases where the antipresuppositions of antecedent and consequent falsity arise. For now we follow the former strategy.

As a result we adopt Weakened Local MP*:

> (Weakened Local MP*) If ϕ is an embedding sentence and S and S' are sentences and alternatives for an embedded position in ϕ, and the presuppositions of S are stronger than those of S' and are met or [accommodable and believed true] in the local context c, then one must use S over S'.

(Weakened Local MP*) is weaker than (Local MP*) in two respects. First, the requirement of local contextual equivalence is dropped. Second, the requirement that the presuppositions of the stronger candidate embedded sentence are met is disjoined with the requirement that the presuppositions of the stronger candidate embedded sentence are accommodable and believed true. This latter weakening is necessary for the application of Chemla's machinery, as described in section 2. On Chemla's account, if a speaker chooses a presuppositionally weak alternative in a context where the stronger presupposition is not satisfied, the audience may infer that the stronger presupposition is either not accommodable or not believed true. Thus the extra disjunct is required in the formulation of (Weakened Local MP*).

We might check (Weakened Local MP*) against an example:

(24) Context: John held a garage sale.
Mary: "John sold a table and all of his bikes."

On the theory we are working with, an antipresupposition that John had more than two bikes is expected to arise due to the available alternative that employs 'both' where (24) employs 'all'. Uttered in a context c, the local context for *John sold all of his bikes* is c+John sold a table. Is the presupposition of the alternative *John sold both of his bikes* met in that context? If so, the sentence is predicted infelicitous. If not, then assuming that the speaker is a competent authority, the audience can infer that John had more than two bikes.

6.2 Weakened Local MP* and Antecedent and Consequent Falsity

How does the foregoing apply to antipresuppositions in counterfactual conditionals? It would help to have a well-developed dynamic theory of conditionals. However, for reasons pointed out in Leahy (2011) the account offered here of counterfactual antecedent falsity requires a variably strict semantics for counterfactuals, and I know of no well worked out dynamic variably strict semantics for counterfactuals. As a result, we will provisionally here illustrate the theory with respect to Heim's (Heim, 1983) context change potential for the material conditional.

Consider a standard CCP for a conditional $A \rightarrow C$:

$$c + (A \rightarrow C) = c \backslash ((c + A) \backslash (c + A + C))$$

In order to interpret a material conditional, we first need to calculate $c + A$, and check whether *Weakened Local MP** is satisfied there. Then we calculate $(c + A + C)$ and check whether *Weakened Local MP** is satisfied there.

Suppose the sentence ϕ "If John had come, he would have met Sue" is uttered in a context c. We want to generate the antipresuppositions that John did not come, and John did not meet Sue. The local context for the antecedent is c. In that context, either it is possible that John came or it is not possible that John came. In the latter case we do not need to appeal to the mechanism of antipresuppositions to explain the information of antecedent falsity: that information is already bourne by the context. That leaves the cases where c admits the possibility that John came. S='John came' and S'='John had come' are alternatives for an embedded position in ϕ. If Weakened local

MP* is to apply, we must assume that the candidate constituent sentence 'John came' bears the presupposition that it is possible that John came, whereas the constituent sentence S' 'John had come' lacks that presupposition. Since the presuppositions of S are stronger than those of S' and are met, then the fact that the speaker has chosen S' over S may lead the audience to infer that they are not accommodable and believed true. If the audience believes that those presuppositions are accommodable (the authority assumption), then they may infer that the speaker does not believe the presupposition to be true. The competence assumption will enable the stronger inference that the speaker believes that the presupposition is not true, and the reliability assumption will enable the inference that the presupposition is not true. So it is inferred that it is not possible that John came.

The local context for the consequent is c+John came. In that context, either it is possible that John met Sue or it is not. Again, in the latter case we need no antipresuppositions to explain the information of consequent falsity. That leaves cases where c+John came is consistent with 'John met Sue'. S='John met Sue' and S'='John had met Sue' are alternatives for an embedded position in ϕ="If John had come, he would have met Sue". If Weakened Local MP* is to apply, we must assume that the candidate constituent sentence 'John met Sue' bears the presupposition that it is possible that John met Sue, whereas the constituent sentence S' 'John had met Sue' lacks that presupposition. Since the presuppositions of S are stronger than those of S' and are met, then the fact that the speaker has chosen S' over S may lead the audience to infer that they are not taken to be both accommodable and true by the speaker. If the audience believes that those presuppositions are accommodable (the authority assumption), then they may infer that the speaker does not believe the presupposition to be true. The competence assumption will enable the stronger inference that the speaker believes that the presupposition is not true, and the reliability assumption will enable the inference that the presupposition is not true. So it is inferred that it is not possible that John met Sue. So using Weakened Local MP* we can derive as antipresupposition both counterfactual antecedent and counterfactual consequent falsity.

6.3 Weakened Local MP* and Embedded Conditional Antipresuppositions

6.3.1 Weakened Local MP* Correctly Derives Antecedent Falsity

Checking *Maximize Presupposition!* locally is a natural place to look for a solution to this embedding problem. To this end we need to look more closely at the structure of past indicative and counterfactual conditionals under 'no'. Recall the problematic examples:

(25) None of these 10 students passed if they took the exam.

(26) None of these 10 students would have passed if they had taken the exam.

Suppose we take the structures of these sentences, respectively, to be:

(27) *No* x_i *[*x_i *is one of these 10 students] [*x_i *passed if* x_i *took the exam]*

(28) *No* x_i *[*x_i *is one of these 10 students] [*x_i *would have passed if* x_i *had taken the exam]*

Following Heim's (Heim, 1983) CCP for *every* (29), we offer (30) as CCP for *no*:

(29) c + Every x_i [R][N]=
$\{< g, w >\in$ c: for every a, if $< g^{i\rightarrow a}, w >\in c+R$, then $< g^{i\rightarrow a}, w >\in c+R+N\}$

(30) c + No x_i [R][N]=
$\{< g, w >\in$c: for every a, if $< g^{i\to a}, w >\in c+R$, then $< g^{i\to a}, w >\notin c+R+N\}$

But for reasons we saw in the last subsection, we need to look even deeper into the local context for the antecedent and consequent. Again (implausibly) adopting a material conditional semantics for both counterfactual and indicative conditionals, where the CPP of a conditional $A \to C$ is

$$c+(A \to C) = c\backslash((c+A)\backslash(c+A+C))$$

we find that the local context for the interpretation of the conditional antecedent in (26) is c+R, while the local context for interpreting the consequent is c+R+*A*.

Now, suppose a speaker chooses to utter (26) instead of (25) in a context where it has not been determined, for any of these 10 students, whether they took the exam or whether they passed. The local context for the interpretation of the antecedent 'x_i had taken the exam' is c+R, which by hypothesis includes a pair <g,w> where g(x_i) is one of these 10 students and g(x_i) took the exam in w. This means that the stronger presupposition of the alternative antecedent 'x_i took the exam' is satisfied in c+R. Given Weakened Local MP*, the audience may infer that the speaker does not take that stronger presupposition to be accommodable and true. Under the authority assumption, it may be inferred that the speaker does not take the stronger presupposition to be true; under the competence assumption it may be inferred that the speaker takes the stronger presupposition to be false; under the reliability assumption it may be inferred that the presupposition is false. The same holds for each x_i that satisfies R, and it follows that the presupposition that it is possible that x_i took the exam is false for each of these 10 students x_i.

6.3.2 Weakened Local MP* Incorrectly Derives Consequent Falsity

Now this story raises a novel problem for counterfactual consequent falsity. By way of comparison, note that (31) implicates that John passed the course, and it seems that (26) also implicates that all of these 10 students passed the exam.

(31) John wouldn't have passed if he had written the exam.

But we do not generate this result when we apply Local MP* to the consequent of (26). The consequent of (26) is 'x_i had passed' and its indicative competitor is 'x_i passed'. The local context for the interpretation of the consequent is c+R+*A*. Let us suppose that this context is consistent with the presupposition of the indicative alternative. Then from the speaker's choice of a presuppositionally weak alternative, the audience may infer that the speaker does not take that stronger presupposition (i.e., that it is possible that x_i passed) to be accommodable and true. Under the authority assumption, it may be inferred that the speaker does not take it to be possible that x_i passed; under the competence assumption it may be inferred that the speaker takes it that x_i did not pass; under the reliability assumption it may be inferred that x_i did not pass. The same holds for each x_i that satisfies R, and it follows that the presupposition that it is possible that x_i passed exam is false for all of these 10 students x_i. We wanted to derive that all 10 students passed, and we have derived that all 10 students failed.

The problem is that in the semantics of 'no' the negation ends up in the wrong place. Note that the parallel problem does not arise for the equivalent sentence quantified by 'all':

(32) All of these 10 students would not have passed if they had written the exam.

Here the negation is part of the consequent, where it needs to be to derive the desired implicature.

Comments that help us address this problem are provided in (Higgenbotham, 2003).

6.3.3 Higgenbotham's Proposal and Conditional Excluded Middle

In (Higgenbotham, 1986) and (Higgenbotham, 2003) it was noted that the interpretation of indicative conditionals under quantifiers appears to depend on the embedding quantifier. Higgenbotham's (2003) example is:

(33) Everyone will succeed if he works hard.

(34) No one will succeed if he goofs off.

The interpretation of (33) is as one would expect: for every x_i, x_i working hard is a sufficient condition for x_i's success. The same does not hold for (34), which does not claim that there is no one x_i such that x_i goofing off is a sufficient condition for x_i's success. That's too weak. It in fact makes the stronger claim that no one x_i is such that goofing off is consistent with x_i's success, that for every x_i, x_i's goofing off is sufficient for x_i's not succeeding.

This is a problem for (some versions of) the compositionality hypothesis, since the interpretation of the conditional depends on information (the nature of the embedding environment) that is not available at the point where the conditional is interpreted. Higgenbotham argues for principle (35):

(35) (Assertions of) quantified conditionals whose quantifiers are not monotone increasing presuppose (CEM) (p. 193).

Where A and C are propositional variables and $>$ is the (Stalnakerian) conditional connective, Conditional Excluded Middle (CEM) is: $(A>C)\vee(A>\neg C)$. This enables the conditional to be interpreted as usual locally. But it is then subject to strengthening. For $(\forall x)\neg(G(x) > F(x))$ together with CEM entail that $(\forall x)(G(x) > \neg F(x))$.

No matter how we address Higgenbotham's problem, it seems that the correct logical form for the indicative competitor of (26) is not $(\forall x)\neg(G(x) > F(x))$ but rather the stronger $(\forall x)(G(x) > \neg F(x))$. But this puts the negation in the right place so that we can generate the desired antipresupposition of counterfactual consequent falsity for counterfactuals embedded under 'no'. For now we can see that given an utterance of (26) the sentences S and S' that compete for a place in this logical form are 'x_i did not pass' and 'x_i had not passed', respectively. The local context for interpreting the consequent of the conditional, employing (29), is c+R+x_i had written the exam. If this context admits the possibility that x_i did not pass, then from the fact that the speaker chose to fail to presuppose the possibility that x_i did not pass, the audience may infer that the speaker does not take it to be both accommodable and true that x_i did not pass. Assuming that she takes herself to be accommodable, the audience may infer that the speaker does not take it to be true that x_i did not pass. As before, the competence and reliability assumptions may convert this into a belief that it is not the case that x_i did not pass. The same holds for each x_i, and the result is the desired implicature that each of the 10 students passed.

7 Conclusion

In this paper I have outlined a mechanism that explains the implicature of counterfactual antecedent falsity, which involves a particular account of the presupposition of competing conditionals and

the mechanism of antipresuppositions. I developed two objections to this account: the problem of the antipresuppositions of counterfactuals embedded under 'no' and the problem of providing a parallel derivation of counterfactual consequent falsity. It was determined that one possible resolution to the former problem, an appeal to existential projection under 'no', was inconclusive. It was then shown that both problems can be addressed by adopting a version of Local Maximize Presupposition, as recommended by Singh (2011) and adopting Higgenbotham's account of the logical form of conditionals embedded under 'no'.

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