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Presupposition Projection and Conditionalization

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Abstract I explain what exactly constrains presupposition projection in compound sentences and argue that the presuppositions that do not project are conditionalized, giving rise to inferable conditional presuppositions. I combine elements of (Gazdar in Pragmatics: implicature, presupposition, and logical form. Academic Press, New York 1979) and (van der Sandt in Context and presupposition. Croom Helm, London 1988) which, together with an additional, independently motivated assumption, make it possible to construct an analysis that makes correct predictions. The core of my proposal is as follows: When a speaker felicitously utters a compound sentence whose constituent clauses (considered in isolation) require presuppositions, the hearer will infer that the speaker presupposes those propositions, unless the sentence contains some element that makes the hearer realize that, if the speaker actually presupposed them, she would be either uninformative or inconsistent in her beliefs. In these cases, the propositions that would have been presupposed, had the clauses been uttered in isolation, will not be presupposed, i.e. the clausal presuppositions will not project.

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1 The Projection Problem of Presupposition

One of the distinctive features of presuppositions is that they *project*. To say that presuppositions project amounts to saying that they escape from the scope of operators such as negation, modals, *believe*-type verbs, as well as from within the antecedent clauses of conditionals and from within questions. This is because these operators usually target the truth-conditional content of a sentence but not its presuppositional content. For instance, the sentence in (1a), carries the presupposition in (1b):

(1)   a. Chris has given up writing.
      b. ≫ Chris used to write.

The presupposition in (1b) is 'triggered' by the aspectual verb *give up*. Lexical expressions like aspectual verbs, factive verbs, definite noun phrases, possessive noun phrases, and particles like *too, also, again, still, yet* are presupposition triggers. Additionally, syntactic constructions (i.e. clefts and pseudo-clefts), and focused constituents may also trigger presuppositions. In (1b), I use the symbol ≫ to indicate that the sentence in (1b) expresses the presupposition carried by the sentence in (1a). I will use this notational device throughout the paper. Whenever I say that a sentence/clause carries a presupposition, I mean that, if that sentence/clause were uttered in isolation, i.e. as a simple sentence, the speaker would be committed to the truth of the relevant presupposition (Stalnaker 1973, 1974), regardless of whether she would actually *believe* that presupposition.

As we can see in the following examples, if (1a) is embedded within the scope of an operator, in the antecedent clause of a conditional, or the sentence is transformed into a question, the presupposition in (1b) projects to the main context. As a result, each of the sentences in

(2a–e), considered as a whole, also carries the presupposition in (1b)(=(2f)):

(2) a. Chris has not given up writing/ It is not true that Chris has given up writing.
   b. It is possible that/ Perhaps/ Maybe Chris has given up writing.
   c. Lenny thinks/believes that Chris has given up writing.[1]
   d. If Chris has given up writing, he must be depressed.
   e. Has Chris given up writing?/ Is it true that Chris has given up writing?
   f. $\gg$ Chris used to write.

Note that, if presuppositions are defined as propositions whose truth the speaker takes for granted for the purposes of the conversation or communicative exchange, there is nothing surprising in the fact that they project. The linguistic fact that presuppositions project is just a reflection of the fact that a speaker who is committed to the truth of a proposition for the purposes of a communicative exchange will keep her commitment regardless of whether the sentence that contains the presupposition trigger is within the scope of an operator. For instance, if a speaker is committed to the truth of the proposition that Chris used to write (2f), she will keep her commitment to the truth of this proposition when she asserts that Chris has given up writing (1a), denies that Chris has given up writing (2a), entertains the possibility that Chris has given up writing (2b, 2d), reports that someone thinks that Chris has given up writing (2c), or asks whether Chris has given up writing (2e).

Furthermore, a sentence which (as a whole) carries a presupposition requires the truth of that presupposition in order to be felicitously uttered in a context. Thus, the context must entail the relevant presupposition. I take a speaker-centered approach to the common ground and follow (Karttunen 1974) in regarding the context as "[the] set of logical forms that describe the background assumptions, that is, whatever the speaker chooses to regard as being shared by him and his intended audience" (p 182). From this viewpoint, to say that a speaker presupposes a proposition since, otherwise, her utterance would not be felicitous in a given context amounts to saying that the context in which the sentence is uttered entails that presupposition.

In this paper, I will tackle the projection problem in compound sentences. By 'compound sentences' I refer not only to natural language sentences that correlate with logical conjunction and disjunction, but also to those that correlate with logical implication. It may happen that a speaker who utters a compound sentence presupposes a

presupposition which is carried by a constituent clause of the sentence. This is often the case when it is the first clause that carries a presupposition, but it is not so often the case when a clause other than the first one carries a presupposition. This is because the presuppositions carried by the clauses of compound sentences do not follow a single projection (or lack of projection) pattern, and thus making accurate predictions about what presuppositions project and what presuppositions do not project has been considered a problem, hence the so-called 'projection problem' (Langendoen and Savin 1971).

For instance, a speaker who utters any of the sentences in (3a), (3b) or (3c) presupposes the proposition expressed by the sentence in (3d). We can also say that (3a), (3b) and (3c), considered as a whole, carry the presupposition in (3d), that (3d) projects, or that (3d) must be entailed by the context in which (3a), (3b) and (3c) are uttered:

(3) a. Lida cares about her health and will stop smoking.
   b. If Lida cares about her health, she will stop smoking.
   c. Either Lida does not care about her health or she will stop smoking.
   d. $\gg$ Lida smokes.

Nevertheless, there are cases in which the speaker uses a presupposition trigger without presupposing the relevant proposition. For example, the second clause of the conjunctive sentence in (4a) carries the presupposition in (4b). However, the speaker of (4a) does not presuppose that (4b) since she asserts that (4b). Thus, (4a), as a whole, does not carry the presupposition that (4b):

(4) a. Chris used to write, but he has given up writing.
   b. $\ngg$ Chris used to write.

Furthermore, there are cases in which the speaker uses a presupposition trigger without committing herself to the truth of the relevant proposition. For example, both the consequent of the conditional sentence in (5a) and the second clause of the disjunctive sentence in (5b) carry the presupposition in (5c). However, the speaker of (5a) is not committed to the truth of (5c), on the assumption that the antecedent of (5a) is used to make a supposition. Likewise, the speaker of (5b) is not committed to the truth of (5c). Thus, neither (5a) nor (5b), considered as a whole, carries the presupposition in (5c):

(5) a. If Chris used to write, he has given up writing (since I never see him write).
   b. Either Chris did not use to write or he has given up writing (since I never see him write).
   c. $\ngg$ Chris used to write.

Finally, in other cases, the speaker does not presuppose the relevant proposition unconditionally but presupposes

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that the relevant proposition is the case if another proposition is the case. For example, the second clause of the sentences in (6a), (6b) and (6c) carries the presupposition in (6d). However, I will argue that (6a), (6b) and (6c) all presuppose (6e) rather than (6d). This is already convincing for (6b) and (6c), but many speakers have the opposite intuition for (6a):

(6)   a. Chris is in Copenhagen, but Lenny won't discover that he's staying at a hotel near the Tivoli Gardens.
       b. If Chris is in Copenhagen, Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
       c. Either Chris is not in Copenhagen or Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
       d. ≫̸ Chris is staying at a hotel near the Tivoli Gardens.
       e. ≫ If Chris is in Copenhagen, he's staying at a hotel near the Tivoli Gardens.

In Sect 2.2.1, I will argue that this intuition owes to the fact that, upon the utterance of (6a), the hearer infers (6d). However, if the speaker presupposed (6d) (always on the premise that both the speaker and her audience know that the Tivoli Gardens are in Copenhagen), she would not assert that Chris is in Copenhagen. But a speaker who asserts (6a) asserts both conjuncts, and thus asserts that Chris is in Copenhagen. Hence, she does not presuppose (6d). In Sect. 2.1.1, I will elaborate on the impossibility of asserting and presupposing a proposition simultaneously, independently of the fact that the propositions which are asserted, and subsequently accepted, are ultimately presupposed.

As for (6b) (understood as a hypothetical conditional, i.e. the speaker does not know whether the antecedent is true or false) and (6c), the speaker implicates that it is compatible with her beliefs that Chris is not in Copenhagen. Therefore, on the assumption that the speaker represents herself as being consistent in her beliefs, she does not presuppose (6d). In Sect. 2.1.2, I will elaborate on the uncertainty implicatures associated with the non-asserted clauses of compound sentences, i.e. the antecedent of truly hypothetical indicative conditionals and the clauses of disjunctions.

In the literature (Karttunen 1973, 1974; Karttunen and Peters 1979; Gazdar 1979; Heim 1983; van der Sandt 1988, 1992; Zeevat 1992; Geurts 1999; Beaver 2001; Pérez Carballo 2008; Singh 2008; Schlenker 2011; Lassiter 2012, among others), there has been a considerable amount of effort in order to make systematic predictions about the projection and lack of projection of presuppositions. However, to date, no theory has provided a comprehensive solution to the projection problem in compound sentences.

The above mentioned theories represent two opposite approaches to the projection problem. On the one hand,

(Gazdar 1979) and (van der Sandt 1988) base their analyses on the idea that the potential or elementary presuppositions of a compound sentence, i.e. the presuppositions carried by its constituent clauses, project except for cases in which they are pragmatically constrained. That is, ideally, presuppositions project. If they do not project, there is some constraint that precludes projection.

This is opposed to the view defended by satisfaction theorists (Karttunen 1974; Heim 1983; Beaver 2001; among others) and by the binding and accommodation theory (van der Sandt 1992; van der Sandt and Geurts 1991; Geurts 1999), on which, ideally, presuppositions do not project to the main context.

The satisfaction theorist maintains that presuppositions must be satisfied (i.e. entailed) by their local contexts. Thus, she argues, if the local context does not coincide with the global context, but results from the incrementation of the global context with the logical form of an incoming sentence or clause (e.g. the local context that results from the incrementation of the global context with the logical form of the first clause of a compound sentence), presuppositions will not project in their original unconditional form. However, I argue, local satisfaction and projection may coexist and, in fact, often coexist. This is because it usually happens that local satisfaction is no more than a logical consequence of global satisfaction (i.e. entailment by the main context). Nevertheless, this fact, noted by (Karttunen 1974), is overlooked by most satisfaction theorists, who develop theories of accommodation in order to account for the unconditional inferences that, in many cases, the hearer draws.

As for the binding and accommodation theory, it is based on the idea that presuppositions are anaphors and, as such, presuppositions are ideally bound and do not project. However, in many cases, there is no suitable and accessible antecedent and, in these cases, the theory must resort to the concept of *accommodation* of the so-called *presuppositional anaphor*, where accommodation is understood as a sort of binding.

In this paper, I will adopt the view that failure of presupposition projection is the consequence of a pragmatic constraint (Gazdar 1979; van der Sandt 1988). I maintain that, upon the utterance of a sentence that contains a presupposition trigger, it is natural for the hearer to infer that the speaker presupposes the relevant proposition. However, it may happen that the speaker's utterance contains some element that makes the hearer realize that, if the speaker presupposed the relevant proposition, she would be either redundant or inconsistent in her beliefs. On the assumption that all the speaker's assertions are informative and that the speaker is consistent in her beliefs, the hearer will not infer in the latter cases that the speaker presupposes the relevant proposition, notwithstanding the presence of a presupposition trigger. My key point is that these two constraints are

enough to explain failure of presupposition projection in compound sentences. Their ultimate purpose is to preserve the appropriateness of the sentence uttered.

I will provide an answer to the following two questions: 1. What exactly constrains presupposition projection? Or, what amounts to the same thing, how does the hearer infer that many propositions that would have been presupposed, had certain clauses of certain compound sentences been uttered in isolation, are not presupposed by the speaker? 2. What happens with those propositions, i.e. the 'potential presuppositions' that do not project?

(I need to make a digression here. I use the term 'potential presupposition', for lack of a better name, but my use of the term differs from that in (Gazdar 1979). Gazdar defines "the potential presuppositions of sentences in terms of their components and constructions, as if potential presuppositions were something given to us by the lexicon and the syntax. […] They are what the presuppositions would be if there were no "projection problem", no "ambiguity" in negative sentences, and no context-sensitivity. [They] are entities whose only role is a technical one in the process of assigning actual presuppositions to utterances" (p 124). In my view, certain lexical expressions and syntactic constructions (so-called 'presupposition triggers') point at the possibility that the context entails certain propositions which are presupposed, though this possibility is not always actualized. However, Gazdar's conceptualization of potential presuppositions as statements of the form *Speaker knows that* χ, where χ is the proposition that would have been presupposed had the relevant clause been uttered in isolation, is inconsistent with the proper use of the term *potential*. If the speaker knew that χ, χ would not be potentially presupposed, but *actually* presupposed by the speaker. Therefore, I will regard potential presuppositions as propositions that would have been presupposed, had the relevant clauses been uttered in isolation.)

In order to answer the first question, I will build on the notion of speaker presupposition (Stalnaker 1973, 1974) as well as on the work of (Gazdar 1979) and (van der Sandt 1988). In relation to the second question, I will analyze the phenomenon of presupposition conditionalization.

2 The Proposal

In this section, I will deal with compound sentences of the forms $\varphi \: and \: \psi_\pi$, $if \: \varphi, \: then \: \psi_\pi$, and $either \: \varphi \: or \: \psi_\pi$, where π is the presupposition carried by ψ_π. These sentence forms correspond to the types of grammatical conjunction that, in natural language, correlate with the logical connectives *conjunction* ($\land$), *implication* ($\rightarrow$) and *disjunction* ($\lor$) and it is in this sense that I will use the relevant terms.

The proposal is divided into two sections which address the issues of pragmatic constraints on projection and the phenomenon of presupposition conditionalization, respectively, thus providing an answer to the two questions that were raised at the end of the preceding section.

2.1 Pragmatic Constraints on Projection

My proposal hinges on the following idea: Presupposition projection is constrained in order to preserve the assumptions that the speaker is informative and consistent in her beliefs. Thus, in cases where the projection of a potential presupposition, i.e. a presupposition that is carried by a constituent clause and that may or may not be presupposed by the speaker, would make the speaker's assertion uninformative or the speaker's utterance inconsistent with what she seems to believe, projection is blocked.

In conjunctions, each clause is used to make an assertion and thus, informativeness will be the key notion in order to explain why the projection of a potential presupposition may be blocked. By contrast, neither the antecedent of a conditional sentence nor the clauses of disjunctive sentences are used to make assertions. In conditionals in which the antecedent is used to make a supposition, the speaker is uncertain about the truth or falsity of the antecedent. Likewise, in disjunctions, the speaker is uncertain about the truth or falsity of each disjunct taken separately. Therefore, in the latter types of sentence, belief consistency will be crucial in order to explain why the projection of a potential presupposition may be blocked.

2.1.1 Informativeness

As noted by (van der Sandt 1988), in conjunctions of the form $\varphi \: and \: \psi_\pi$, where π entails φ, the projection of π would make the speaker's assertion of φ uninformative. That is, if the speaker presupposed that π, her assertion of φ would be redundant. The idea dates back to (Stalnaker 1978). According to Stalnaker, if a speaker presupposes that π, π is true in all the worlds of the context set, i.e. the set of worlds where every proposition which is presupposed is true. Also, according to Stalnaker, the essential effect of an assertion is to reduce the context set, i.e. to discard all the worlds where the asserted proposition is false. Thus, if a speaker asserts that φ, and φ is entailed by π which, in turn, is presupposed, she does not perform any reduction of the context set since she asserts a proposition which is already true in all the worlds of the context set.

It follows from Stalnaker's notions of presupposition and assertion that it is not possible to assert and presuppose the same proposition at the same time. For a speaker who presupposes that χ acts as if she believed that χ and as if she believed that her interlocutor believes that χ (Stalnaker

1978), whereas a speaker who asserts that χ (with the intention of informing her interlocutor that χ is the case) acts as if she believed that χ, but not as if she believed that her interlocutor believes that χ. Furthermore, a speaker cannot informatively assert that φ at the same time as she presupposes that π, where π entails φ.

Let us look at an example. The sentence in (7a) does not carry the presupposition in (7c) for, if it did, the assertion of (7b) would be redundant. A speaker who presupposes that (7c) acts as if she believes that (7c) and as if she believes that her interlocutor believes that (7c) as well. Therefore, this speaker cannot informatively assert that (7b):

(7) a. Chris is in Copenhagen, but Lenny won't discover that he's staying at a hotel near the Tivoli Gardens.
     b. Chris is in Copenhagen.
     c. $\gg$ Chris is staying at a hotel near the Tivoli Gardens.

From the hearer's perspective, the key question is: if π (in the example above, (7c)) were a presupposition of the speaker, would the sentence be felicitous? In principle, π is just a potential presupposition that may or may not be presupposed by the speaker. Thus, the assumption that all the speaker's assertions are informative overrides the possibility that π might be presupposed by the speaker. Consequently, the hearer does not infer that the speaker presupposes that π.

However, (7c) is inferred by the hearer. Since (7c) is not an entailment of (7a) either, since the presupposition-inducing clause is in the scope of negation, the question arises as to how the hearer infers (7c). I will answer this question in Sect. 2.2.1, where I address the phenomenon of presupposition conditionalization.

2.1.2 Belief Consistency

Let us now see how, in conditionals and disjunctions, the hearer's assumption that the speaker is consistent in her beliefs is crucial when it comes to determine whether a potential presupposition projects. What I understand by *belief consistency* amounts to (Hintikka 1962)'s notion of *epistemic defensibility*, according to which a set of sentences $\{\varphi_1, \varphi_2 \ldots \varphi_n\}$ is epistemically defensible just in case $K(\varphi_1 \, and \, \varphi_2 \, and \ldots \varphi_n)$ is consistent, where K is Hintikka's epistemic necessity operator, so that $K_a\varphi_i$ stands for *a knows that φ_i*.

Just as happened in conjunctions, though for different reasons, in conditionals of the form *if φ, then ψ_π*, where π entails φ, the projection of π would make the sentence infelicitous. I am focusing on the interpretation of the sentence on which the antecedent is used to make a supposition; that is, the speaker does not represent herself as believing that the antecedent is true. On this interpretation, if π projected, the speaker would show inconsistency in her beliefs. This is because there would be inconsistency between the speaker's belief that π and the fact that the falsity of φ must be compatible with the speaker's beliefs. The set $\{\Box_{Dox}\pi, \Diamond_{Dox}\neg\varphi\}$, where π entails φ, is inconsistent. $\Box_{Dox}$ represents belief (i.e. doxastic necessity) and $\Diamond_{Dox}$ represents compatibility with one's beliefs (i.e. doxastic possibility).

I represent the speaker's presupposition that π as $\Box_{Dox}\pi$ since, if the speaker presupposes that π, she believes that π or, at least, represents herself as believing that π. The fact that the falsity of φ must be compatible with the speaker's beliefs is explained as follows: The speaker is making a supposition and, therefore, the context in which *if φ, then. . .* is uttered must be compatible with both φ and $\neg\varphi$. Both φ and $\neg\varphi$ are contextually possible ($\Diamond\varphi$ and $\Diamond\neg\varphi$). (Stalnaker 1975) argues that the requirement that the context be compatible with the antecedent of an indicative conditional is a pragmatic constraint. However, in order not to rule out indicative conditionals whose antecedents are believed to be true, he does not say anything about the requirement that the context be compatible with the negation of the antecedent as well. Nonetheless, this paper is just concerned with genuinely hypothetical conditionals and, with respect to the latter, the requirement that the context be compatible with the negation of the antecedent is as crucial as the requirement that it be compatible with the antecedent. Hence, on the assumption that the speaker believes everything that is in the context or, at least, represents herself that way, the hearer draws the inference $\Diamond_{Dox}\neg\varphi$, i.e. the falsity of φ is compatible with the speaker's beliefs.

Let us look at an example. The sentence in (8a) does not carry the presupposition in (8c) for, if it did, the speaker would show inconsistency in her beliefs by presupposing that (8c) at the same time as she implicates that the falsity of (8b) is compatible with her beliefs:

(8) a. If Chris is in Copenhagen, Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
     b. Chris is in Copenhagen.
     c. $\gg$ Chris is staying at a hotel near the Tivoli Gardens.

Once the hearer infers that the falsity of the antecedent is compatible with the speaker's beliefs, she cannot withdraw this inference. This implicature is not defeasible. (As was mentioned before, some occurrences of indicative conditionals are such that the speaker believes in the truth of the antecedent. However, in these cases, the context must not be just compatible with φ but must entail φ. Therefore, it is not that, in these cases, the implicature that $\Diamond_{Dox}\neg\varphi$ is canceled, but rather that it does not arise.)

Thus, on the one hand, the hearer infers that $\Diamond_{Dox}\neg\varphi$, which cannot be canceled. On the other, π (in the example above, (8c)) is just a potential presupposition that may or may not be presupposed by the speaker. Given that π is a *potential* presupposition, the hearer is not bound to infer that π. In the case at hand, the hearer's assumption that the speaker is consistent in her beliefs overrides the possibility that π might be presupposed by the speaker. Hence, the hearer does not infer that the speaker presupposes that π.

The latter is close to (Gazdar 1979)'s view that *clausal implicatures* can override potential presuppositions, which has been criticized in the literature (Beaver 2001; van der Sandt 2010; among others). According to Gazdar, sentences of the form *if φ, then ψ_π* and *either φ or ψ_π* give rise to the following set of so-called 'clausal implicatures' (Gazdar considers clausal implicatures as conversational quantity implicatures): $\{P\varphi, P\neg\varphi, P\psi_\pi, P\neg\psi_\pi\}$, where P is (Hintikka 1962)'s epistemic possibility operator, and $P\varphi$ stands for *for all the speaker knows, it is possible that φ* or *it is compatible with all the speaker knows that φ*.

As was mentioned at the end of Sect. 1, in Gazdar's theory, every so-called 'potential presupposition' consists of a proposition, π, which would have been presupposed had the relevant clause been uttered in isolation, prefixed with Hintikka's knowledge operator K. The problem is that $K\pi$ (i.e. *the speaker knows that π*) does not represent a potential presupposition, but does represent an actual presupposition of the speaker (though Gazdar takes $K\pi$ to be a purely theoretical construct). According to (van der Sandt 2010), Gazdar prefixes π with K so that there may be a conversational implicature that is inconsistent with the relevant presupposition. For instance, $P\neg\varphi$ is inconsistent with $K\pi$ or, in the notation I use, $\Diamond_{Dox}\neg\varphi$ is inconsistent with $\Box_{Dox}\pi$, where π entails φ. In contrast, if π were not prefixed with K, the argument goes on, π would be consistent with the implicature that $\Diamond_{Dox}\neg\varphi$, and there would be nothing that could prevent π from projecting.

Note that, in my proposal, π is, as in Gazdar's, prefixed with $\Box_{Dox}$. But there is a crucial difference. I argue that what the hearer does in order to decide if π is a presupposition of the speaker is check whether, if π were presupposed, the speaker's utterance would be still felicitous, given that the speaker has implicated that $\neg\varphi$ is compatible with her beliefs, and π entails φ. That is, I argue that the hearer does a bit of possibly counterfactual thinking, instead of setting $\Box_{Dox}$ against $\Diamond_{Dox}\neg\varphi$, and making $\Diamond_{Dox}\neg\varphi$ override $\Box_{Dox}$. It seems clear that, in the case at hand, the hearer does not infer that the speaker presupposes that π.

I will turn now to disjunctions of the form *either φ or ψ_π*, where π entails $\neg\varphi$. The approach is very similar to that of conditionals. The projection of π would make the sentence infelicitous for, if π

projected, the speaker would show inconsistency in her beliefs. This is because there would be inconsistency between the speaker's belief that π and the fact that the truth of φ must be compatible with the speaker's beliefs. The set $\{\Box_{Dox}\pi, \Diamond_{Dox}\varphi\}$, where π entails $\neg\varphi$, is inconsistent.

In relation to disjunctions, (Stalnaker 1975) argues that the context must be compatible with the truth and the falsity of all the clauses of a disjunctive sentence taken separately. Thus, following Stalnaker, the context in which *either φ or ...* is uttered must be compatible with φ or, in other words, φ must be contextually possible ($\Diamond\varphi$). On the assumption that the speaker believes everything that is in the context or, at least, represents herself that way, the hearer draws the inference that φ is compatible with the speaker's beliefs ($\Diamond_{Dox}\varphi$).

Let us look at an example. The sentence in (a) does not carry the presupposition in (9c) for, if it did, the speaker would show inconsistency in her beliefs by presupposing that (9c) at the same time as she implicates that the truth of (9b) is compatible with her beliefs:

(9) a. Either Chris is not in Copenhagen or Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
   b. Chris is not in Copenhagen.
   c. $\gg$ Chris is staying at a hotel near the Tivoli Gardens.

Similarly to what happened with the implicature associated with the antecedent of indicative conditionals, once the hearer infers that the truth of the first disjunct is compatible with the speaker's beliefs, she cannot withdraw this inference. It is true that there are situations (e.g. games, exams) in which a speaker asserts *either φ or ψ* knowing what disjunct is true and which one is false. However, it is not that, in the latter cases, the inferences $\Diamond_{Dox}\varphi$ and $\Diamond_{Dox}\psi$ are canceled, but rather that they do not arise. (In these cases, the context must not only be compatible with one of the disjuncts but must also entail that disjunct, whereas the context must be incompatible with the other disjunct. The hearer may not know what disjunct is entailed by the context, but knows that only one of them is, and also knows that the speaker knows which one is. Therefore, the hearer will not infer that φ is compatible with the speaker's beliefs nor that ψ is compatible with the speaker's beliefs.)

In a parallel way to that in conditionals, the implicature that $\Diamond_{Dox}\varphi$ cannot be canceled; however, π (in the example above, (9c)) is just a potential presupposition that may or may not be presupposed by the speaker. Thus, the hearer's assumption that the speaker is consistent in her beliefs overrides the possibility that π might be presupposed by the speaker. Hence, the hearer does not infer that the speaker presupposes that π.

2.2 Presupposition Conditionalization

In this section, I will address the second question that was raised at the end of Sect. 1, i.e. what happens with a potential presupposition that does not project? In Sect. 2.2.1, my answer will be that the presupposition is conditionalized to the proposition that prevents it from projecting. In Sect. 2.2.2, the discussion will revolve around cases where an appropriate continuation of the sentence cancels the conditionalization, to the effect that the presupposition will project unconditionally.

2.2.1 What Happens with a Potential Presupposition that Does not Project?

I argue that a potential presupposition which does not project is conditionalized to the clause it entails or, in disjunctions, to the negated clause it entails, which is just the opposite of what is argued by (Karttunen 1973, 1974) and satisfaction theories thereof. With respect to conditionals and disjunctions, the latter amounts to saying that the hearer infers that the presupposition carried by the consequent or second disjunct (π) follows from the antecedent (φ) or the negation of the first disjunct ($\neg\varphi$), which, in turn, amounts to saying that she infers that φ (in conditionals) or $\neg\varphi$ (in disjunctions) is a sufficient condition for π.

This claim is based on the observation that, upon the utterance of a conditional sentence like (10a), where a potential presupposition carried by the consequent (in (10b)) entails the antecedent of the sentence, the potential presupposition does not project unconditionally (for the reasons given in Sect. 2.1.2), but what projects is a conditional presupposition (in (10c)) whose antecedent is the antecedent of the sentence and whose consequent is the potential presupposition:

(10) a. If Chris is in Copenhagen, Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
  b. $\gg$ Chris is staying at a hotel near the Tivoli Gardens.
  c. $\gg$ If Chris is in Copenhagen, he's staying at a hotel near the Tivoli Gardens.

In a similar way, upon the utterance of a disjunctive sentence like (11a), where a potential presupposition carried by the second disjunct (in (11b)) entails the negation of the first disjunct of the sentence (since, if Chris is in a hotel near the Tivoli Gardens, it is not the case that he is not in Copenhagen – I assume that double negation cancels out), the potential presupposition does not project unconditionally, but what projects is a conditional presupposition (in (11c)) whose antecedent is the negation of the first disjunct of the sentence and whose consequent is the potential presupposition:

(11) a. Either Chris is not in Copenhagen or Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
  b. $\gg$ Chris is staying at a hotel near the Tivoli Gardens.
  c. $\gg$ If Chris is in Copenhagen, he's staying at a hotel near the Tivoli Gardens.

Given what has been said so far, there is no clear reason why this should be so, since, as was stated in Sect. 2.1, potential presuppositions fail to project in cases where *they entail* a previous clause or its negation, and not the other way round. Therefore, the antecedent (in conditionals) or the negation of the first disjunct (in disjunctions) express necessary conditions for the potential presuppositions (in the consequent or in the second disjunct) that entail them. In conditionals, π is contingent on φ, which is uncertain (since the falsity of φ is compatible with the speaker's beliefs). In disjunctions, π is contingent on $\neg\varphi$, which is uncertain (since the truth of φ is compatible with the speaker's beliefs). This dependence on something which is uncertain explains why π does not project, but does not explain why the hearer infers that π follows from φ or $\neg\varphi$ (from now on, I will write $(\neg)\varphi$ when I need to represent both the antecedent of a conditional (φ) and the negation of the first disjunct of a disjunction ($\neg\varphi$)). The only plausible explanation for why the hearer infers that $(\neg)\varphi$ is a sufficient condition for π is that, upon the utterance of the sentence, π is inferred to be contingent on $(\neg)\varphi$ and on nothing else, so that it is inferred that $(\neg)\varphi$ is all that is necessary for π (there are no other necessary conditions), and thus that $(\neg)\varphi$ is not just necessary but also sufficient for π. Hence, the conditional presupposition *if* $(\neg)\varphi$, *then* π.

As a matter of fact, if an additional necessary condition for π is provided, χ, π is conditionalized to χ too. That is, the presupposition is conditionalized to the conjunction of both necessary conditions. The conjunction (as a whole) is then interpreted as everything that is necessary, and thus sufficient for the presupposition.

For example, suppose that in order for Chris to stay at a hotel near the Tivoli Gardens, not only must he be in Copenhagen but he must have come alone (otherwise, Chris might stay somewhere else). The small discourse in (12a), considered as a whole, carries the conditional presupposition in (12b):

(12) a. If Chris is in Copenhagen, Lenny will discover that he's at a hotel near the Tivoli Gardens. Unless he has not come alone, in which case he might stay somewhere else.
  b. $\gg$ If Chris is in Copenhagen and he has come alone, he's staying at a hotel near the Tivoli Gardens.

Before continuing, I would like to clarify why I defend a unified analysis for conditionals and disjunctions. Regardless of whether we adopt the material implication analysis of indicative conditionals or we reject it and instead adopt (Stalnaker 1968, 1975)'s account, it is reasonable to infer *if ¬φ, then ψ* from *either φ or ψ*. On the material implication analysis, they are logically equivalent. According to Stalnaker, indicative conditionals are not material implications, and thus *if ¬φ, then ψ* and *either φ or ψ* are not equivalent; nevertheless, it would be reasonable to infer the former from the latter. In the examples above, it would be reasonable to infer (10a) from (11a).

It is worth noting that the resulting conditional inference, *if (¬)φ, then π* is actually an equivalence: *iff (¬)φ, then π*, since π entails (¬)φ. However, what the hearer infers to be presupposed is *if (¬)φ, then π*, not the entailment of (¬)φ by π. The conditional presupposition is predicted to survive when we embed these sentences further, as we will presently see.

A standard way of testing whether an inference is a presupposition consists in embedding the sentence whose utterance gives rise to the relevant inference in the *if*-clause of a conditional sentence and see whether the inference survives. (As we saw in Sect. 1, presuppositions generally project from the *if*-clauses of conditionals.) If (13a) is embedded in the *if*-clause of a conditional sentence (as in 13b), (13c) projects:

(13)   a. Chris is in Copenhagen and Lenny will discover that he's at a hotel near the Tivoli Gardens.
       b. If Chris is in Copenhagen and Lenny discovers that he's at a hotel near the Tivoli Gardens, we'll be in trouble.
       c. ≫ If Chris is in Copenhagen, he's at a hotel near the Tivoli Gardens.

The test above supports the hypothesis that (13c) is the presupposition carried by (13a), particularly if we compare the embedding in (13b) with that in (14b) below, where the conjunctive sentence in (14a), which carries the unconditional presupposition in (14c), has been embedded in the antecedent. The presupposition in (14c) projects in its original unconditional form in (14b):

(14)   a. Lida cares about her health and will stop smoking.
       b. If Lida cares about her health and stops smoking, Lenny will be happy.
       c. ≫ Lida smokes.

This contrast shows that it is not the embedding in the antecedent of a conditional that produces the conditionalization. Unless the conjunctive sentence that is embedded already carries a conditional presupposition, the presupposition that projects in the embedding will be unconditional.

In a similar way, if (15a) is embedded under an epistemic modal, as in (15b), the conditional presupposition in (15c) projects:

(15)   a. Chris is in Copenhagen but Lenny won't discover that he's at a hotel near the Tivoli Gardens.
       b. It is possible that Chris is in Copenhagen but Lenny won't discover that he's at a hotel near the Tivoli Gardens.
       c. ≫ If Chris is in Copenhagen, he's at a hotel near the Tivoli Gardens.

By contrast, the embedding of (14a) above under an epistemic modal does not result in the conditionalization of (14c), as the reader can check for herself. The latter presupposition projects in its original unconditional form.

An important question that arises at this point is whether conditional presuppositions also project in conjunctions. Unlike what happens in conditionals and disjunctions, when a sentence of the form *φ and ψ_π* (where π entails φ) is asserted, the hearer does not infer *if φ, then π*, but just π. However, for the reasons given in Sect. 2.1.1, π must not project unconditionally, and thus π cannot be the presupposition of the whole sentence. Let us look at an example. Upon the utterance of (16a), the hearer infers (16b). However, if (16a) as a whole carried the presupposition that (16b), its first clause would be uninformative (the symbol ⤳ represents the hearer's inferences which are not presupposed):

(16)   a. Chris is in Copenhagen, and Lenny will discover that he's staying at a hotel near the Tivoli Gardens.
       b. ⤳ Chris is staying at a hotel near the Tivoli Gardens.
       c. ≫ If Chris is in Copenhagen, he is staying at a hotel near the Tivoli Gardens.

It might be argued that (16b) is 'accommodated' after the first clause of (16a) has been asserted, as is defended by the binding theorists. Nonetheless, if 'accommodation' is understood as recognition on the part of the hearer of the presuppositions of the speaker (as it is understood in this paper)[2], this argument is untenable. If a speaker asserts that φ (*Chris is in Copenhagen*), she does not presuppose that π (*Chris is staying at a hotel near the Tivoli Gardens*) either before or after she has asserted that φ. If she presupposed

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[2] I assume (Stalnaker 1978)'s view that the hearer presupposes everything the speaker presupposes. I understand the notion of 'accommodation' as recognition on the part of the hearer that a certain proposition holds in the context, so that the context is not updated with a presupposition at the moment when the hearer infers it, but rather the hearer realizes at that moment what the context is like.

that π before asserting that φ, her assertion would be redundant given that π entails φ, as was explained in Sect. 2.1.1. If she presupposed that π right after asserting that φ, without the assertion of π in between, she would be acting as if π was in the main context before φ was asserted. Thus, φ would be redundant in this case too.

By contrast, suppose that the interlocutors are not sure of whether Chris is in Copenhagen, but are sure that if Chris is in Copenhagen, he's staying at a hotel near the Tivoli Gardens (16c). At a certain point in the conversation, one of the interlocutors is informed by a third party (e.g. she gets a phone call) that Chris is in Copenhagen and, in turn, informs the other participants in the conversation of this. At that point, it is inferred that Chris is at a hotel near the Tivoli Gardens (16b) by the rule of *modus ponens*. That is, the speaker (the interlocutor who is first informed) asserts the antecedent of the conditional presupposition in (16c) and, by *modus ponens*, her audience infers the consequent, which is the inference in (16b). The initial conditional presupposition gives rise to an unconditional inference because the speaker has asserted its antecedent.

However, if (16c) were not presupposed, it would not be acceptable for the speaker to assert (16a), but rather she should assert (17) below:

(17)   Chris is in Copenhagen. He's staying at a hotel near the Tivoli Gardens, and Lenny will discover this.

This is because, whereas it is natural to assert a sentence that expresses a logically stronger proposition following a sentence that expresses a logically weaker proposition (as happens in (17)), this is not the case if the logically stronger proposition is not explicitly stated but expressed as if it were presupposed (as happens in (16a)). I say 'as if it were presupposed' because, in cases where a proposition cannot be easily accommodated, it should be expected that the speaker will not act as if she believed that her audience believes that proposition (see (Stalnaker 1978)).[3]

This leads to a second issue. In conjunctions, the relevant conditional presuppositions are not amenable to being accommodated. The clauses of conjunctions are asserted, and their assertion precludes any uncertainty on the part of the hearer with respect to their truth (on the assumption that the hearer accepts the speaker's assertions, in which case the hearer represents herself as not disbelieving them). Thus, if φ is asserted, and π follows from φ, it is inferred that π.

Nonetheless, in order to infer the conditional presupposition that if φ, then π (in cases where π entails φ), the hearer only has to infer that π is contingent on φ and on nothing else, to the effect that φ is all that is necessary for

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[3] There are exceptions of course; for instance, journalistic style is characterized by passing many assertions off as presupposed.

π, and thus φ is sufficient for π. Therefore, the lack of uncertainty is not in itself responsible for the fact that the conditional presuppositions of conjunctions are not easily accommodated. It is the fact that π is unconditionally inferred that overrides the inference of the conditional presupposition that if φ, then π. However, the latter does not mean that conjunctions cannot carry conditional presuppositions. It just means that the speaker cannot expect that the hearer will act as if she knew that the context entailed them. Therefore, if a conjunction carries a conditional presupposition, as is the case with (16a) above, its felicitous assertion requires the hearer's knowledge that the context entails the relevant conditional presupposition.

As a last point, it might be argued that (16b) is just an entailment of (16a). But this objection does not stand up to scrutiny, for (16b) is also inferred in cases such as (18) below, where the second clause is negated:

(18)   Chris is in Copenhagen, but Lenny won't discover that he's staying at a hotel near the Tivoli Gardens.

2.2.2 Cancellable Conditionalization

There are sentences of the form *if φ, then ψ_π*, in which it is φ that, together with one or more contextual premises, entails π. Notwithstanding the fact that π does not entail φ in these cases (recall that it is the entailment of φ by π that prevents π from projecting), a conditional presupposition of the form *if φ, then π* projects. The phenomenon is not exclusive to conditionals but also occurs in conjunctions and disjunctions. However, in order to simplify the discussion, I will focus on conditional sentences.

The antecedent of (19a), together with the premises that, in order for a non-US citizen to live permanently in the States, she needs a green card, and that Jade is a non-US citizen, entails the potential presupposition in (19c). Though (19c) does not entail the antecedent of (19a), the preferred interpretation of (19a) is that on which the sentence carries the conditional presupposition in (19b):

(19)   a. If Jade does not get a green card, she will regret having to leave the States.
        b. $\gg$ If Jade does not get a green card, she will have to leave the States.
        c. $\ggg$ Jade will have to leave the States.

The question arises why this is the preferred interpretation of the sentence for, even though the antecedent of (19a), together with unstated premises, entails (19c), this in itself should not prevent (19c) from projecting. It is perfectly possible to presuppose a logically weaker proposition, *Jade will have to leave the States*, whereas the truth of a logically stronger sentence, *Jade does not get a green card* (logically stronger given the implicit premises), is

uncertain. To illustrate this further, take the example in (20a). Though the antecedent of (20a) entails the presupposition in (20b) (on the premise that the Tivoli Gardens are in Copenhagen), this does not prevent (20b) from projecting unconditionally:

(20) a. If Chris is staying at a hotel near the Tivoli Gardens, Lenny will discover that he's in Copenhagen.
    b. ≫ Chris is in Copenhagen.

(This is by far the preferred interpretation of (20a). Nonetheless, (20a) might also be interpreted as presupposing the trivially true conditional presupposition that, if Chris is staying at a hotel near the Tivoli Gardens, he is in Copenhagen, which amounts to no substantial presupposition. In fact, this is the only interpretation that satisfaction theorists are able to predict. By contrast, as we will shortly see, my proposal can account for both interpretations.)

My hypothesis is that, in (19a) (and similar examples), the conditionalization sets itself up as the preferred interpretation for the same reason as in the cases we saw in Sect. 2.2.1. The hearer is very likely to infer that the potential presupposition carried by the consequent, π, is contingent on the antecedent of the sentence, φ, so that φ is inferred to be necessary, in addition to being sufficient, for π. This is to say that the hearer is very likely to infer the equivalence in (21) below:

(21) ⤳ Iff Jade does not get a green card, she will have to leave the States.

If the hearer infers that (19c) entails the antecedent of (19a), she infers that the antecedent of (19a) follows from (19c), in (22) below (verb tenses have been adjusted):

(22) ⤳ If Jade has to leave the States, she did not get a green card.

But then (19c) should not project for the reasons given in Sect. 2.1.2. The speaker would show inconsistency in presupposing that (19c), from which the antecedent of (19a) follows, at the same time as the falsity of the antecedent of (19a) is compatible with her beliefs.

In the same way as in the Copenhagen examples in Sect. 2.2.1, the part of the equivalence iff φ, then π that the hearer infers to be presupposed is just if φ, then π. However, unlike in the Copenhagen examples, now, the implication if π, then φ can be canceled. As a matter of fact, it is canceled as soon as, in addition to φ, other sufficient conditions for π are explicitly stated, so that the hearer infers that φ is not necessary for π, and thus π can project. This is exactly what happens if (19a) is followed by a continuation such as that in (23a) below:

(23) a. If Jade does not get a green card, she will regret having to leave the States. But, if *she is*

suspected of espionage, she won't regret having to leave the States.
    b. ≫ Jade has to leave the States.

In the small discourse in (23a) above, the antecedents of the two conditional sentences, i.e. *Jade does not get a green card* and *Jade is suspected of espionage* provide two different sufficient conditions for the presupposition carried by the consequent *Jade has to leave the States*. I am considering the interpretation on which the second sentence of the small discourse in (23a) also carries a conditional presupposition, namely *if Jade is suspected of espionage, she will have to leave the States*, on the assumption that the speaker has in mind that someone suspected of espionage had better leave the country before she is charged with espionage. Though both sentences in (23a), taken separately, carry conditional presuppositions, the small discourse in (23a), considered as a whole, carries the unconditional presupposition in (23b).

The hearer of (23a) will *not* infer that the only possible reason why Jade should leave the States is that she did not get a green card. The reason why she has to leave the country might be that she has been suspected of espionage. Thus, the hearer will not draw the inference in (22) above, and without the latter inference, there is nothing that prevents the presupposition in (23b) from projecting.

The inferential process involved in the conditionalization seems to be closely related to what is known in the literature on conditional sentences as *conditional perfection*, i.e. the phenomenon by which a sufficient condition tends to be interpreted as a sufficient and necessary condition (Geis and Zwicky 1971; van der Auwera 1997; Horn 2000; Canegem-Ardijns and Belle 2008; among others).

The conditionalization is not exclusive to conditional sentences but arises whenever an asymmetric entailment is perfected into a symmetric one. Thus, the disjunctive and conjunctive counterparts to the conditional sentence in (19a), in (24a) and (24b) below, also carry the conditional presupposition in (24c):

(24) a. Either Jade gets a green card or she will regret having to leave the States.
    b. Jade did not get a green card, and she regrets having to leave the States.
    c. ≫ If Jade does not get a green card, she will have to leave the States.

Furthermore, the same inferential process seems to be responsible for the conditionalization that gives rise to the non-presuppositional interpretation ('non-presuppositional' in the sense that the resulting conditional presupposition is trivially true) of sentences such as (25a) (from (van der Sandt 1988)). There is just one way for the hearer to infer that the speaker does not presuppose (25b). She must infer

that the only possible reason why John's wife might be dead is that John murdered her (in (25c)). If that is the case, the hearer will infer that the antecedent of (25a) is a necessary condition, in addition to being a sufficient condition for the presupposition in (25b). As a consequence, (25b) will be conditionalized to the antecedent of (25a), and the result will be the trivially true conditional presupposition in (25d):

(25) a. If John murdered his wife, he will be glad that she is dead.
      b. ≫ John's wife is dead. (Presuppositional interpretation)
      c. ⤳ If John's wife is dead, he murdered her.
      d. ≫ If John murdered his wife, she's dead. (Non-presuppositional interpretation)

Just as happened with the green card example, if the hearer infers (25c), the projection of (25b) is blocked. The speaker would be inconsistent in her beliefs in presupposing that (25b) while allowing for the possibility that the antecedent of (25a) is false, since, if (25c) is inferred, it is inferred that the antecedent of (25a) follows from (25b). Furthermore, without (25c), the entailment in (25d) could not prevent the projection of (25b), since it would be consistent for the speaker to presuppose that (25b) while allowing for the possibility that the antecedent of (25a) is false.

Also, just as happened with the green card example, if the sentence is followed by a continuation that provides a different sufficient condition for the presupposition of the consequent, the conditionalization is canceled, since the antecedent of the sentence is no longer considered a necessary condition for the presupposition of the consequent, which is to say that the inference in (25c) above is canceled.[4] Thus, the small discourse in (26a), considered as a whole, carries the unconditional presupposition in (26b) (ex. from (van der Sandt 1988)):

(26) a. If John murdered his wife, he will be glad that she is dead. But, if *she took those pills herself*, he won't be glad that she is dead.
      b. ≫ John's wife is dead.

A remaining question is why the preferred interpretation of (19a) is that on which the sentence has a conditional presupposition, whereas this is not the case with (25a). The question arises why it is easier to infer the entailment of the antecedent by the presupposition in (19a) than in (25a). A plausible answer is that the number of reasons why

someone should leave the States is much smaller than the number of reasons why someone might be dead. To illustrate this point further, take the sentence in (27a) from (Karttunen 1973). Given that the number of reasons why someone should wear holy underwear is really small, it would be almost impossible not to derive the inference in (27b), thus blocking the projection of (27c) and obtaining the conditional presupposition in (27d):

(27) a. If Geraldine is a Mormon, she has given up wearing her holy underwear.
      b. ⤳ If Geraldine has worn holy underwear, she is a Mormon.
      c. ≫̸ Geraldine has worn holy underwear.
      d. ≫ If Geraldine is a Mormon, she has worn holy underwear.

A final note in relation to the last two sections. My analysis predicts that if a potential presupposition entails – or it is inferred that it entails – just one of the constituent clauses of a clause which is itself compound (or the negation of a clause, if the sentence is a disjunction), the presupposition will be conditionalized to that clause. In that case, unless further conditions are made explicit, it will be inferred that the presupposition is contingent just on the truth of that clause, which not only will block projection, but will lead to the conditionalization of the presupposition.

As for the opposite case, if a potential presupposition entails (or it is inferred that it entails) a conjunction of clauses (or a conjunction of negated clauses, if the sentence is a disjunction), it will be inferred that the presupposition is contingent on each of these clauses and on nothing else. Thus, the presupposition will be conditionalized to the conjunction of these clauses. The example in (12b) from Sect. 2.2.1 exemplifies the latter case. Lack of space prevents me from giving a more detailed analysis, but the general idea is that a potential presupposition that does not project is conditionalized to the clause or conjunction of clauses it entails within the sentence. Unless further conditions are made explicit, the hearer interprets that the presupposition is contingent just on the truth of that clause or conjunction of clauses, which becomes everything that is necessary, and thus sufficient for the presupposition to obtain.

3 Summary

The following two principles: i. the hearer assumes that the speaker is informative, and ii. the hearer assumes that the speaker represents herself as being consistent in her beliefs, can become constraints which prevent the projection of presuppositions in compound sentences. The further

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[4] (Lassiter 2012)'s probabilistic approach to presupposition accommodation leaves the presuppositional interpretation of sentences like (25a) unaccounted for. In other cases, the predictions that follow from my proposal are fully compatible with his results.

assumptions that necessary conditions can be taken to be sufficient, and that sufficient conditions can be taken to be necessary explain the conditionalization of the presuppositions that do not project. As a result, the conditionalization is inferable and unrelated to the material implications that satisfaction theories regard as semantic conditional presuppositions. The latter assumptions are closely related to the phenomenon of conditional perfection, which is crucial in order to account for several aspects of the pragmatics of conditionals, and thus both are independently motivated.

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