

An Epistemic Step for Anti-Presuppositions

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Abstract

Sentence (1) strongly suggests that the speaker does not have a sister:

- (1) John believes that I have a sister.
- a. Alternative: John knows that I have a sister.
 - 5 b. Actual inference: the speaker does not have a sister.
 - c. Predicted inference: it is not common belief that the speaker has a sister.

According to Heim (1991), Percus (2006), and Sauerland (2006), this inference should follow from the comparison of (1) to (1a). However, such an analysis would only predict a very weak implicature: it is not common belief that the speaker has a sister.

10 I propose to strengthen this prediction by two means. First, I rely on a precise understanding of the modern Stalnakerian view of presuppositions and common ground (Stalnaker, 1998, 2002; von Stechow, 2000; Schlenker, 2006). Second, I argue that this inference depends on contextual factors. More precisely, I show that the Competence Assumption (see Spector, 2003, van Rooij and Schulz, 2004, and Sauerland, 2004) necessary to obtain secondary scalar implicatures should be supplemented with an Authority Assumption. I motivate this additional assumption on independent empirical grounds. Finally, I show how my proposal accounts for a wide variety of inferences with fine variations governed by (i) contextual differences and (ii) specific properties of the presupposition triggers involved.

20 1 Introduction

An utterance of sentence (1) most commonly conveys the additional piece of information in (1b). Although this *anti-presupposition* looks very similar to classical cases of scalar implicatures, there is as yet no explicit derivation of this fact.

- (1) John believes that I have a sister.
- 25 a. Alternative: John knows that I have a sister.
 - b. Inference: I don't have a sister.

Let us assume the classical Stalnakerian view of presupposition and common ground (Stalnaker, 1973, 1974) which states that a sentence with presupposition p is felicitous only in contexts where p is common belief (i.e. all participants to the conversation believe that p , all believe that all believe that p , etc.), or so the speaker thinks. If (1a) is an alternative

to (1), the application of a Maximize Presupposition principle à la Heim (1991), as given in (2), predicts the inference that the alternative sentence (1a) is not felicitous. In other words, it predicts that (1) implies that it is not common belief that the speaker has a sister. This prediction is much weaker than the intuitive inference: the speaker does not have a sister.

- 35 (2) Maximize Presupposition: Among a set of alternatives, use the felicitous sentence with the strongest presupposition.

Soames (1982) and Horn (1989) noted that a similar puzzle arises with scalar implicatures:

- (3) John saw some of his students today.
- a. Alternative: John saw all of his students today.
 - 40 b. Predicted inference: It is not the case that the speaker believes that John saw all of his students today.
 - c. Actual inference: The speaker believes that John did not see all of his students today.

The comparison of (3) with (3a) and the application of the Maxim of Quantity – as given in (4) for instance – predicts that an utterance of (3) implicates (3b): it is not the case that the speaker believes that (3a) is true (written: $\neg B_s[p]$, where p refers to the meaning of the alternative (3a) and $B_s[\dots]$ is the operator true of the propositions that the speaker s believes to be true). This inference is weaker than the observed inference in (3c), i.e. $B_s[\neg p]$.

- (4) Maxim of Quantity: Among a set of alternatives, use the most informative sentence you believe to be true.

50 Spector (2003), van Rooij and Schulz (2004) and Sauerland (2004) argue that the inference in (3c) is not available in every context. Rather, this inference is the result of the *epistemic step*, i.e. the enrichment of the weaker inference (3b) via the following contextual assumption about the speaker:

- (5) Competence Assumption:¹
The speaker is opinionated about the truth of the alternative sentence p .
55 Technically: $B_s[p] \vee B_s[\neg p]$.

The purpose of this paper is to argue in favor of a similar solution to the puzzle exemplified in (1). More precisely, I argue that the Competence Assumption should be supplemented with an independently motivated Authority Assumption along the lines of (6). Importantly, the present proposal predicts a variety of inferences depending on fine contextual variations.

- 60 (6) Authority Assumption:
The speaker believes that she could convince her addressee that p is true by simply uttering a sentence presupposing p .

¹This term is due to van Rooij and Schulz (2004), Sauerland (2004) uses the term *Expert hood Assumption*.

In the first section below, I review the crucial parts of theories of Maximize Presupposition and show in more detail why naive solutions to the puzzle presented in (1) fail. The next section spells out the felicity conditions for presuppositional sentences delivered by a modern Stalnakerian view of presupposition as advocated by Stalnaker (1998, 2002), von Fintel (2000), and Schlenker (2006). These theoretical and technical considerations are the necessary preliminaries before I describe and motivate my own proposal. The last section reviews a range of facts which fit naturally with the present account. Technical details are confined to the Appendix.

2 Theoretical situation

In this section, I first review the main facts about theories that use the Maximize Presupposition constraint and point out the minimal assumptions needed for this paper. Next, I show that a whole family of naive proposals inescapably fail to account for (1).

2.1 Background on Maximize Presupposition

The purpose of this sub-section is to introduce the minimal pieces of evidence in favor of the theoretical framework which will be assumed throughout the rest of the paper. In particular, I motivate the type of alternatives which are usually assumed to play a role in the application of the Maximize Presupposition principle and present a set of assumptions to which this paper is an amendment.

Initial motivation: oddness of non-presuppositional sentences

Consider the pairs of sentences given in (7) through (11). The (a) sentences are odd, the (b) sentences are natural. Such examples were first discussed by Hawkins (1991) and analyzed by Heim (1991), the underlying theory was subsequently developed in Magri (2006), Percus (2006), Sauerland (2006) and Schlenker (2006). In a nutshell, these theories argue for an account of these contrasts in two steps: (i) the (a) sentences are in competition with the (b) sentences; (ii) sentences with stronger presuppositions are preferred, if felicitous.

(7) *Context: People have one father.*

a. * John has interviewed a father of the victim.

b. John has interviewed the father of the victim.

(8) *Context: People have one father.*

a. * John has interviewed each father of the victim.

b. John has interviewed the father of the victim.

(9) *Context: People have two arms.*

a. * Mary broke all her arms.

b. Mary broke both her arms.

(10) *Context: Mary has been cheating on John for years ...*

- a. *...and he believes it.
- b. ...and he knows it.

100 (11) *Context: John, a teacher with a very bad hand writing, has just written an exercise on the blackboard. When he is finished he reads it aloud to make sure everyone can copy it down properly. A student may not hear it all very well and ask:*

- a. * Can you read that word?
- b. Can you read that word again?

105 (12) a. * I had tea and John had tea.

- b. I had tea and John had tea too.

For the purpose of this paper, I rely on these examples to motivate the assumption that lexical scales (e.g., $\langle a, the \rangle$, $\langle each, the \rangle$, $\langle all, both \rangle$,² $\langle believe, know \rangle$, $\langle again, \emptyset \rangle$, $\langle too, \emptyset \rangle$) generate competition between utterances; the competition involves the respective presuppositional content of these sentences. Note that in principle, the claim that the competition arises at a lexical level is not necessary and there is a principled way to test whether two sentences are alternatives of the relevant type on a case-by-case basis: in a context where the presupposition of the sentence with the stronger presupposition is satisfied (i.e. common belief), the sentence with the weaker presupposition should be infelicitous.

115 The focus of this work is the inferential pattern which should follow from such a paradigm without further assumptions. The general structure of the critical examples is given in (13).

(13) General structure of the critical examples

- a. Situation: A speaker utters a sentence S_1 . S_1 has an alternative sentence S_2 , constructed via one of the lexical scales given above so that: (i) the presupposition p_2 of S_2 is stronger than the presupposition p_1 of S_1 , (ii) their assertions are equivalent.
- b. Predicted inference: S_2 is infelicitous, i.e. the constraints on its presupposition p_2 are not met.

125 A few remarks are in order. First, this account predicts *inferences*, these inferences have a presuppositional origin, but they are not presuppositions. Sauerland's terminology "implicated presuppositions" suggests that these inferences have a presuppositional essence and this is a position I am not willing to take. For this reason, I adopt Percus' terminology "anti-presuppositions". Note that it would be consistent with this terminology to refer to classical cases of scalar implicatures as "anti-assertions".

130 Second, I assume that any theory of presupposition should describe constraints on the use of a presuppositional sentence. This is independent from the type of mechanism assumed for presupposition projection or triggering; even if presuppositions ended up being a species of scalar implicature, for instance, this account would not be affected as long as the constraints on the use of presuppositional sentences remain the same. A significant proportion of this

²See Chemla (2007) for a potential worry about this scale.

135 paper investigates the form that anti-presuppositions take under different Stalnakerian views
on presupposition. Ultimately, this work argues in favor of a particular set of constraints
for a presuppositional sentence to be felicitous and there is no reason why this result could
not be extended to non-Stalnakerian frameworks (see for instance Thomason, Stone and
DeVault, 2006 for a discussion of constraints on presuppositions from the point of view of
140 computer science).

Finally, the characterization in (13) involves several approximations which are meant to
simplify the application of these principles to the range of examples discussed in this paper.
Percus (2006) investigates different formulations of the relevant principles and I refer to
his work for a finer-grained analysis. In particular, the format in (13) does not apply to
145 more complicated cases where both the assertion and the presupposition vary between the
utterance and its alternative.³ Of particular importance for the data investigated in this
paper, the assumption in (13-ii) seems to fail systematically for the scale $\langle believe, know \rangle$, so
I will discuss this case in some detail.

More on *believe* vs. *know*

150 Does the scale $\langle believe, know \rangle$ ever lead to examples satisfying the constraints given in (13)?
In particular, there might be differences between the assertions generated by *believe* and
know. The goals of this section are, first, to argue that this difference between the two verbs
is irrelevant for the present purpose (because it might not be at the level of their assertions),
and second, to show that even if it was, it would just be an indication that the constraint in
155 (13) should be relaxed, and that doing so would not affect the core of the present proposal.

There has been much discussion in the philosophy literature of the observation that *know*
seems to convey that the subject's belief is supported by adequate evidence, as suggested by
example (14) (see Gettier, 1963 for various possible versions of this difference and related
puzzles, which are still debated).

- 160 (14) – Does Bill have a sister?
– Yes.
– Do you know that, or just believe it?

What is the nature of this difference between *believe* and *know*, and is it encoded in the
lexical content of these verbs? Not necessarily. In particular, one prediction of the proposal
165 to be developed here is that sentences of the form “I believe that *p*” convey, by means of

³Examples such as (i) have been recently discussed in the literature: a scalar term is embedded in the
scope of a presupposition trigger.

- (i) a. John knows that some of his advisors are crooks.
b. John knows that all of his advisors are crooks.

Russell (2006) and Simons (2006) argue for a treatment of these cases which is very close to the view
advocated here. Sharvit and Gajewski (2007) propose a treatment of these examples in terms of a local
theory of implicatures à la Chierchia (2004). This last type of grammatical approach would be more difficult
to reconcile with contextual variations of the data.

anti-presuppositions, that the speaker is somewhat uncertain about p (see example (35)). It seems to me that a pragmatic account of the difference between the two verbs would be desirable.

170 Importantly, such a pragmatic difference between the two verbs would not play any role in the present analysis. In fact, whether or not there are additional differences between *believe* and *know*, and whether or not these differences are semantic or pragmatic differences, the Maximize Presupposition principle does apply between *believe*- and *know*-sentences, as witnessed by the examples in (10). This might call for a modification of (13), but for the purpose of this paper, I will use this formulation at least as a working simplification, 175 together with the counter-balancing approximation that *believe* and *know* only differ by their presupposition. Again, this is not a necessary step for our purpose.

The reader might wonder why the scale $\langle believe, know \rangle$ underlies most of the examples of this paper since it seems to involve unnecessary complications. One of the advantages of this scale is that the alleged content of the inference is easy to manipulate and to identify: it is 180 fully expressed in the complement of the verb. To make sure that the data are not biased by peculiar properties of the $\langle believe, know \rangle$ scale, examples involving the scale $\langle each, the \rangle$ are presented in parallel without necessarily repeating the discussion (the empirical motivation for this scale is illustrated by (8)).

Summary

185 Utterances of non presuppositional sentences (e.g., (7a)) are infelicitous when a given presuppositional alternative sentence (e.g., (7b)) is felicitous. Consequently, a felicitous utterance of the first should trigger the inference that its presuppositional alternative is not felicitous. A proper theory of presupposition must postulate constraints on the use of presuppositional sentences, the inference is thus that some of these constraints are not fulfilled.

190 In the present paper, I make explicit assumptions about constraints on the use of presuppositional sentences so that such a theory can account for the previously unnoticed range of different flavors that the predicted inference can have, depending on well defined contextual variations.

2.2 Naive approaches, technical limitations

195 I would now like to spell out exactly why example (1) is a puzzle for current theories of anti-presupposition. The main argument comes from the following quote from Sauerland (2006): “[anti-presuppositions] must have weak epistemic status in contrast to scalar implicatures and conventional presuppositions”. In other words, it is claimed that inferences such as (1b) should never arise in such a strong form, contrary to the facts.

200 In the second half of this section, I show that the technical structure of the theory does not allow for anti-presuppositions with such a strong epistemic status. Before getting into this technical overview, I explain why an intuitive comparison with classical cases of scalar implicatures remains incomplete.

Comparison with scalar implicatures: incomplete

205 At first sight, one could formulate the problem in the following terms: If a speaker utters the sentence (1a), she is committed to having a sister. Why would a cooperative speaker utter the less informative sentence (1) which does not convey this information? This formulation of the question is strongly reminiscent of cases of scalar implicatures and may receive a very similar answer: the least informative sentence is chosen because the speaker does not have
210 the belief that the additional piece of information conveyed by the alternative is true (i.e. $\neg B_s[p]$).

Unfortunately, another complication comes into play when the alternative triggers a presupposition, because its use is restricted by independent principles. The very weak claim that presuppositions must obey particular conditions to be felicitous is not controversial in
215 any respect, no matter what theory of presuppositions is assumed. Let us still back up this point with an example. The two sentences in (15) only differ by the amount of information they presuppose; the presuppositional version (15b) is infelicitous (we will come back to this example later).

(15) *Context: Someone just asked “Is the coffee machine working today?”*

- 220 a. No, John broke it.
b. * No, it is John who broke it.

Let $\mathcal{C}(p)$ denote the constraint on the use of a sentence with presupposition p . The decision to utter a sentence which was in competition with a sentence with an additional presupposition p should allow the hearer to conclude that the speaker does not believe that
225 p or that the speaker does not believe that the constraints on the use of presuppositional sentences were met (i.e. $\neg B_s[\mathcal{C}(p)] \vee \neg B_s[p]$). Importantly, it is reasonable to require that a speaker who uses a sentence with presupposition p believes that p and the predicted inference boils down to the claim that the speaker did not believe that the use of the presupposition p was felicitous: $\neg B_s[\mathcal{C}(p)]$.⁴

230 In sum, whatever the constraint on the use of presuppositional sentences is, the inference one can draw from a sentence which has a sentence with presupposition p as an alternative is that the speaker does not assume this constraint to be satisfied. Since the constraint on the use of presuppositions is intricate, a rough comparison with scalar implicatures cannot settle the issue raised by (1).

235 Naive contextual enrichment: technical limitations

As shown above, one cannot innocently rely on a rough comparison to classical cases of scalar implicatures to account for the fact in (1). The challenge now becomes more technical: if our hypotheses about presuppositions’ felicitousness are refined, can we explain the inference in

⁴The proof relies on particular assumptions on the structure of the speaker’s beliefs as spelled out in the appendix. It basically goes as follows: If $\mathcal{C}(p) \Rightarrow B_s[p]$, then $B_s[\mathcal{C}(p)] \Rightarrow B_s[B_s[p]]$, assuming that $B_s[B_s[p]]$ and $B_s[p]$ are equivalent, we obtain that $B_s[\mathcal{C}(p)] \Rightarrow B_s[p]$ and by contraposition that $\neg B_s[p] \Rightarrow \neg B_s[\mathcal{C}(p)]$. Thus, $\neg B_s[p] \vee \neg B_s[\mathcal{C}(p)]$ boils down to $\neg B_s[\mathcal{C}(p)]$.

(1b) as an enrichment of the bare prediction that the conditions of felicitousness were not met? In other words, we want to derive the inference that the speaker believes that p is false from the fact that presupposing p would have been infelicitous. One might argue that this enrichment looks very similar to the epistemic step and might be achieved thanks to contextual assumptions (e.g., the speaker could be assumed to be opinionated about the matter at hand).

Following Stalnaker (1973, 1974), let us adopt the idea that a sentence with presupposition p is felicitous only in contexts where p is common belief – i.e. p is (part of the) common ground. What type of contextual assumptions should we recruit? (16) presents a range of attempts which are arguably inconclusive. The problematic parts are highlighted with question marks in the formulae in (16), and I very briefly the problems encountered below. The bottom line for each of these attempts is the following: the corresponding assumption is implausible or the outcome does not match our empirical observation ($B_s[\neg p]$).

(16a) shows that trying to apply the Competence Assumption used in the case of standard scalar implicatures does not yield any fruitful enrichment: the predicted inference is too weak since it is true as soon as the speaker does not believe that the addressee believes that p .

(16b) is an attempt to apply a generalization of this Competence Assumption: the speaker is opinionated as to whether p is common ground. The predicted inference remains too weak.

(16c) is an attempt to generalize the competence assumption slightly differently: the speaker believes that p is common ground or that its negation is common ground. This assumption seems extremely speculative: under what conditions would a speaker believe that the common ground “is opinionated about p ” (i.e. the common ground settles whether p is true or false)? In any event, the prediction is now excessively strong: the inference is that the speaker believes that p is false, and not that $\neg p$ is common ground.

(16d) explores the minimal assumption that would be needed to obtain the advocated inference. Again, it is not clear why a speaker should assume for a proposition p that it is either common ground or false, there seems to be a much wider range of possibilities (e.g., the addressee does not believe the proposition).

(16) Inconclusive attempts to account for the initial observation:

- a. $\neg B_s[CG[p]]$ and $(B_s[p] \vee B_s[\neg p]) \equiv ((B_s[p] \wedge \neg B_s[CG[p]]) \vee B_s[\neg p])??$
- b. $\neg B_s[CG[p]]$ and $(B_s[CG[p]] \vee B_s[\neg CG[p]]) \equiv B_s[\neg CG[p]]??$
- c. $\neg B_s[CG[p]]$ and $(B_s[CG[p]] \vee B_s[CG[\neg p]])?? \equiv B_s[CG[\neg p]]??$
- d. $\neg B_s[CG[p]]$ and $(B_s[CG[p]] \vee B_s[\neg p])?? \equiv B_s[\neg p]$

To sum up, inferences such as (1) cannot be explained by elementary extensions of scalar implicature accounts. The correct explanation should rely on a proper understanding of the constraints on the use of a sentence with presupposition p , the classical view of presuppositions and common ground is not adequate. In the next section, these felicity conditions of presuppositional sentences are investigated in more detail following a modern Stalnakerian view of presupposition and common ground. The main appeal of the upcoming description of these conditions lies in the range of possible enrichments it accurately predicts for inferences similar to the one presented in (1), as will be illustrated in Section 5.

280 3 Felicity conditions of presuppositional sentences

In the previous section, I argued that if the overall constraint to use a sentence with presupposition p is written $\mathcal{C}(p)$, the predicted inference from an utterance of a sentence which has such a presuppositional sentence as an alternative is $\neg B_s[\mathcal{C}(p)]$. Example (1) shows that, under certain circumstances, the inference is rather that $B_s[\neg p]$. At a very abstract level, this shows that if the latter is a contextual enrichment of the former, the relevant contexts ensures that: $B_s[CG[p]] \vee B_s[\neg p]$ (see (16d)).

Interestingly, this suggests that a systematic investigation of the contexts where a strong inference seems to be drawn from a sentence with a presuppositional alternative could be a new source of information about the general constraints on presuppositions and, by the same token, about the very nature of presupposition. The focus of this paper is different: I will first try to establish a reasonable picture of what the constraints on the use of presuppositional sentences can be and then show that it accurately predicts inferences generated in various contexts.

3.1 What it takes for a presupposition to become common ground

295 Stalnaker (1973, 1974) proposed that a sentence with presupposition p is only felicitous in contexts where p is part of the common ground (or so the speaker believes). Stalnaker (1998) argues that this formulation is too strong, or at least it is inappropriate, because it does not tell whether the condition should be met before or after the utterance. A sentence with presupposition p is felicitous in contexts where an utterance of this sentence makes its presupposition become common belief. I refer to von Stechow (2000) for a thorough discussion of this claim; the key idea is that the common ground constraint only holds at some point *after* the utterance of a presuppositional sentence. For the purpose of this paper, we need to spell out in more detail what condition must hold *before* an utterance of a presuppositional sentence.

305 Stalnaker (2002) describes this timing version of the relation between presupposition and common ground, I rely here on Schlenker's (2006) implementation of these ideas. In the remainder of this section, I review Schlenker's analysis and extend it by bringing accommodation into the picture. The definitions, technical assumptions as well as the formal proofs of the results can be found in the appendix. Some interesting differences with and improvements on Schlenker's analysis (2006) are discussed in the appendix. More generally, the main goal here is not to give a Gricean account of the Maximize Presupposition principle, as Schlenker (2006) aimed to do, but rather to describe the circumstances under which a sentence can make its own presupposition become common belief.

The starting point of Schlenker (2006) is to elaborate what it takes for a proposition p to be common belief – assuming certain general hypothesis about the beliefs of the participants to a conversation. This leads to the lemma in (17). (The technical details are discussed in the appendix).

(17) Lemma (adapted from Schlenker, 2006)

320 **If** a speaker s and her addressee a both believe that p ,
if furthermore it is common ground that the speaker believes that both of them
believe that p (i.e. $\text{CG}[\text{B}_s[\text{B}_s[p] \wedge \text{B}_a[p]]]$),
then p is common belief.

325 Arguably, if s uses a sentence with presupposition p , it becomes common belief that s
expects everyone to accept p as true. On this assumption, the second condition in (17) is
automatically satisfied when a sentence with presupposition p is uttered. The theorem in
(18) puts together these results, spelling out the consequences of the utterance of a presup-
positional sentence:

(18) Theorem (adapted from Schlenker, 2006)

330 **If** a speaker s and her addressee a both believe that p ,
if furthermore the speaker s utters a sentence S with presupposition p ,
then p becomes common belief.

This theorem has to be enriched to allow for the possibility of accommodation: it is not
necessary that an addressee believe that p is true prior to an utterance for p to become
common belief right after this utterance. The straightforward technical result is given in
335 (19):

(19) Theorem (introducing accommodation)

340 **If** a speaker s believes that p ,
and if the speaker s utters a sentence S with presupposition p ,
and if furthermore s 's uttering this sentence S would cause a to *accommodate* and
believe p ,
then p becomes common belief.

This theorem (19) spells out the conditions under which an utterance of a sentence S
makes its presupposition become common belief. These conditions are discussed in more
detail in the next section.

345 3.2 Discussion of the constraints obtained

The first hypothesis in (19) – s believes p – is unproblematic: a speaker who uses a sen-
tence with presupposition p is committed to the truth of this presupposition. Noticeably,
there might be cases like (20) where a speaker could break this rule but they are arguably
deliberately distorted uses of presuppositions.

350 (20) *Context: John sees Mary at a party. He wants to discover whether his beautiful
addressee is married, but he does not want to reveal that he would prefer her to be
single. John may ask:*

Didn't you come with your husband?

355 Interestingly, assuming that speakers believe the presuppositions of the sentences they utter
prior to their utterance, the set of conditions given in (19) provide necessary and sufficient

conditions to ensure that the presupposition of a sentence S would become common belief after an utterance of S .

The second condition in (19) – s utters a sentence S with presupposition p – represents the move to a modern Stalnakerian view of presupposition: it makes room for the possibility that the very utterance of a sentence contributes to its presupposition becoming common belief.

The third condition in (19) introduces accommodation into Schlenker’s analysis and deserves more discussion – s ’s uttering this sentence S would cause a to *accommodate* and believe p . This enrichment eliminates the problematic requirement that the addressee must believe the presupposition beforehand, which is what made Stalnaker’s original proposal fail to account for well-known cases of informative presuppositions. Intuitively, this condition describes a constraint on the relation between s and a with regard to p . In other words, it states that s is in a position to convince a that p by merely using a sentence which presupposes p , without any further effort (e.g., without providing rational arguments). I will refer to this condition by simply saying that “the speaker is an authority” (relative to her addressee a and with regard to p). Finally, notice that this condition does not prevent the addressee from believing p before the assertion of S ; in this case, s is trivially an authority about p since hearing a sentence which presupposes p should not make a revise her belief that p is true.

This last condition can be fleshed out as follows. It is well known that in a conversation where there is a disagreement about p , it is inappropriate to use a sentence which presupposes p . This is exemplified in (21). In (21a), the second participant tries to convey that her addressee is wrong; it is inappropriate to do so with a sentence which presupposes something that the previous speaker denied. The example in (21b) shows that this constraint does not hold for assertion; (21c) shows that the non-presuppositional alternative to (21a) is also felicitous in this context.

- (21) *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.

The authority condition given in (19) and discussed above predicts this contrast: it is inappropriate to use a sentence if you are not an authority about its presupposition since the common ground condition would not be met. Clearly, when there is an explicit disagreement between two people, none of them can claim to be an authority: it would require some arguments to make the other participant change her mind.

Before moving on, a word of caution is in order: it *is* possible to use presuppositional sentences in situations of debate. For instance, “No, any first year student knows that it’s not” is a perfectly plausible utterance in contexts like (21). This actually provides an additional argument for my claim: such an utterance seems to deny that there could be a debate in the first place. If 319 turns out to be a prime number, having uttered a presuppositional version

of a denial is much more embarrassing.⁵ Presumably, it is because presuppositional versions are much more aggressive, they deny the soundness of the discussion in the first place. In other words, my claim is that if the participants accept that there might be disagreement and debate, they should not use presuppositional sentences; if they do use presuppositional sentences, they make clear that they disagree that there could be a debate.

Coming back into our main track, (22) rephrases (19) with the convenient terminology of speaker’s authority:

(22) Theorem

If a speaker s believes that p ,
and if the speaker s utters a sentence S with presupposition p ,
and if s is an authority,
then p becomes common belief.

3.3 An additional constraint: non-crucial information

In the previous section, I described the conditions under which an utterance of a presuppositional sentence can make its own presupposition become common belief. At first sight, this corresponds to the felicity conditions advocated by Stalnaker (1998). I suggest below that there might be an additional constraint, but, since it will turn out to be trivially satisfied in the relevant cases (see section 4), I keep this discussion short and informal.

How do the conditions in (22) account for the contrast in (15)? Unfortunately, they don’t. Intuitively, the deviance of (15b) is due to the fact that crucial pieces of information (e.g., the actual answer to an explicit question under discussion) cannot be conveyed by means of presupposition, and (22) doesn’t require this.

The modern Stalnakerian picture of presuppositions adopted here is a natural framework to capture this intuition. The previous section made extensive use of the idea that a presupposition p of a sentence S could unproblematically become common ground *after* an utterance of S . Nevertheless, this should not happen too late either. In other words, the presupposition of S can become common belief after an utterance of S , but it must become common belief *before* the sentence S achieves its illocutionary purposes.

Returning to the contrast in (15), the purpose of the utterance is to answer the question. By the time the presupposition that “somebody broke the coffee machine” becomes common belief, the question is fully answered and the rest of the process is pointless.

3.4 General constraints on presuppositions

Summarizing this section: a sentence with presupposition p is felicitous if p becomes common belief early on after the utterance of the sentence. The technical result (22) and the discussion in section 3.3 lead to the following reformulation of the general constraints on the use of presuppositional sentences:

⁵Fortunately, $319 = 11 * 29$.

- (23) Constraints on the use of presuppositional sentences:
 A sentence S with presupposition p can be felicitously uttered by a speaker s only if:
- a. s believes that p is true;
 - b. s is an authority about p ;
 - c. p is not crucial for the current purpose of the conversation.

This result was derived from a Stalnakerian view of presupposition, but it is of course compatible with other frameworks. For instance, Geurts (1999) and Abbott (2000) argue that pieces of information conveyed by means of presuppositions are “backgrounded”. Intuitively, background information should probably be (i) believed by the speaker (cf. condition (23a)), (ii) non controversial (cf. condition (23b) and the discussion of example (21)), and (iii) non-crucial (cf. condition (23c)). It seems to me that the Stalnakerian approach focusses on condition (23b) while this alternative backgrounding view focuses on condition (23c), but this does not result in any problematic incompatibility.

4 The proposal

The initial puzzle involves situations of the following type: s utters a sentence S_1 , S_1 has no presupposition but has an alternative sentence S_2 which asserts what S_1 asserts and additionally presupposes p . The Maximize Presupposition principle introduced in (2) states that S_1 should not be uttered if S_2 is felicitous. Therefore, the hearer should infer in this situation that it is not the case that the speaker believes that S_2 is felicitous. According to the previous section, the predicted inference can be stated as: it is not the case that the speaker believes that the conditions in (23) are all met.

The constraint in (23c) is automatically met in the relevant situations. Indeed, the speaker uttered S_1 and thus decided not to introduce p either by means of presupposition or by means of assertion: the speaker believes that p is not a crucial piece of information for the current purpose of the conversation.

Thus, the predicted inference becomes: it is not the case that the speaker believes both that she believes that p and that she is an authority about p . Let $\text{Auth}_s[p]$ stand for the proposition that s is an authority about p (where the addressee and the presuppositional sentence are left implicit). The inference can be written as: $\neg B_s[B_s[p] \wedge \text{Auth}_s[p]]$. Adopting a few straightforward assumptions about speakers’ beliefs (see Appendix), this is equivalent to: $\neg B_s[p] \vee \neg B_s[\text{Auth}_s[p]]$. (24) summarizes this prediction:

- (24) Prediction of the Maximize Presupposition principle:

Situation: a speaker s utters a sentence S_1 . S_2 is an alternative sentence to S_1 ; S_2 asserts what S_1 asserts, but additionally presupposes p .
Predicted inference: $\neg B_s[p] \vee \neg B_s[\text{Auth}_s[p]]$.

This prediction is weaker than the inference described for (1), namely: the speaker believes that p is false. The claim is now that the stronger version of the inference arises only if

470 the addressee believes that the two assumptions in (25) and (26) hold (in short: in contexts where these assumptions hold).

(25) Competence Assumption:

The speaker s is opinionated about p .

Technically: $B_s[p] \vee B_s[\neg p]$.

475 (26) Authority Assumption:

The speaker s believes in her authority about p .

Technically: $B_s(\text{Auth}_s p)$.

480 The contextual assumption (25) does not require much discussion, it is the exact same assumption needed to achieve the epistemic step in the case of classical scalar implicatures (see Spector, 2003, van Rooij and Schulz, 2004, and Sauerland, 2004). However, in cases of anti-presupposition, this assumption needs to be supplemented with the less standard assumption in (26) about the authority of s . (21) already provided independent evidence in favor of such an assumption.

5 Further predictions

485 This section extends the proposed analysis to a range of further phenomena. As a methodological strategy, I often refer to the intuitive notions of Authority and Competence introduced in the foregoing, and the relevant tests are discussed when necessary. Since the core of my proposal is a precise description of the interaction between inferences and contexts, I start with examples in a variety of different contexts. In each situation, the first examples 490 involve the scale $\langle \textit{believe}, \textit{know} \rangle$, and parallel examples involving the scale $\langle \textit{each}, \textit{the} \rangle$ are provided to ensure the generality of the empirical pattern.

Then comes a series of less crucial examples involving slightly less standard cases of anti-presuppositions relying on *too* and *again*. These examples are interesting because the intuitive strength of the inference does not only depend on the contextual assumptions 495 described above, but also relies on intrinsic properties of these triggers.

Finally, I discuss how anti-presuppositions interact with general projection properties of presupposition. Interestingly, many examples look like counter-examples if not handled with care.

5.1 *Believe* in contexts

500 Undeniable competence and authority

Let us start with the opening example (1) repeated here as (27). In this example, p refers to the proposition that the speaker has a sister; (28) is a parallel example involving the scale $\langle \textit{each}, \textit{the} \rangle$.

(27) John believes that I have a sister.

505 Inference: The speaker (believes that she) does not have a sister.

(28) I bought a car for each of my brothers.

Inference: The speaker (believes that she) has several brothers.

It is fairly natural to expect people to be opinionated about their having a sister and the Competence Assumption is met in unmarked contexts where (27) is uttered. People also naturally consider themselves an authority as to whether they have a sister: we do not normally require any evidence to believe them in this matter. The Authority Assumption is satisfied too. As shown in (29), the application of the Maximize Presupposition principle combined with these two contextual assumptions now fully accounts for the inference in (27): $B_s[\neg p]$.

- 515 (29) a. Applying the Maximize Presupposition principle: $\neg B_s[p] \vee \neg B_s[\text{Auth}_s p]$
b. With the Authority Assumption $B_s[\text{Auth}_s p]$: $\neg B_s[p]$
c. With the Competence Assumption ($B_s[p] \vee B_s[\neg p]$): $B_s[\neg p]$

Note: There is apparently an additional step here which might lead to the stronger conclusion that the speaker does not have a sister ($\neg p$ rather than $B_s[\neg p]$). This could be accounted for by an additional assumption of the form “ $B_s[\neg p] \Rightarrow \neg p$ ” which basically says that the speaker is reliable with regard to $\neg p$. This seems to be closely related to the Authority Assumption and one might think that the present proposal predicts this stronger version of the inference by default.

However, even if the authority assumption entailed such a reliability assumption (which is not true strictly speaking, especially if potential rhetorical effects of presupposition are taken into consideration), it is important to note that the Authority Assumption applies to p while the Reliability Assumption applies to $\neg p$. This goes slightly off topic, but I would like to clarify this asymmetry between a proposition and its negation. Consider the example in (30). If your honest plumber tells you (30a), it is probably because she saw a leak. Unless she is a liar, there might very well be a leak. On the other hand, if she tells you (30b), it is probably because she did not find a leak, but this by itself does not mean that there is no leak and you might reserve your opinion.

- (30) a. There is a leak.
b. There is no leak.

535 The summary of this digression is that an anti-presupposition might lead an addressee to form an opinion about a speaker’s beliefs; this is independent from the reliability attributed to this belief.

Authority with and without Competence

(31) *Context: During a trial, the judge summarizes the main facts:*

540 Mr. John Smith believed that Mrs. Mary Smith was cheating on him.

Judges are supposed to refrain from subjective opinion, and in this sense, judges are highly reliable conversation partners. If the judge had said: “Mr. John Smith knew that Ms. Mary

Smith was cheating on him”, everyone would certainly have accommodated that Mary was cheating on John. In other words, the Authority Assumption holds. Therefore, at least the
545 inference obtained in (29b) goes through: $\neg B_s[p]$.

Now we can investigate two variants of this example. First, imagine that this is the opening of the trial so that the judge is not supposed to have formed an opinion about the facts yet (i.e. the Competence Assumption does not hold). In this context, the sentence merely implicates that it is not the case that the judge believes that Mary was cheating on
550 John: $\neg B_s[p]$.

On a second version of this scenario, the sentence is uttered at a later stage in the trial where every piece of the investigation starts making sense and the judge should also start forming her own opinion about the case. One may now expect the Competence Assumption to hold ($B_s[p] \vee B_s[\neg p]$) and the judge may be aware that one is very likely to infer from (31)
555 that she believes that Mary was *not* cheating on John.

Example (32) shows that the same range of judgments can be reproduced with the scale $\langle \textit{each}, \textit{the} \rangle$: the inference that Mrs. Smith had several accomplices comes in different flavors depending on whether the judge is expected to be opinionated.

(32) *Context: During a trial, the judge says:*
560 Did you check her mailbox? Mrs. Smith certainly exchanged e-mails with each of her accomplices.

Competence without authority

Contexts where the speaker is competent but not an authority were already discussed in (21): they arise naturally in situations of debate where every participant might be opinionated
565 but none can consider herself as an authority. Let us look at a slightly different example:

(33) Mary is pregnant; John believes it too.

In this case, it seems that the speaker uses the second clause as further evidence in favor of her claim that Mary is pregnant. In other words, she does not believe that she is an authority.⁶ This is exactly what the present proposal predicts as the computation in (34)
570 shows.

- (34) a. Applying the Maximize Presupposition principle: $\neg B_s[p] \vee \neg B_s[\textit{Auth}_s p]$
b. With the belief expressed by the speaker $B_s[p]$: $\neg B_s[\textit{Auth}_s p]$

The sentence in (35) provides a shorter version of the same type of example. Here again, there is an inference that the speaker is not an authority about Mary being pregnant.
575 Interestingly, what might at first be seen as an essential difference between *believe* and *know* (i.e. roughly, the degree of confidence in the given belief) comes out as an anti-presupposition

⁶Note that this type of inference could trigger various interesting rhetorical effects. In particular, it could motivate under-uses of presuppositional phrases to increase the overall impression of objectivity of the speaker, who somehow avoids claiming her authority.

of *believe*. This is only a partial account since it only applies to first person beliefs, but it opens a way to pragmatic accounts of this contrast.⁷

(35) I believe that Mary is pregnant.

580 Example (36a) is the usual counterpart example with the scale $\langle each, the \rangle$.⁸ As before, the second part of the sentence seems to be a justification for the first claim that Mary published only one paper: the speaker does not believe himself to be an authority for that matter. There are two ways to make this judgment clear. One way is to see that the second part of the sentence seems to be a reply to “How do you know that?”. Another way is to
585 contrast (36a) with (36b). (36b) would achieve very different purposes: the speaker seems to assume that her addressee will accept that Mary published only one paper and the rest is a further comment on this.

(36) *Context: Mary is a great linguist, she writes many excellent papers every year. Someone asks John how many papers she published this year. John replies:*

- 590 a. Mary published only one paper, I asked her to send each of them to me...
b. Mary published only one paper, I asked her to send it to me...

5.2 Other triggers

In this section, I present empirical data involving presupposition triggers which might generate anti-presuppositions via null alternatives: *again* and *too* (see Amsili and Beyssade, 2006
595 for related discussion).

Again

Sentences with *again* are associated with alternative sentences without the particle (see example (11)). This accounts for the inference in (37b).

- (37) John will never go to Paris.
600 a. Alternative: John will never go to Paris again.
b. Inference: John has never been to Paris.
(Adapted from Amsili and Beyssade, 2006)

At first sight, this inference goes through without any special assumptions about the context. This is an illusion: if the assumptions are explicitly blocked, the inference is blocked too.
605 Imagine the following context: at a party your friend Mary meets a seductive stranger, John.

⁷It might be that an utterance of the form “John believes that *p*” naturally suggests that John uttered “I believe that *p*”, for instance because our main access to other people’s beliefs is through their own words. Therefore, the inference that the belief expressed is somewhat uncertain would generalize to third person belief reports.

⁸Examples of this kind involving the $\langle believe, know \rangle$ scale are easier to construct, presumably because other people’s beliefs easily count as justification for the speaker’s own belief and this is what the target sentence ends up doing in these examples.

John leaves the party early and Mary tells you how much John seems to hate French people and how ugly he thinks the Eiffel Tower is. She concludes that (37). In this context, the inference (37b) does not go through because Mary might not have asked John whether he has ever been to Paris before and therefore she might not have any strong opinion about it. In fact, it is not hard to see that we find the whole range of inferences we described in the case of the scale *<know, believe>*.

Thus, the inference (37b) does require the contextual assumptions advocated here but interestingly, they seem to arise by default. This raises an interesting issue: what special features of this case make these assumptions jump into existence? This could be attributed to a particular property of *again*. Roughly, *again* is not a content word, it triggers a presupposition by picking up some content which is already expressed in the sentence and conveys that it already happened before. Therefore, the content of the presupposition of *again* is necessarily very similar to the actual assertion of the sentence. This is not true for *know*: the assertion is about someone’s beliefs whereas the presupposition may concern any facts in the actual world. Crucially, an assertion clearly implies a claim of competence and authority and this claim can naturally be generalized to the very similar presupposition that the alternative sentence with *again* would trigger.⁹

Importantly, classical cases of scalar implicatures also raise this issue: the competence assumption naturally jumps into existence in “out of the blue” contexts. Again, a tentative explanation comes from the idea that an assertion is a claim of competence (and authority). Furthermore, it is “natural” (to claim) to be an expert about a range of closely related facts so that any claim of competence and authority about *p* might by default be extended to a broader range of propositions, potentially including additional content of alternative sentences.

630 *Too*

Part of the explanation for the strength of the anti-presupposition associated with *again*-alternatives relied on the fact that *again* is not a content word. The presupposition trigger *too* might behave differently: (38) is similar to (37) while (39) is based on an example which should be more familiar.

- 635 (38) John will never go to Paris.
 a. Alternative: ??John, too, will never go to Paris.
 b. Fragile inference: No one will ever go to Paris.
- (39) John is having dinner in New York.
 a. Alternative: ??John is having dinner in New York too.
 640 b. Fragile inference: John is the only one to have dinner in New York.
 (Adapted from Kripke, 1990)

⁹Note that a somewhat different way to exploit the “similarity” is to say that the information conveyed in the alternative sentence might be just as relevant as the information conveyed in the utterance and to argue that, in general, relevance matters in the activation of alternatives.

The word *too* is not a content word but it has an anaphoric element and this has been used to explain why the presuppositions it triggers are difficult to accommodate (see Geurts and van der Sandt, 2004 and Beaver and Zeevat, forthcoming for discussion), as witness the deviance of (38a) and (39a) in contexts where there is no salient individual other than John. In other words, nobody can be an authority for these cases: it is not possible to convince anyone that the presupposition of (39a) is true simply by asserting (39a) since this presupposition is not retrievable from this sentence to begin with. Hence, (39a) is infelicitous and no inference like (39b) is predicted.

The crucial element to explain why the inference does not go through in these cases is that it is not possible to accommodate the presupposition of the alternative sentence. Interestingly, there are special cases where it is possible to accommodate the presupposition of *too*. For instance, one might naturally accommodate from Mary saying (40a) that the headmaster beat her. Now, as predicted, the corresponding inference that the headmaster did not beat Mary does go through if she utters (40).

(40) *Context: John and Mary, two naughty students, are called separately before the headmaster who is notoriously cruel. Afterwards, they want to know what happened to each other. Mary asks John:*

Did he beat you?

- a. Alternative: Did he beat you too?
- b. Inference: The headmaster did not beat Mary.

(I owe this example to Bart Geurts, pc.)

Summary of *too* and *again*

I capitalized on properties of *too* and *again* to investigate and clarify how the present proposal applies to various other, sometimes quite delicate, cases. In general, presuppositions triggered by *again* are easier to accommodate than presuppositions triggered by *too*. Both of these particles have an anaphoric component but it seems that the content of the presupposition is easier to accommodate in the case of *again*. That presuppositions triggered by *again* are easier to accommodate than presuppositions triggered by *too* is certainly controversial (see van der Sandt and Huitink, 2003 for instance). What is important for present purposes and should *not* be controversial is that in the examples provided, the relative ease of accommodation of the alternative correlates with the strength of the associated anti-presupposition.

5.3 Other environments

The projection properties of anti-presuppositions simply follow from the projection properties of the presuppositional alternative sentences, no matter how presupposition projection is accounted for. This section first shows that when *believe* appears under negation, the present proposal seems to make incorrect predictions. I present an assortment of arguments which suggest that these apparent discrepancies arise from the interference of independent factors

680 (e.g., neg-raising). The rest of the section shows that the predictions are correct when
the interfering factors are out of the way. The relevant examples involve (i) negation with
different scales: $\langle each, the \rangle$ and $\langle every, both \rangle$, and (ii) the scale $\langle believe, know \rangle$ in modal
environments.

Believe under negation

685 The predicted inference in (41) is not borne out.¹⁰ The analysis of this example will remain
incomplete, but I will argue that the problem faced here is orthogonal to the present proposal.

- (41) John does not believe that I have a sister.
- a. Alternative: John does not know that I have a sister.
 - b. Predicted inference: I do not have a sister.
 - 690 c. Actual inference: I have a sister.

The first important interfering factor is that *believe* is a neg-raising verb. In other words,
the sentence in (41) normally means (42). Importantly, *know* is not a neg-raising verb and
so the alternative (41a) cannot mean (42a), and the asserted content of (41) is thus stronger
than the assertion of its alternative.¹¹ If the Maximize Presupposition principle compares
695 sentences which differ only in their presuppositional content, sentences (41) and (41a) are
not in immediate competition and this explains why the inference in (41b) is *not* an actual
prediction of the present proposal.

- (42) John believes that I do not have a sister.
- a. Alternative: John knows that I do not have a sister.
 - 700 b. Predicted inference: I have a sister.
 - c. Actual inference: I have a sister.

Thus, the problematic inference (41b) can be ruled out, but we still want to account for
the actual inference (41c). One line of investigation would be that, in general, alternatives
should not be thought of as syntactic objects and one could investigate a more abstract
705 mechanism which explains that (42a) is the relevant alternative to (41).

¹⁰ Sauerland (2006) provides the following judgments for (i) and (ii).

- (i) John doesn't believe that 313 is prime.
Inference: 313 is not prime.
- (ii) John doesn't believe that Mary is cheating on him.
Inference: Mary is cheating on John.

These data would be somewhat contradictory: the anti-presupposition of (i) is claimed to be the negation of
the content of the belief expressed, it is exactly the opposite for (ii). Rather than investing these particular
examples in detail, I propose to analyze a more familiar example where, for instance, the contextual factors
should be better understood at this point of the paper.

¹¹I implicitly assume here that neg-raising phenomena arise at the level of assertion. The minimal as-
sumption needed to make the same point is that whatever principles drive these effects have precedence over
the Maximize Presupposition principle.

Alternatively, one could think that the inference in (41c) is of a very different nature. For instance, it might be due to some interpretation under which *believe* would be close to *believe me (when I tell him)*. Under this reading, (41) would mean something like “John does not believe me (when I tell him) that I have a sister” or “I told him, but John does not believe me that I have a sister”. It would naturally follow from there that the speaker believes that she has a sister. One of the challenges for a proper formalization of such an approach would be to explain why this interpretation arises for (41) and not for (42) or for (1). Interestingly, this correlates well with the alternation of subjunctive and indicative moods in negative belief reports in Romance languages (see Quer, 1998 and Egré, 2004 for discussion):

(43) Jean ne croit pas que je suis linguiste.
 Jean *ne* believes not that I am-IND linguist.
 ‘Jean doesn’t believe that I’m a linguist.’
 Inference: I am a linguist – the reading of *believe* is close to *believe me*

(44) Jean ne croit pas que je sois linguiste.
 Jean *ne* believes not that I am-SUBJ linguist.
 ‘Jean doesn’t believe that I’m a linguist.’
 Inference: I am not a linguist.

(45) Jean ne sait pas que je suis linguiste.
 Jean *ne* knows not that I am-IND linguist.
 ‘Jean doesn’t know that I’m a linguist.’

(46) *Jean ne sait pas que je sois linguiste.
 Jean *ne* knows not that I am-SUBJ linguist.
 ‘Jean doesn’t know that I’m a linguist.’

The facts of main importance are: (i) the reading of *believe* which could be paraphrased as “believe me when I tell him” appears when the indicative mood is used, example (43); (ii) the inference that “the belief” is false does show up in French with subjunctive complements (i.e. also when the “believe me when I tell him” reading vanishes), example (44). Here is a sketch of a theory. The subjunctive mood is the default mood (see Schlenker, 2005, which provides an analysis of the French subjunctive via a competition with the indicative mood and with reference to the Maximize Presupposition principle). As such, the subjunctive mood may allow the competition between *believe* and *know*, while the indicative mood blocks it. In fact, the indicative mood may itself compete with the subjunctive mood and thus trigger the opposite inference.

This description is quite far from being a complete account. In particular, it does not extend straightforwardly to languages like English which mainly lack the relevant mood distinctions. Nevertheless, this sketch of a theory is sufficient to claim that the present proposal would handle examples like (41) appropriately if other phenomena were better understood.

I would like to add a last piece of data which argues accordingly. The predicted inference may emerge in English when the alleged alternative is suggested by previous linguistic mate-

rial. The intuition here is that in (47), the first part of the sentence makes constructions of the form “Mary doesn’t know p ” salient so that if it is appropriate to use such a construction in the second part of the sentence, it should be done. In short: when the relevant alternatives are salient, scalar implicatures are more robust; (47) is an attempt to make the alternative salient by copying its structure in the first clause. This reinforcement seems to compete with the effects of the conflicting factors, so that the predicted implicature does emerge.

(47) Mary doesn’t know that I love her, but (at least) she doesn’t believe that I’m married.
Inference: I am not married.

This section started with the statement that (41) could be problematic. I mentioned a range of independent phenomena (neg-raising, mood, salience of the alternative) which may explain this conflict. In the following section, I show that the proposal makes the right predictions when these issues are factored out.

Each and every under negation

Let us consider as before that *each* and *every* are in competition with *the* and *both*, respectively. (Both universal quantifiers might very well be in competition with both *the* and *both*, but let us put this aside for simplicity). For these scales, the alternatives for negative sentences are unproblematic and the inferences are maintained, as predicted. The relevant examples are in (48) and (49) for *each* and in (50) and (51) for *every*.

- (48) I met each friend of John’s.
a. Alternative: I met John’s friend.
b. Inference: John does not have exactly one friend.

- (49) I did not meet each of John’s friends.
a. Alternative: I did not meet John’s friend.
b. Inference: John does not have exactly one friend.

- (50) I met every friend of John’s.
a. Alternative: I met both friends of John’s.
b. Inference: John does not have exactly two friends.

- (51) I did not meet every friend of John’s.
a. Alternative: I did not meet both friends of John’s.
b. Inference: John does not have exactly two friends.

Believe under modals

How do anti-presuppositions behave with regard to other environments? Examples in (52) show that embedding a *believe*-sentence in different modal contexts does not affect the anti-presupposition it triggers, just as it does not affect the presupposition of the corresponding alternatives (see examples in (53)).

- (52) a. John believes that I have a sister.
 Inference: the speaker does not have a sister.
- 780 b. Perhaps, John believes that I have a sister.
 Inference: the speaker does not have a sister.
- c. For sure, John believes that I have a sister.
 Inference: the speaker does not have a sister.

- (53) a. John knows that I have a sister.
 785 Presupposition: the speaker has a sister.
- b. Perhaps, John knows that I have a sister.
 Presupposition: the speaker has a sister.
- c. For sure, John knows that I have a sister.
 Presupposition: the speaker has a sister.

790 **Summary**

The present proposal naturally predicts the projection properties of anti-presuppositions as the mirror image of the projection properties of presuppositions: an anti-presupposition is the denial of the presupposition of some alternative sentence. Empirical discrepancies seem to arise if independent conflicting factors are neglected. I argue that these difficulties are 795 orthogonal to the present proposal. These difficulties vanish if examples are constructed carefully, as exemplified in (48-53), where the problematic factors do not intervene.

6 Conclusion

Heim (1991) advocated a presuppositional counterpart to the Maxim of Quantity, the Maximize Presupposition principle. From then on, two different kinds of issues have been discussed in the literature. First, the consequences of this principle for the oddness of underpresupposing sentences have been widely investigated (see Amsili and Beyssade, 2006 and Magri, 2006 for recent discussions). Second, the independence of the principle from the Maxim of Quantity have been recently discussed by Percus (2006), Sauerland (2006) and Schlenker (2006). Although the ideas and data presented here strongly rely on this literature, the focus was somewhat different: what inferences does this principle predict? 805

I argued that, so far, the predictions were too weak. As was proposed for the epistemic step (Spector, 2003; van Rooij and Schulz, 2004 and Sauerland, 2004), I showed how conversational inferences can be reinforced within the framework of the modern Stalnakerian view of presupposition and common ground. I reviewed a variety of empirical facts which support the particular contextual assumptions advocated. I also discussed how independent 810 phenomena may interfere with the predictions. Although these issues were not settled, I argued that these conflicting phenomena could be factored out of the present analysis. In fact, the present interaction may provide new ways to investigate these phenomena (e.g., if issues having to do with mood interact with anti-presuppositions, a better understanding

815 of anti-presuppositions might help understand better mood issues). Further investigations
should explore anti-presuppositions generated by competition with a wider range of presup-
position triggers (e.g., definite descriptions, wh- and it-clefts, gender and number features).
Ultimately, we should also address more complicated cases where both the assertion and
820 the presupposition vary significantly between the utterance and its alternative, for instance
because of the presence of several scalar terms, possibly of different types (*some, all*) and
(*believe, know*). This would take a much better understanding of the interaction between
the Maximize Presupposition principle and the Maxim of Quantity (e.g., does one of these
principles have priority over the other?) and is therefore left for future research.

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Appendix

840 The goal of this appendix is to provide the formal implementation of ideas used in the text.
A large part of these technical details were suggested in Stalnaker (2002) and spelled out
in Schlenker (2006). The main contribution here is to introduce accommodation into the
general picture. The resulting system deviates Schlenker's so that it reveals some hidden
assumptions (see (61)).

845 Definitions and notations

Let us start with the definition of the belief operators we are going to need:

(54) $B_x[\dots]$ designates the belief operator associated with the individual x . If p is a proposition, $B_x[p]$ stands for x believes that p is true.

850 (55) s and a are used as indexes for belief operators to refer respectively to the speaker and her addressee(s). They are also used to refer to the agents themselves.

(56) The null operator T :
It will be convenient to introduce the trivial, non-epistemic operator T which is true of a proposition p iff this proposition is true.

855 Next, I introduce the tools to manipulate higher order belief operators (e.g., the speaker believes that the addressee believes that...).

(57) Iterated self-beliefs:
For all $n > 0$, $B_x^n[p]$ stands for the proposition which is true iff $B_x \dots B_x[p]$ is true, where B_x occurs n times.

860 (58) The set of higher-order belief operators: \mathcal{B} .
 \mathcal{B} designates the set of operators obtained from any composition of belief operators associated with s or a . By convention, this set includes the null operator T which can be obtained from the composition of zero belief operators.
 $\mathcal{B} = \{T, B_s, B_a, B_s B_s, B_s B_a, B_s B_s B_s, \dots\}$.
Technically, \mathcal{B} can be defined as the minimal set of operators satisfying the following
865 criteria:

- a. $T \in \mathcal{B}$
- b. $\forall B \in \mathcal{B}, B_s B \in \mathcal{B}$ and $B_a B \in \mathcal{B}$

(59) The set of strict higher order belief operators: \mathcal{B}^* .
This set includes every strictly epistemic operators built from B_s and B_a :
870 $\mathcal{B}^* = \mathcal{B} \setminus \{T\}$, i.e. the set of operators in \mathcal{B} except T .

(60) Common ground:
 $CG[p]$ stands for p is part of the common ground, or equivalently: p is common belief.
 $CG[p]$ is true iff $\forall B \in \mathcal{B}^*, B[p]$.

Assumptions about agents' beliefs

875 (61) Assumptions about agents' beliefs:

- a. $\forall x \in \{s, a\}, \forall p, \forall B \in \mathcal{B}, B B_x p \Leftrightarrow B B_x B_x p.$
- b. $\forall x \in \{s, a\}, \forall p, \forall q, B_x[p \wedge q] \Leftrightarrow B_x[p] \wedge B_x[q].$

880 Following Stalnaker (1998), Schlenker (2006) assumes that an agents' beliefs can be represented by an epistemic accessibility relation between worlds. They require that this accessibility relation be transitive and euclidean and this guarantees positive and negative introspection. Simplifying a bit, (61a) imposes similar types of introspection properties. Interestingly, the universal quantification over the set of higher belief operators \mathcal{B} also makes explicit that the properties of agents' beliefs are very well known by the agents: agents have true beliefs about the structures of their beliefs.

885 The second hypothesis (61b) is also satisfied by default in the epistemic worlds framework, it should be uncontroversial: as a first approximation, it is indeed equivalent for someone to believe that two propositions are true and to believe that each of these propositions is true.

Adaptation of Schlenker's (2006) lemma

890 (62) is the formal counterpart of (17). This is a straightforward adaptation of Schlenker's (2006) example (5) together with the footnote 10 therein.

- (62) Lemma (adapted from Schlenker, 2006)
If (i) $B_s[p]$; (ii) $B_a[p]$; (iii) $CG[B_s B_s[p]]$; and (iv) $CG[B_s B_a[p]]$,
then $CG[p]$.

895 Note: On the assumptions I make, (iii) entails (i). I keep them separate here because (i) has a different status: it must be true prior to the utterance (this is discussed above under (20)).

Proof of (62)

Let B be an operator in \mathcal{B}^* and show that, whatever operator it is, $B[p]$ holds:

- If B ends with B_s :
 900 B is of the form $B' B_s$ (with $B' \in \mathcal{B}$) and $B[p]$ is equivalent to $B' B_s[p]$. Applying (61a) twice, we obtain that it is equivalent to $B' B_s B_s B_s[p]$. This is of the form $B'' B_s B_s[p]$ with $B'' \neq T$ and thus is true according to (iii).
- If B contains no B_s operator:
 B is of the form B_a^n with $n > 0$. Applying (61a) inductively, we obtain that for all
 905 $m > 0$, $B_a^m[p]$ is equivalent to $B_a[p]$. Thus, $B[p]$ is true according to (ii).
- If B ends with B_a and contains at least one B_s operator:

B is of the form $B' B_s B_a^n$ with $n > 0$. Applying (61a) inductively, we obtain that $B[p]$ is equivalent to $B' B_s B_a[p]$. Applying (61a) again (but with $p = B_a[p]$), we obtain that $B[p]$ is equivalent to $B' B_s B_s B_a[p]$. Since $B' B_s \neq T$, (iv) shows that $B[p]$ is true.

910 **Adaptation of Schlenker's (2006) theorem (section 2.3 therein)**

Theorem (63) is the technical counterpart of theorem (18) above.

(63) Theorem (adapted from Schlenker, 2006)

If (i) $B_s[p]$; (ii) $B_a[p]$; and (iii) s utters a sentence S with presupposition p ,
then p becomes common belief.

915 Conditions (i) and (ii) are common to (62) and (63).

Assuming that the utterance of a sentence with presupposition p makes it common belief that the speaker believes that both her and her addressee will come to believe that p ; the hypothesis in (63iii) guarantees that (62iii) and (62iv) are about to be satisfied.

So, the hypotheses of (62) are about to be satisfied and, therefore, so is its conclusion.

920 This is what (63) states.

Introducing accommodation

Finally, theorem (64) is the formal counterpart of (19). It extends the previous result (63) by introducing the possibility of accommodation.

(64) Theorem

925 **If** (i) $B_s[p]$; (ii) s 's utterance of a sentence S with presupposition p implies $B_a[p]$;
and (iii) s utters this sentence S ,
then p becomes common belief.

The main contribution of this theorem is that $B_a[p]$ may now become true after the utterance of S (by means of accommodation). As before, we conclude that at some point after an
930 utterance of S , all the hypotheses of the lemma (62) are satisfied and therefore, so is its conclusion.

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