Obligatory implicatures and the presupposition of "too"

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Abstract. The paper provides an analysis for the obligatory occurence of the presupposition triggers "too", "again" and "know". The claim is that these triggers are inserted to avoid a mandatory exhaustivity implicature that contradicts the context. Two main empirical arguments for why this account is to be preferred over analyses of these obligatory triggers that make use of a principle *Maximize Presupposition* will be presented.

1. Introduction

Recently the maxim *Maximize Presupposition* (Heim (1991)) has been reformulated and extended to explain not only the obligatory occurence of the definite determiner but all kinds of different presupposition triggers (Percus (2006), Sauerland (2008), Chemla (2008), Schlenker (2012)). The set of examples that are being explained with *Maximize Presupposition* are given in (1) to (5) below.

(1) a. #A sun is shining.
b. The sun is shining.

(2) a. #All of John's eyes are open.
b. Both of John's eyes are open.

(3) a. #John thinks/believes that Paris is in France.
b. John knows that Paris is in France.

(4) John came to the store.
a. #Bill did.
b. Bill did, too.

(5) Jenna went ice skating.
a. #Today she went ice skating.
b. Today she went ice skatin, again.

The assumption behind these recent proposals is that lexical items or sentences are ordered on a scale with regard to their presuppositional strength. They predict that the item or sentence that is presuppositionally weaker will lead to a specific inference ("antipresupposition", Percus (2006) or "implicated presupposition", Sauerland (2008)). I will argue that at least a subset of phenomena

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that have been explained by using *Maximize Presupposition* should be accounted for by assuming that exhaustification of an implicit or explicit Question Under Discussion (QUD; Roberts (1996)) is sometimes obligatory. The proposal is that the insertion of the triggers "too", "again" and "know" is mandatory when it avoids a contradiction that the sentence without the trigger would yield due to this exhaustivity implicature. The account is able to explain the fact that these triggers are not obligatory in complex sentences and under negation. A possible extension to definite determiners will be discussed. In addition to the empirical advantages explained in further detail below the present account has a number of conceptual advantages. No lexical scales of presuppositional strength have to be postulated (as for a similar proposal made by Magri (2009)). No additional pragmatic maxims (Singh (2009)) or inferences with special status have to be introduced into the grammar. The insertion follows from an independently needed mechanism under the present account.

The paper is structured as follows. Section two gives a theoretical background on obligatory presupposition triggers. Accounts working with *Maximize Presupposition* and the potential empirical problems they face will be discussed in the first part of section two. Then the alternative account working with obligatory exhaustivity implicatures will be explained and argued for in the second part of section two. Some of the competing predictions of the two theories are tested in an empirical study which is reported and discussed in section three of the paper.

2. Theoretical Background

2.1. *Maximize Presupposition*

Heim (1991) observes that Grice's Maxim of Quantity cannot capture the fact that the sentence with the definite determiner in (1-b) is to be preferred over the sentence with the indefinite in (1-a) since both are equally informative: they share the same assertion and only differ in their presuppositions. She hence introduced the maxim *Maximize Presupposition*.

Maximize Presupposition (Heim (1991)) Make your contribution presuppose as much as possible!

This principle can explain why the sentence with the presupposition trigger in (1-b) is preferred over the sentence without the presupposition trigger in (1-a). It also accounts for why the sentence without the trigger has an inference that the presupposition is not true: via pragmatic reasoning the hearer assumes that since the presupposition has not been introduced it is not verified by the context.

Recently the principle has been reformulated and applied to other presupposition triggers besides the definite (Percus (2006), Chemla (2008), Sauerland (2008)). These recent approaches focused

more on the fact that using a lexical item that is an alternative to a presupposition trigger creates the inference that the presupposition of that trigger is not verified by the context. An example is given in (6) below. The sentence in (6-a.) has the inference in (6-c.) since the alternative in (6-b.) has not been used.

(6) a. Peter believes it is raining.
b. Peter knows it is raining.
c. It is not certain that it is raining.

The basic assumption behind newer proposals is that sentences (Sauerland (2008)) or lexical items (Chemla (2008), Percus (2006)) are in global or local pragmatic competition. Sentences with stronger presuppositions or presuppositionally stronger items are assumed to be preferred. A local version of *Maximize Presupposition* is given in (7). In this case competition is based on (ordered lexical) scales of presuppositional strength. These scales are given in (8).

(7) **Maximize Presupposition (Percus 2006)**
a. Alternatives are only defined for lexical items. For any lexical item, the alternatives consist of all "presuppositionally stronger" items of the same syntactic category.
b. Do not use ϕ if a member of its Alternative Family is felicitous and contextually equivalent to ψ (ϕ is contextually equivalent to ψ iff for all w in the common ground, $\phi(w) = \psi(w)$).

(8) {the, a}, {know, believe}, {too, $\varnothing$}, {again, $\varnothing$}, {both, all}

Both local and global versions of *Maximize Presupposition*, assume that this competition creates another type of inference that should be distinguished from implicatures and presuppositions based on the characteristics in (9) (Sauerland (2008)).

(9) a. Weak epistemic status
b. Projection behaviour

The inferences arising from not using the trigger share the weak epistemic status with implicatures but exhibit projection behaviour just like presuppositions. The last property follows from the fact that presuppositions project under negation. As a result, presupposition triggers should be obligatory under negation as well. Not inserting the trigger should lead to same inferences in negated sentences (and other kinds of embedding). The inferences resulting from leaving out the trigger thus have been argued to form their own class of inferences (implicated presuppositions/antipresuppositions).

Maximize Presupposition faces an empirical challenge when trying to extend its scope to the whole set of presuppositional items in (1) to (5). It would predict that all triggers are obligatory under negation. Accordingly, the sentences in (10-b), (11-b) and (12-b) should have to be used and the sentences in (10-a), (11-a) and (12-a) should be degraded in the contexts below.

(10) Jenna went iceskating yesterday.
  a. Today she didn't go.
  b. Today she didn't go again.

(11) Mary came to the party.
  a. It is not the case that Peter came to the party.
  b. It is not the case that Peter came to the party, too.

(12) Mary is pregnant.
  a. Joe does not believe she is.
  b. Joe does not know she is.

It does not seem to be the case that the triggers "again", "too" and "know" are obligatory under negation or that the missing trigger leads to the described inference under negation. Furthermore, versions of *Maximize Presupposition* which work with local competition cannot explain why (13-a.) should not be considerably worse than (13-b.). The same holds for (14-a.) and (14-b.).

(13) a. John came to the party and Peter came.
  b. John came to the party and Peter came, too.

(14) a. Peter was in Norway last year and Peter was in Norway this year.
  b. Peter was in Norway last year and Peter was in Norway this year, again.

I will provide an alternative explanation for the insertion of the triggers "know", "again" and "too" which captures these empirical facts. It will be explained in the next section.

2.2. Alternative Explanation: Obligatory Implicatures

The following explanation of the obligatory insertion of the triggers "too", "again" and "know" is based on a grammatical approach to scalar implicatures (Chierchia (2004), Fox and Hackl (2006), Fox (2007), Chierchia and Spector (2011)) and makes use of a covert exhaustivity operator which

functions like overt “only”. This operator identfies a propostion as the most informative out of a given set. A simple version is given in (15).

(15) $[\![\text{ exh }]\!](A_{<<s,t>,t>})(p_{<s,t>}) = \lambda w.p(w) = 1 \wedge \forall q \in A \rightarrow p(w) \models q(w)$

The proposal I want to make is inspired by observations made by Sæbø (2004) and Krifka (1999) regarding obligatory additives. They argue that a sentence with focus and without “too” generates a contrastive implicature of the form given in (16). It says that there exists no proposition in the focus alternatives besides q (the proposition uttered) that is true.

(16) $\neg\exists p[p \in C \wedge p = 1 \wedge p \neq [\![\text{ q }]\!]^0]$

For example, a sentence like (17-a.) has the contrastive implicature in (17-b.) that there is no proposition of the form “x came to the party” in the alternatives that is true besides “Mary came to the party”.

(17) a. MARY$_F$ came to the party.
b. $\neg\exists p[p \in \{p : \exists x.person(w)(x) \wedge p = \lambda w.$x came to the party in w$\} \wedge p = 1 \wedge p \neq [\![$ Mary came to the party $]\!]^0]$

The claim of these approaches is that “too” has to occur obligatorily when this implicature is contradicting the context (when it is clear that there is a relevant alternative). This is the case in contexts that verify the presupposition of “too” because they have to entail that there is a relevant alternative. The presupposition of “too” that ensures that is given in (18).

(18) $\exists p[p \in C \wedge p = 1 \wedge p \neq [\![\text{ q }]\!]^0]$

The sentence in (19-a.) is only defined in contexts which entail (19-b.), for example. Using (17-a.) in this context would yield a contradiction.

(19) a. MARY$_F$ came to the party, too.
b. $\exists p[p \in \{p : \exists x.person(w)(x) \wedge p = \lambda w.$x came to the party in w$\} \wedge p = 1 \wedge p \neq [\![$ Mary came to the party $]\!]^0]$

My proposal extends the idea that the insertion of additives follows from contrastive implicatures to the obligatory occurence of the triggers "again" and "know". Moreover, it modifies the accounts from Krifka (1999) and Sæbø (2004) by combining their idea with a grammatical approach to scalar implicatures. Under the following explanation the implicatures which force the insertion of the triggers are exhaustivity implicatures resulting from the sometimes mandatory insertion of an exhaustivity operator which identifies propositions as the most informative answer to the QUD. To see how the proposal works for "too" and "again" one has to see first what the inferences of sentences missing these triggers would look like, again. Under the assumption that there are competing sentences with "too" and "again" for (20-a.) and (21-a.) the inferences resulting from the missing triggers would be the ones in (20-b.) and (21-b.), respectively.

(20) a. Mary was at the party
b. No one else was at the party

(21) a. Peter was in Norway last year.
b. There is no time before last year where Peter was in Norway.

With focus on "Mary" in (20-a.) and focus on "last year" in (21-a.) these sentence have the exhaustivity implicatures in (20-b.) and (21-b.), respectively. The implicatures of these sentences without "too" or "again" are thus equivalent to their "antipresuppositions" or "implicated presuppositions". I assume that these implicatures arise because people interpret sentences exhaustively with respect to the implicit QUD. I further assume that this is mandatory when there is obligatory focus which marks the implicit QUD, also in cases of contrastive focus (Beaver and Clark (2008)). Under this view the inferences described above are exhaustivity implicatures derived by the grammar. The alternatives the operator works on are defined by the question set, which is the set of propositions that are possible answers to the QUD. It identifies one answer as the most informative (the one that has to entail all other true answers). The version of an exhaustivity operator working on the question set and returning the most informative answer is given in (22).

(22) $[\![\text{ exh }]\!](Q_{<s,<<s,t>,t>})(p_{<s,t>})(w) \Leftrightarrow p = (\iota p)[Q(p)(w) = 1 \wedge \forall q[Q(q)(w) = 1 \rightarrow Q(p)(w) \models Q(q)(w)]]$

For the example in (20-a) this would mean that the proposition "Mary was at the party" with focus on "Mary" would be interpreted as the exhaustive answer to the implicit question "Who was at the party?". The result of this is given in (23).

(23) $[\![\text{ exh }]\!]([\![\text{ Who was at the party }]\!]^w)([\![\text{ Mary was at the party }]\!])$
$\Leftrightarrow [\lambda w. \text{ Mary was at the party in w }] = \iota p[\exists x[person(w)(x) \wedge p = \lambda w[\text{ x was at the party}$

in w])] $\wedge p(w)] \wedge \forall q[\exists x[person(w)(x) \wedge q = \lambda w[$ x was at the party in w])] $\wedge q(w)]$: $p(w) \models q(w)$

The obligatory insertion of the presupposition trigger follows from the fact that mandatory exhaustive interpretation can result in a contradiction as in (24).

(24) Peter was at the party. Mary was at the party # (too).

If “too” is left out in the second sentence and it is interpreted exhaustively with respect to the QUD “Who was at the party?” due to the obligatory focus on “Mary” a contradiction arises: “Peter and only Mary came to the party”. A parallel explanation holds for examples with “again”.

(25) Peter was in Norway last year. Peter was in Norway # (again) this year.

“Peter was in Norway this year” is interpreted exhaustively with respect to the question “When was Peter in Norway?” due to obligatory focus on “this year”. The result is that “Peter was in Norway this year” is identified as the most informative answer and has to entail all other true answers. This is shown in (26).

(26) $[\![$ exh $]\!]([\![$ When was Peter in Norway $]\!]^w)([\![$ Peter was in N. this year $]\!])$
$\Leftrightarrow [\lambda w.$ Peter was in Norway this year in w $] = \iota p.[\exists t[time(w)(t) \wedge p = \lambda w[$ Peter was in Norway at t in w $] \wedge p(w)]] \wedge \forall q[\exists t[time(w)(t) \wedge q = \lambda w[$ Peter was in Norway at t in w $] \wedge q(w)]] : p(w) \models q(w)$

A contradiction arises when “Peter was in Norway last year” is in the common ground and “Peter was in Norway this year” is interpreted exhaustively with respect to the implicit question “When was Peter in Norway?”. The contradiction resulting from this exhaustivity implicature can be avoided when the trigger is inserted. To see why the insertion of, for example, *again* blocks the implicature one has to look at the truth conditions of “Peter was in Norway again this year” (Beck (2007)) in (27).

(27) $[\![$ Peter was in Norway $again_{t_1}$ this year $]\!]^w =$ is defined only if Peter was in Norway at g(1) and g(1) $<$ this year. If defined, it is true iff Peter was in Norway this year.

Since “again” is anaphorically referring to “Peter was in Norway last year” the alternative that was excluded by the exhaustivity operator is presupposed to be true. It can hence not function as an

excludable alternative anymore. Exluding "Peter was in Norway last year" would make "Peter was in Norway again this year" undefined.

The present account straightforwardly predicts that "too" and "again" are not oligatory under negation and in complex sentences. The facts are repeated in (28) and (29) below.

(28) a. Mary came to the party. Peter did not come.
b. Peter was in Norway last year. Peter was not in Norway this year.

(29) a. Mary came to the party and Peter came.
b. Peter was in Norway last year and he was in Norway this year.

Negation changes the QUD to either to a polar question ("Did Peter come or not?") or to "Who did not come" in the case of (28-a.). Parallely, the QUD changes to "Was he in Norway this year or not?" or "Where was he not this year" in the case of (28-b.). Exhaustifying the second sentences in (28-a.) and (28-b) with respect to either of these questions will not yield a contradiction with the context. The insertion of the trigger is only necessary under the present account when an exhaustivity implicature arises which leads to a contradiction. Hence, obligatory insertion of the trigger is not expected in (28-a.) and (28-b.) which seems to fit the empirical picture.

The present account can also explain why both sentences in (29) are not degraded. A standard analysis of the discourse connective "and" assumes that it takes two propositions p (Mary came to the party) and q (Peter came to the party) and returns a truth value true if both propositions are true. It is hence asserted by the sentence in (29-a.) that both Peter and Mary came to the party. "And" is moreover the strongest item on a Horn scale. The insertion of an exhaustivity operator into the second conjunct in (29-a.) is blocked since the exclusion of either would yield a weaker meaning than the asserted meaning. In the sense of Fox (2007) neither p nor q are innocently excludable alternatives. Since no implicature is assumed to occur in (29-a.) or (29-b) the acceptability of both sentences is expected under the present account. According to - at least local versions of - *Maximize Presupposition*, however, there should be a competing sentence "Mary came and Peter came to the party, too" for (29-a.) which has the same assertion but stronger presuppositions. As a result, the second sentence in (29-b.) should have the inference that someone else besides Peter came and hence should be degraded.

A parallel explanation holds for the data regarding the propositional attitude verbs "know" and "believe". "Know" is inserted when the implicature that "believe" triggers contradicts the context. This implicature is the reason for the oddness of (30-b.) in the context in (30-a.).

(30) a. Peter has a sister.
b. #John believes that Peter has a sister.

The most natural place to put focus on in the second sentence in (30) is "believe". This is because in the given context what is at issue is John's attitude towards the proposition *p* in (30-a.) and not *p* itself. The QUD with respect to which the sentence is mandatorily exhaustified is hence "What is the R such that John R that Peter has a sister?". The result of this exhaustification is given in (31) below.

(31) $[\![\text{exh}]\!]([\![\text{What is the R John R Peter has a sister}]\!]^w)([\![\text{John believes Peter has a sister}]\!])$
$\Leftrightarrow [\lambda w.$ John believes Peter has a sister in w $] = \iota p.[\exists R[PropAtt(w)(R) \wedge p = \lambda w[$ John R Peter has a sister in w $] \wedge p(w)]] \wedge \forall q[\exists R[PropAtt(w)(R) \wedge q = \lambda w[$John R Peter has a sister in w$] \wedge q(w)]] : p(w) \models q(w)$

The R that is asked for is assumed to be restricted to propositional attitudes that are salient alternatives to "believe" in the context. The most salient alternative to "believe" is "know" since both express a degree of certainty with regard to the proposition that follows and stand in an entailment relation to one another. Under this assumption the question set that is exhaustified only contains "John knows that Peter has a sister" and "John believes that Peter has a sister" (making the QUD "Does John believe or know that Peter has a sister?"). Approaches to obligatory triggers that make use of *Maximize Presuppostion* would assume that these two propostions are identical with respect to their assertion. Exhaustifying the sentence with "believe" should hence not exclude the sentence with "know". Recently, however, "know" has been shown to be a soft trigger (Abusch (2010)) whose complement in unembedded contexts should rather be seen as an entailment, not a presupposition (Romoli (2011)). It has furthermore been argued that in embedded contexts the complement of "know" is an implicature (Romoli (2011)) which can explain that the presupposition of "know" sometimes does not seem to project.

(32) Mary might not be in NY but if Peter knows that she is he will definitely meet her.

There are other analyses of "know" and its projection behaviour which share the idea that its complement is special in that it only sometimes behaves like a PSP, i.e. projects. Simons et al. (2011) argue that the PSP of "know" does project when its content is explicitly marked as not at-issue. Abrusan (2011) argues for a separate mechanism related to the *topic* which can turn the complement of "know" into a presupposition in certain contexts. For the present account it is only important that asking the question whether John believes or knows that p which is evoked by the sentence in (30-b) clearly implies that the truth of p is still at issue and not entailed by the context. It seems that at least in this competition with "believe" the complement of "know" does not behave like a presupposition.

I adopt the view that the complement of "know" is an entailment in simple affirmative sentences. I assume that *know p* $=$ *believe p* $\wedge$ *p*. The obligatory insertion of "know" can then be explained by

exploiting the mechanism described above and accounts for the fact that "know" is not obligatory under negation. The result of exhaustifying the sentence that contains "believe" in (33) below with respect to the restricted question set given in (33-a.) would be the one in (33-b.)

(33) John believes Peter has a sister.

a. $Q = \{$ (∀w' ∈ BEL(J)(w) → (P has a sister)(w')), (∀w' ∈ BEL(J)(w) → (Peter has a sister)(w') ∧ Peter has a sister (w)$\}$

b. $Exh(Q)$ = (∀w' ∈ BEL(J)(w) → (Peter has a sister)(w')) and ¬ (∀w' ∈ BEL(J)(w) → (Peter has a sister)(w') ∧ Peter has a sister(w))→ ¬ Peter has a sister (w).

Since "John knows Peter has a sister" is not entailed by "John believes that Peter a sister" exhaustifying the latter sentence will result in the implicature that the former sentence is false. Under the assumption that *know p* is equal to *believe p* ∧ *p* this amounts to saying that *p* is false since *believe p* is part of the assertion of (33) and cannot be false. The implicature of the second sentence that is the result of mandatory exhaustive interpretation contradicts what is entailed by the context. It can also be explained why the negated sentence is not infelicitous in the same context as can be seen in (34) below.

(34) Peter has a sister. John does not believe it.

Parallely to the examples discussed above negation is taken to change the QUD. The QUD is most likely the polar question "Does John believe or not that Peter has a sister?" in the case of (34). This explains why the sentence in (34) seems to mean that John refuses to believe something uncontroversial. Exhaustifying the sentence with respect to this question will not result in a contradiction.

The account just presented faces a serious challenge when trying to explain the obligatory insertion of definite determiners. The inferences resulting from non-presuppositional determiners as the indefinite are the only ones that survive under negation and in complex sentences. This can be seen by the fact that both (35-a.) and (35-b.) are equally unacceptable.

(35) a. #A father of the victim arrived.

b. #A father of the victim did not arrive.

When trying to maintain and extend the analysis of the obligatory insertion of "too", "again" and know" in the previous section it could be argued that this so called "antiuniqueness" effect of the indefinie arises because (35-a.) triggers the scalar implicature "Not all fathers arrived" which requires that there is at least one father that did not arrive and thereby contradicts common knowledge. This line of reasoning cannot explain the oddity of the following sentences, however.

(36) a. #Every father of the victim arrived.
b. #John broke every arm.

Since "every" is the strongest item on the Horn scale there is no implicature which could lead to the oddness of the sentences in (36-a.) and (36-b.). *Maximize Presupposition* makes the right predictions for determiners whereas an account working with implicatures needs to assume that additional mechanims are at play here. There have been some attempts to capture the facts which do not require *Maximize Presuppostion* and are in accordance with the alternative explanation presented. Magri (2009) extends his account of blind mandatory scalar implicatures to the presuppositional domain and assumes that sentences with determiners are exhaustified with respect to their presuppositions. This approach has the conceptual disadvantage of introducing scales of presuppositional strength into the grammar after all. Singh (2009) proposes another maxim *Maintain Uniformity* which forbids the introduction of an already answered question (How many fathers arrived?) instead. If the account just laid out is correct in assuming that insertion of the trigger is related to the structure of discourse then combining Singh's (2009) view with the present perspective might be a suitable way of subsuming all occurence of obligatory triggers under the same mechanims. Further investigations of the empirical picture is needed to confirm that.

To sum up, at least for a subset of cases (iteratives, additives, propositional attitude verbs) there seems to be a principled way of explaining the obligatory occurence of presupposition triggers that does not require the maxim *Maximize Presupposition*. The insertion of these triggers follows from the fact that exhaustivity implicatures are sometimes mandatory and can lead to a contradiction. The insertion of the presupposition trigger prevents this contradiction from arising. The present proposal has some empirical and conceptual advantages over *Maximize Presupposition*. First, it predicts that inferences resulting from leaving out the trigger are in fact implicatures and thus do not project under negation or occur in complex sentences with "and". Second, the present account predicts a connection between exhaustification and the obligatoriness of the trigger. The experimental evidence supporting this point will be presented in the next section. One conceptual advantage of the account presented is that one does not have to stipulate scales of presuppositional strength for "too", "again" or "know" or inferences with special status. The mechanism used is needed for independent reasons, e.g. for strong or weak versions of answers to questions (Heim (1994)) and other generalized conversational implicatures (Chierchia (2004), Fox and Hackl (2006)).

3. Experiment

3.1. Hypotheses

To test some of the predictions of the two competing theories just outlined (referred to as *Maximize Presuppostion* and *Obligatory Implicatures* in the subsequent discussion) I conducted an experimental study on the German presupposition trigger "auch" ("too"). One general aim of the study

was to find empirical evidence for the prediction of both theories that sentences without the trigger in a context where their PSP is verified will lead to oddness due to an inference which is contradictory to the context. For that purpose, people were asked to provide an interpretation for and judge the acceptability of sentences with and without “auch” (“too”) in context where its PSP was fulfilled.

To distinguish between *Maximize Presuppositions* and *Obligatory Implicatures* sentences with the German discourse connective “und” (“and”) were tested in the same contexts as sentences with and without “auch” (“too”). The prediction of *Maximize Presupposition* is that these sentences should have the same status as sentences without the trigger. This is due to the fact that “and” is not a presupposition trigger and that there is a competing sentence with “too” which is presuppositionally stronger. Since the inferences *Maximize Presupposition* predicts result from this competition the sentence with “and” should have the inference that the sentence with “too” is false and be odd in contexts where the PSP of “too” is fulfilled. Opposed to that view *Obligatory Implicatures* predicts that the insertion of “and” should have the same effect as inserting “too”. The connective combines with two propositions and asserts that both are true. The exhaustivity operator cannot exclude any of these two as false since this would a weaker meaning than what is asserted.

Additionally, *Maximize Presupposition* does not predict any influence of discourse or information structure on the obligatoriness of the trigger. *Obligatory Implicatures* predicts that the effect of obligatory insertion of the trigger depends on whether exhaustification is made mandatory through the structure of discourse, e.g. focus or the presence of a question. That is, when an explicit QUD is given in the context exhaustification should be forced and the resulting implicature should make the sentences without the trigger contradictory and less acceptable in a context where the PSP is fulfilled than when no overt question is present. The predictions of the two theories are summarized in table one below.

	Maximize Presupposition	**Obligatory Implicatures**
Sentences with the trigger “too”	Not contradictory High acceptability	Not contradictory High acceptability
Sentences without the trigger (no expression)	Contradictory Low acceptability	Contradictory Low acceptability
Sentences with “and”	Contradictory Low acceptability	Not contradictory High acceptability
Presence of a question	Contradictory Low acceptability	Contradictory more often than without question Lower acceptability than without question

Table 1

3.2. Method

36 comic-like stimulus sets consisting of 4 pictures each were constructed. The comic showed three people having a conversation. The first picture of the comic showed one of the three people making a general statement. Then the second person replied either with a general remark (e.g. “cool”) or a question in the second picture. After that the person who started the dialogue made a statement again in the third picture. In the version with the question in the second picture this statement could function as an answer. The third person gave a parallel answer in the fourth picture. His/her answer included “und” (“and”) or “auch” (“too”) or no trigger/“and” (∅). The general pattern of the dialogue is illustrated in (37) below. The corresponding stimulus set (in the condition no question/no expression) is given in Figure 1.

(37) a. A: Peter had a party at his house last night.
b. B: Cool. / B: Who came to the party?
c. A: Mary came to the party.
d. C: And Julia came to the party./ C: Julia came to the party./ C: Julia came to the party, too.

Figure 1: Visual Stimulus

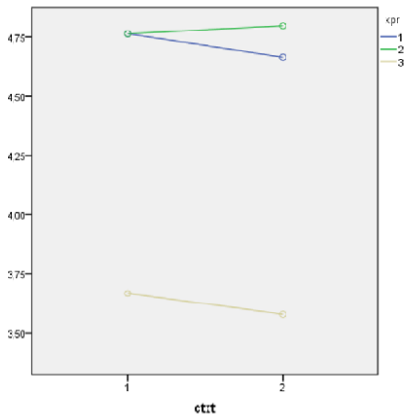
The design thus crossed the 2-level factor CONTEXT (ctxt; no question/question) with the 3-level factor EXPRESSION (xpr; auch/und/∅). Every item was realized in six conditions. A variant of each item was assigned to one of six lists so that every condition appeared six times in every list. The items were pseudo-randimized over these six lists. Additionally, 72 filler items were intermixed.

24 native speakers of German with normal or corrected to normal vision participated in the experiment. They received 10 Euros for their participation. The stimulus set was presented on a computer

screen. Participants first read the dialogue and then gave an interpretation. They indicated their interpretation by opting between saying that the last speaker agrees with the statement made by the speaker before him/her (interpretation=1, “both Mary and Julia came”) or contradicts/corrects him/her (interpretataion=0, “Only Julia came”). After choosing between these interpretative options participants were asked to judge the acceptability of the utterance of the last speaker on a scale from 1 (unacceptable) to 5 (completely acceptable).

3.3. Results

Acceptability Acceptability judgments were aggregated across items and within participants and condition and were subjected to a repeated measure analyses of variance (ANOVA). The ANOVA revealed no significant main effect of CONTEXT (question/no question)(F(1,23)=1.311, p<.264). EXPRESSION had a highly significant main effect on ACCEPTABILITY (F(2,46) = 39,703, p <.001). For the three level factor EXPRESSION a difference contrast (reverse Helmert contrast) was calculated comparing “too” against “and” in a first step and then comparing the mean of these two conditions with “no expression”. The contrast revealed that the main effect expression is due to a difference between the conditions no expression versus “and” and “too” (F(1,23)= 41.43, p <.001). There was no difference between “and” and “too” (F(1,23)=2,3, p<.142) (see Figure 2).

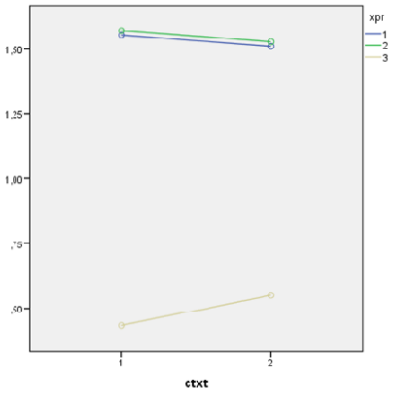


cxt	xpr	mean total
with question	“too”	4,76
	“and”	4,76
	Ø	3,67
without question	“too”	4,67
	“and”	4,80
	Ø	3,58
total	“too”	4,72
	“and”	4,78
	Ø	3,62

Figure 2: Mean average ACCEPTABILITY for sentences with “too” (1) and “and” (2) and no expression (3) in context with a question (1) and without a question (2) in the dialogue

Interpretation This analysis is based on arcsine squareroot transformed mean relative frequencies for the dependent variable INTERPRETATION. The data were transformed after they were aggregated across items and within participants and condition. The aggregated data were subject to a repeated measure analyses of variance (ANOVA). The ANOVA revealed that the choice of EXPRESSION had a highly siginficant main effect on INTERPRETATION (F(2,46) = 199.43, p <.001). For the three level factor EXPRESSION a difference contrast was calculated. It showed that the

effect rests on a difference between the conditions “no expression” and “too” and “and” ($F(1,23)$= 224.12, $p<.001$). There was no difference between “and” and “too” in interpretation ($F<1$). The CONTEXT (question/no question) had no significant main effect on INTERPRETATION ($F < 1$). There was, however, a significant interaction between the conditions CONTEXT and choice of EXPRESSION in interpretation. This interaction is due to a contrast between no expression and “too” and “and” ($F(1,23) = 6.1$, $p<.02$). There was no contrast between “and” and “too” ($F < 1$) (see Figure 3).



cxt	xpr	mean % of “both” answers
with question	“too”	.99
	“and”	1
	∅	.24
without question	“too”	.97
	“and”	.98
	∅	.32
total	“too”	.98
	“and”	.99
	∅	.28

Figure 3: **Left**: Transformed mean relative frequencies of interpretation 1 (“both”) in contexts with a question (1) and without a question (2) for sentences with “too” (1), “and” (2) and no expression (3) **Right**: Untransformed mean percentage of interpretation 1 (“both”) in contexts with and without a question for “too”, “and” and no expression

3.4. Discussion

The predictions of both theories discussed above are identical for sentences without and with the trigger in contexts that verify its presupposition. The sentences without the trigger should be unacceptable and read as a contradiction/contrastive due to the special inference/ exhaustivity implicature they posssess. The results show that this prediction is borne out: sentences with no expression are read contrastive in most cases (71% on average) and are significantly less acceptable than sentences with “too” (∅ 3,62 vs. ∅ 4,72) or “and” (∅ 3,62 vs. ∅ 4,78).

At first glance the total average acceptability of sentences without the trigger seems a bit high from the point of view of both theories. The same holds for the percentage of answers corresponding to a non-contrastive reading of these sentences (29%). In all likelihood the results can be explained with the fact that the sentences were presented as a dialogue. It is clearly less coherent and acceptable when a person is contradicting her/hisself than correcting or contradicting other interlocuters in a conversation. Moreover, it is not clear within the dialogue what is individual and

common knowledge and what relations hold between the speaker. This might very well influence how likely and acceptable contradicting each other is. Furthermore, the plausibility of an “Only”-reading of the sentence of the last speaker crucially changed with the context, i.e. type of question that is explicitly or implicitly introduced. Looking at the interpretation of singular items in the experiment revealed that in contexts with questions for which by definition more than one true answer is expected (Who was at the party?, Who went to the concert?) the last sentence without the trigger was less likely to be identified as the only true proposition (according to the belief of the speaker). Answers to questions like “What did Mary plant in the garden?” and “Where does Birgit work?” were more likely to be perceived as contrastive. This speaks in favour of an analysis of obligatory triggers that is sensitive to the question type and context which pertains to *Obligatory Implicatures* but not *Maximze Presupposition*. However, this requires the assumption that implicatures are pragmatic default, rather than absolutely mandatory. This default can be overruled by certain contextual factors the specification of which is up for further investigation. It is related to the still open research question under which circumstances answers can be interpreted as so called “mention some” answers as opposed to strongly exhaustive answers. A systematic investigation regarding the influence of the question type on the obligatoriness of the trigger is necessary to confirm these preliminary findings.

Regarding the sentences containing the discourse connective “and” the prediction of *Maximize Presupposition* but not *Obligatory Triggers* is that these sentences should be interpreted as contradictory or contrastive to the proposition in the context and thus be less acceptable than sentences with “too”. This prediction is, however, not borne out. Sentences with “and” are not read contrastive in almost all cases (98% on average) and are not significantly less acceptable than sentences with “too” (∅ 4,78 vs. ∅ 4,72). This is explicable with the theory advocated for making use of obligatory implicatures. No exhaustification is expected in the sentences with “and” since the resulting implicature would yield a weaker meaning than the asserted.

Moreover, no impact of the presence of an explicit question is expected under *Maximize Presupposition*. Even though no main effect of context (presence of question) was found for acceptability or interpretation there was an interesting and significant interaction between the choice of expression and the presence of an explicit question. This interaction resulted from a contrast between sentences with no expression and sentences with “and” or “too”. Sentences without “too” or “and” were read contrastively significantly more often, when there was a question in the discoure (76% of the time) than in contexts where there was no question (68% of the time). *Maximize Presupposition* cannot explain that the question has an influence on the obligatoriness of the trigger. *Obligatory Implicatures*, however, straightforwardly predicts that the presence of a question should make the exhaustivity implicature which results from leaving out the trigger more prominent.

3.5. Conclusion and Outlook

The study provided additional empirical evidence for the view that "too" is inserted obligatorily to avoid an exhaustivity implicature from arising which ends up contradicting the context. The findings are in accordance with the fact that "too" as well as the triggers "again" and "know" are not obligatory under negation. The insertion of at least the triggers "too", "again" and "know" should hence be considered to follow from the independently needed mechanism of exhaustification and not a general pragmatic principle *Maximize Presupposition*.

It is up for further research whether the present account operating with the QUD and exhaustivity implicatures as a default is to be preferred and can be distinguished from theories working with contrastive implicatures (Krifka (1999), Sæbø (2004)). One needs to find more evidence for the relation between the factors for when questions are exhaustified and the necessity of inserting the trigger, especially the triggers "again" and "know". Moreover, more research is necessary on the possible connection between discourse and information structure and the insertion of definite determiners. It has to address the question whether the general mechanism of exhaustification and the arising of implicatures is responsible for the insertion of definites or whether scales of presuppositional strength have to be postulated for determiners after all.

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