A cross-linguistic view on the obligatory insertion of additive particles — Maximize Presupposition vs. Obligatory Implicatures

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Abstract

Presupposition triggers, such as the additive particle *too*, the iterative particle *again*, and the definite determiner *the*, are obligatory if their presuppositions are satisfied in the context. This observation is accounted for in the literature by two theories: one based on *Maximize Presupposition* (e.g., Heim 1991; Percus 2006; Chemla 2008), the other based on *Obligatory Implicatures* (Bade 2016). In this paper, we report on two experiments in two typologically unrelated languages, Ga (Kwa) and German, which were designed to test the predictions of these two approaches for the insertion of additive particles. The results show that in both languages the insertion of additives is regulated by *Obligatory Implicatures*, posing challenges for *Maximize Presupposition*. Following Bade (2016), we assume a division of labor between the two theories in explaining obligatory presupposition effects.

1 Introduction

Presupposition triggers, such as the additive particle *too*, the iterative particle *again*, and the definite determiner *the*, are obligatory as soon as their presuppositions are met in the context. For example, in (1-a) the additive particle *too* must be used since its presupposition—that somebody other than Bill came to the party—is satisfied in the context. Generally, not using a presupposition trigger when one could leads to pragmatic oddness, indicated by # below (see e.g., Percus 2006; Chemla 2008; Sauerland 2008a for English; Heim 1991; Bade 2016 for German; and Amsili et al. 2016 for French).

(1)   a.   John came to the party. Bill came, # (too).
        b.   Jenna went ice skating yesterday. She went ice skating today, # (again).
        c.   #A/The sun is shining.

In the previous literature, two different types of mechanisms have been proposed to be at play in the obligatory insertion of presupposition triggers. The first one is based on the principle *Maximize Presupposition* and competition on the presuppositional level; the second one works with *Obligatory Implicatures* and the exclusion of contextual (focus) alternatives. Recently, Bade (2016) argued for a division of labour between the two mechanisms. While the insertion of presupposition triggers that lack a lexical, presuppositionally weaker alternative, such as additive particles, is governed by *Obligatory Implicatures*, the insertion of presupposition triggers that have a structurally well-defined, lexical alternative is regulated by *Maximize Presupposition*.

In this paper, we offer a cross-linguistic perspective on the obligatory insertion of presupposition triggers by comparing two experimental studies on the occurrence of additive particles in two unrelated languages: German and Ga (Kwa). The results suggest that in both languages the insertion of additive particles is governed by *Obligatory Implicatures*, pointing to cross-linguistic stability of the effect. Our experimental results do not speak against *Maximize Presupposition* per se, however. Rather, they point towards the empirical validity of the division of labour between the two mechanisms across languages, as proposed by Bade (2016). Further, our work contributes to the debate on possible universals in pragmatics (Matthewson 2006; von Fintel & Iatridou 2008) and the classification of non-at-issue content in view of cross-linguistic data, see e.g., Tonhauser et al. (2013).

The paper is structured as follows: in Section 2 we present two analyses of obligatory presupposition effects, one based on *Maximize Presupposition* and one on *Obligatory Implicatures*. In Section 3, we discuss their predictions for our experimental studies. Previous experimental work on the insertion of presupposition triggers is briefly discussed in Section 4. In two subsequent sections we report on four experiments in total. Specifically, we discuss two novel experiments (one on Ga and one on German) on the interaction of the insertion of additives with (non)-exhaustive interpretation of the sentence in Section 5. We also discuss two experiments (again, one on Ga and one on German) on the interaction of additive particles with negation in Section 6. The German data in Section 6 were previously reported (see Bade & Tiemann 2016) but are re-analyzed for the purposes of the present paper. The results are discussed in Section 7. Section 8 summarizes the paper.

2 Theoretical Background

2.1 Maximize Presupposition

The principle *Maximize Presupposition*, which states "Make your contribution presuppose as much as possible!", was originally introduced in Heim (1991) to account for the infelicity of the indefinite determiner in (2-a).

(2)   a.   #A father of the victim arrived at the crime scene.
        b.   The father of the victim arrived at the crime scene.

The sentences in (2) are contextually equivalent, i.e., equally informative given the truth of the presupposition in the context. As a result, their competition cannot be accounted for by the maxim of quantity (Grice 1989). They differ, however, on the level of presupposition: (2-b) unlike (2-a) presupposes that there is a unique father of the victim. Since that presupposition is satisfied in the context—everybody has just one biological father— (2-b) is preferred over (2-a).

Since Heim (1991), *Maximize Presupposition* has been modified and discussed for other presupposition triggers and environments (e.g., Percus 2006; Sauerland 2008a; Schlenker 2012), including the insertion of additive particles (Chemla 2008; Amsili & Beyssade 2009; Singh 2011). While all these accounts work with competition on a presuppositional level, they differ with regard to whether this competition is defined for sentences (Sauerland 2008b) or lexical items (Percus 2006). Recent proposals maintain the definition of *Maximize Presupposition* for sentences (Singh 2011; Schlenker 2012). However, they stress the importance of local contexts.[1] Examples of alternatives whose competition on the level of presupposition has been accounted for by *Maximize Presupposition* are given in (3).

(3)   {the, a}, {every, both}, {Ø, too}, {Ø, again}, {believe, know}, {SG, PL}, {SPEAKER, HEARER}, {PRESENT, PAST}   (Chemla 2008)

Coming back to (2-a), its dispreference is explained with pragmatic reasoning similar to the one involved in deriving quantity implicatures: the hearer assumes that by not obeying *Maximize Presupposition*, the speaker wants to convey that she does not believe the presupposition of the stronger alternative (i.e., that there is one unique father of the victim) to be true. This, however, is incompatible with common knowledge and, as a result, leads to pragmatic oddness.

(4)   #A father of the victim arrived at the crime scene.
        ⤳ *the speaker does not believe that there is a unique father of the victim*
                                                                           ANTI-UNIQUENESS INFERENCE

This non-uniqueness inference of the indefinite—or *anti-presupposition* of the indefinite (Percus 2006)—and other inferences arising as a result of not obeying *Maximize Presupposition* have been argued to have a special status, as their properties are neither consistent with an analysis as implicatures nor as presuppositions (Sauerland 2008a). First, unlike presuppositions and implicatures, anti-presuppositions are epistemically weak and resist strengthening.[2] For example, the sentence in (5-a) leads to the inference that the speaker does not believe that there is a unique 6ft long catfish, i.e., she does not believe the presupposition of the competitor in (5-b). This inference cannot be strengthened to mean that the speaker believes that there is more than one 6 feet long fish (Heim 1991).

(5)   a.   Robert caught a 6 feet long catfish.
              ⤳ *The speaker does not believe that there is a unique 6 feet long catfish*
              ⤳̸ *The speaker believes that there is not a unique 6 feet long catfish*

        b.   Robert caught the 6ft long catfish.
              ⤳ *The speaker believes that there is a unique 6 feet long catfish*

Second, like presuppositions but unlike implicatures, inferences which are the result of reasoning with *Maximize Presupposition* project. For example, (6) is still odd because the non-uniqueness inference—that there is not one unique father of the victim—survives when embedded under negation.[3]

(6)   #It is not the case that a father of the victim arrived.
        ⤳ *The speaker does not believe that there is a unique father of the victim*

Anti-presuppositions are thus theoretically set apart from both presuppositions and implicatures.[4] This theoretical distinction is supported by empirical data. The results of recent experimental studies suggest that the non-uniqueness inference of indefinites and uniqueness presupposition of definites differ in processing and epistemic status (Clifton et al. 2006; Kirsten et al. 2014;

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[1]   While these accounts differ with respect to the predictions they make for different local environments, they make the same predictions for the cases discussed in the paper. For that, we do not go into details regarding the exact distinctions between them. For the sake of concreteness, we are working with a version of *Maximize Presupposition* which assumes competition on the level of sentences and is sensitive to local contexts but nothing really hinges on that.

[2]   The question of whether certain anti-presuppositions can be strengthened and under which conditions is controversially discussed in the literature (Chemla 2008; Rouillard & Schwarz 2017; Elliott & Sauerland 2019). In this paper, we adopt a view that anti-presuppositions generally cannot be strengthened (see Bade & Schwarz 2019a; b for empirical evidence).

[3]   We will discuss how this projection behaviour is predicted by *Maximize Presupposition* below in Section 3.

[4]   Recently, Marty (2017) argued that anti-presuppositions are actually both presuppositions and implicatures. See also Marty & Romoli (2020b; a) for discussion.

Bade & Schwarz 2019a; b; Schneider et al. 2019). Based on these and other empirical results, Bade (2016) argues that *Maximize Presupposition* regulates the obligatory insertion of definites and suggests that this extends to other triggers with well-defined lexical alternatives, e.g., presuppositional features (Sauerland 2008b; a).[5]

2.2 Obligatory Implicatures

An alternative proposal to account for the obligatory insertion of some presupposition triggers was put forward by Bade (2016). It is inspired by observations discussed in Krifka (1999) and Sæbø (2004) that the insertion of additive particles aligns with factors favoring contrastive implicatures.[6] Bade assumes a grammatical approach to scalar implicatures (e.g., Fox 2007; Chierchia et al. 2012), which makes use of a covert exhaustivity operator (EXH) with the meaning provided in (7). The EXH operator takes a proposition *p* and a set of innocently excludable alternative propositions (IE-A) and excludes all alternatives in *A* that are not entailed (non-weaker) by the proposition *p*.[7,8]

(7) $[\![\text{EXH}]\!](A_{\langle\langle s,t\rangle,t\rangle})(p_{\langle s,t\rangle})(w) = p(w)\,\&\,\forall q[(q \in \text{IE-A}\,\&\,p \not\Rightarrow q) \rightarrow \neg q(w)]$

Importantly, under Bade's approach the exhaustivity operator EXH is forced to be inserted with the presence of focus, as in (8).[9,10]

(8)   Q: Who came to the party?
         A: EXH [Bill]$_F$ came to the party.

The EXH operator in (8-A) uses focus alternatives, i.e., *Bill came to the party, John came to the party, Alice came to the party, Bill and John came to the party,* etc., just as *only* does (Rooth 1992).[11] It excludes all alternatives that are not entailed by *Bill came to the party*, leading to the interpretation that Bill and nobody else came to the party.

Now, the insertion of an additive particle is taken to be obligatory when the insertion of the EXH operator leads to a contradiction, as in (9).

(9)   John came. EXH [Bill]$_F$ came, #(too).

Due to the focus on *Bill* (evoked by a contrastive phrase in this case, see e.g., Rooth 1992), the EXH operator is obligatorily inserted. Exhaustifying the sentence with regard to the Question Under Discussion (QUD, see Roberts 1996) evoked by focus – *Who came?* in the case of (9) –

5   Note that not all accounts of *Maximize Presupposition* consider *again* and *too* to be part of scales of presuppositional strength. They thus do not make any predictions for the case we are discussing (Percus 2006; Sauerland 2008a; Schlenker 2012). Importantly, they do not assume null alternatives which are problematic for a theory of alternatives working with structural complexity (Katzir 2007; Fox & Katzir 2011). According to this theory, a sentence without the trigger cannot have as its alternatives the sentence with the trigger as the latter is structurally more complex. See Singh (2008); Chemla (2008), and Amsili & Beyssade (2009) for discussion and different views on the issue.

6   One crucial difference between the proposals is that while Krifka (1999) and Sæbø (2004) focus on additive particles, Bade (2016) argues that the mechanism is more general and extends to the obligatory insertion of *again* and *know*. Furthermore, Krifka (1999) does not discuss the inference as having the status of an implicature, whereas Bade explicitly does. Another difference is that while for Krifka the resulting inference is due to the contrastive topic itself, similarly to what Bade (2016) proposes, for Sæbø (2004) the inference arises as a result of leaving out the additive. See Krifka (1999) and Sæbø (2004) for details.

7   '⟹' stands for entailment and '→' for material implication.

8   Innocently excludable alternatives are the intersection of all maximal sets of alternatives which can be negated while maintaining consistency with the prejacent (Fox 2007).

9   This assumption holds both for information focus, as in (8), and contrastive focus, as in (9). Even though there are important theoretical differences between the two types of focus (e.g., Büring 2007), they seem to behave similarly when it comes to exhaustification. See, for example, Gotzner (2019) for recent empirical results. Any difference in strength of the exhaustivity effect may be due to the fact that it is easier to construct different domains for EXH with information focus than with contrastive focus. See Bade (2016) for details.

10   The assumption that EXH can be obligatory is not specific to Bade's (2016) proposal. It is usually made to account for the fact that implicatures can give rise to mandatory oddness effects (Magri 2009; Marty 2017). For Bade it is the presence of focus alternatives that forces insertion. The same or similar predictions would be made by a view under which alternatives must be evaluated by an operator (Chierchia 2013), or a more radical view where EXH is obligatory in every matrix clause (Magri 2009).

11   To satisfy a question-answer-congruence, focus alternatives must be a subset of the question set, i.e., the set of propositions that are possible answers to the question (Hamblin 1973).

yields the interpretation that Bill and nobody else came.[12] This, however, contradicts the first sentence stating that John came. So to block the contradictory exhaustivity implicature of the second sentence, the additive particle *too* is inserted.

Blocking arises as a result of EXH and *too* trying to access the same alternatives. As a focus sensitive operator, *too* operates on the alternatives introduced by focus and makes them inaccessible to EXH. As a result, EXH cannot exclude any alternatives that are presupposed to be true and a coherent discourse arises. There are two potential LFs where EXH and *too* could try to access the same alternatives: when EXH scopes above or below *too*, as schematically illustrated in (10).

(10)   a.   LF1: *[EXH [too] F]
        b.   LF2: [too [EXH] F]

The configuration in (10-a) is ruled out as focus alternatives cannot percolate further than the first focus sensitive operator they combine with (see Rooth 1996 for discussion). Following Rooth (1996), we assume that additives associate with focus indirectly, via the focus evaluating operator $\sim$. After the evaluation, the focus value is "reset". (10-a) is thus an instance of an intervention structure caused by the fact that both operators try to access the same set of alternatives (Beck 2006). Importantly, however, an intervention effect does not arise when EXH and *too* take different sets of alternatives introduced by the focus in their relative scope. Thus the intervention effect does not exclude all instances in which EXH and *too* co-occur, just those in which they compete for the same set of alternatives. That is, while (11-a) and (11-b) are intervention structures, (11-c) is not.

(11)   a.   *[$\sim$ … [$\sim$ … F]]
        b.   *[$\sim$ … [$\sim$ … F… F]]
        c.   [$\sim$ …F [$\sim$ … F]]

As an illustration, consider (12) with EXH and (13) with overt *only*. Both (12) and (13) are acceptable, as EXH/*only* and *also/too* access different sets of alternatives.

(12)   John drank orange juice. Mary also drank orange juice.
        John drank EXH$_1$ orange juice$_{F1}$. Mary$_{F2}$ also$_2$ drank EXH$_1$ orange juice$_{F1}$.

(13)   John drank only$_1$ orange juice$_{F1}$. Mary$_{F2}$ also$_2$ only$_1$ drank orange juice$_{F1}$.

By contrast, a sentence in which *only* and *also/too* try to access the same set of alternatives is degraded, as demonstrated in (14) with overt *only* (see Beck 2006; 2016b for more data and discussion). Analogously, we argue that the parallel structure with EXH also would be ruled out.[13]

(14)   #Mary drank orange juice. Mary only$_2$ also$_1$ drank water$_{F1/2}$.
        ≈ *Mary drank orange juice. Besides orange juice, Mary drank only water.*

Coming back to the LFs in (10), the LF in (10-b) is not ruled out by an intervention effect, as EXH passes on alternatives (Bade & Sachs 2019).[14] This structure, however, makes all alternatives that EXH accesses mutually exclusive. For example, the exhaustified alternatives in (9) passed on to *too* are as following: {EXH Bill came, EXH Peter came, EXH Mary came… }. Now, the second sentence in (9) asserts that one of these alternatives is true. However, given their exhaustified status, the presupposition of *too* that another alternative is true can never be satisfied. Thus, the exhaustified status of the alternatives leads to the necessary contradiction between presupposition of *too* and the assertion of the sentence. Following *Obligatory Implicatures*, the blocking effect (10-b) is the result of EXH and *too* being ruled out for independent reasons.

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12   For concreteness, we model the effect of focus in terms of QUD but nothing hinges on this decision. Important for us, however, are two standard assumptions in focus semantics, which are also obeyed in the QUD framework, namely that focus alternatives (i) satisfy the focus constraint and (ii) they constitute a subset of the contextually relevant alternatives (Rooth 1992; 1996).

13   The alternatives that *only* would need to yield the paraphrased reading are of the following form: *Mary drank water and orange juice, Mary drank beer and orange juice, Mary drank coke and orange juice,* etc., that is, alternatives ranging over *water* which were already used by *also/too.*

14   Bade & Sachs (2019) note that this assumption must be made for a variety of cases involving EXH, including questions (Nicolae 2013), free choice (Fox 2007), plurals (Magri 2014) and interaction with other focus sensitive operators (Crnič 2013; Constant 2014; Beck 2016a).

Note that blocking an implicature differs from cancelling it. Blocking alone is not sufficient to avoid a contradiction when exhaustivity is already forced in the first sentence, e.g., when it is an answer to a question requiring an exhaustive answer, as in (15).

(15)   Q: Tell me, who all came to the dinner?
         A: EXH [Mary and Bill]$_F$ came.
         B: Sue$_F$ came, #(too).

After blocking the exhaustivity inference in (15), the discourse is still incoherent as there is a contradiction between the exhaustivity inference of (15-A), that nobody other than Mary and Bill came, and the assertion of (15-B) that Sue came. For that, the insertion of the additive in (15) must not only block the exhaustivity implicature of (15-B), but also cancel an exhaustivity inference in (15-A) (see Aravind & Hackl (2017) for this observation).[15] While the version of *Obligatory Implicatures* presented in Bade (2016) does not offer an analysis of these cases, our experimental data suggest that cancellation should indeed be distinguished from blocking. We will return to this point in Section 7.

Additives are also predicted not to be obligatorily inserted if exhaustivity is explicitly ruled out by other means. An example of such environment are lists, as in (16-A) (see Amsili & Beyssade 2009 and Winterstein 2009 for discussion). The question under which contextual circumstances an EXH requirement can be lifted is, however, still debated in the literature.

(16)   Q: What did you buy?
         A: I bought bread, I bought butter, I bought milk…

To sum up, *Obligatory Implicatures* assumes that additives are added to the structure to block and/or cancel exhaustivity implicatures which would otherwise give rise to an incoherent discourse. These implicatures are considered obligatory when focus alternatives are evoked by the presence of a question or contrast. Under this approach, the status of additives as focus sensitive operators is essential for blocking EXH from accessing focus alternatives. Given these assumptions, additives are not predicted to be obligatory in contexts where exhaustivity is blocked for independent reasons or cancelled by other means. Since focus evaluation and the corresponding intervention effects have independently been shown to be cross-linguistically stable (Beck 2006; Beck & Kim 2006; Beck 2016b), cross-linguistic stability of the obligatory insertion of additives is predicted.

2.3 Non-uniform behaviour of obligatory presuppositions

It should be noted that the theories introduced above do not necessarily (attempt to) account for the obligatory insertion of all presupposition triggers. In particular, as already mentioned in Section 2.1, not all theories working with *Maximize Presupposition* assume that it regulates the obligatory insertion of additives. That insertion of additives is governed by *Maximize Presupposition* is proposed by Chemla (2008); Amsili & Beyssade (2009); Singh (2011); Eckardt & Fränkel (2012) but not by Percus (2006); Sauerland (2008a); Schlenker (2012). *Obligatory Implicatures*, on the other hand, originally accounted only for the obligatory insertion of additives (Krifka 1999; Sæbø 2004) and only recently has been extended to other triggers, specifically *know* and *again* (Bade 2016).

Moreover, presupposition triggers may not behave uniformly when it comes to their obligatory insertion (Bade 2016; Aravind & Hackl 2017). Following Bade (2016), we assume that the insertion of triggers which have non-presuppositional, lexical competitors is regulated by *Maximize Presupposition*. Leaving them out results in weak, projective inferences which are distinct from implicatures. By contrast, the insertion of triggers that make explicit reference to previous discourse on the presuppositional level is governed by *Obligatory Implicatures*. The inferences resulting from not using them when they can be used are predicted to share all properties with quantity implicatures. The aim of our studies is to add to the debate on the

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15   The assumption that the exhaustive inference of EXH can be cancelled or suspended is widely accepted in the literature (Horn 1972; Gazdar 1979; Magri 2009; Gajewski & Sharvit 2012; Chierchia et al. 2012; Chierchia 2013), even though it is problematic given that under a grammatical approach the inference of EXH is part of asserted content. In this paper, we assume a cancellation mechanism to be active for EXH derived exhaustivity but we leave studying its exact nature for further research, as our data are not directly relevant to the issue. For discussion, see for example Magri (2009) and Göbel (2019) (the latter specifically addressing cancellation with additives).

empirical scope of each of the principles cross-linguistically, not to argue against one of them in general.

3 Predictions of *Maximize Presupposition* vs. *Obligatory Implicatures*

3.1 Insertion of additives in matrix clauses

The predictions of *Maximize Presupposition* and *Obligatory Implicatures* do not differ with respect to the insertion of the trigger in matrix clauses: they both predict sentence (17-a), but not (17-b), to be degraded in the context of (17).

(17)   Context: John came to the party.
     a.   #Bill came to the party.
     b.   Bill came to the party, too.
          ⤳ *Somebody other than Bill came to the party*   PRESUPPOSITION

The two theories offer, however, different explanations of what regulates insertion of additives. For *Maximize Presupposition*, (17-a) competes with (17-b). In addition, the latter, but not the former, presupposes that somebody other than Bill came to the party. From the fact that the speaker used (17-a) instead of (17-b), the hearer deduces that the speaker does not believe that the presupposition of (17-b) is true. This, however, contradicts the context which states that it is true that somebody else came to the party, i.e., John. Therefore, (17-a) is unacceptable in the context of (17). This is shown formally in (18) and (19): (18) illustrates the meaning of (17-b) and (19) demonstrates the reasoning which arises due to the competition of (17-a) with (17-b).[16,17]

(18) $[\![[[\text{too } C]\ [\text{Bill}_F \text{ came to the party}]]]\!] = \lambda w : \exists p[p \in C \& p(w) \&$
$p \neq \lambda w.\text{Bill came to the party in } w].\ \text{Bill came to the party in } w$

(19)   a. $[\![\text{Bill came to the party}]\!] = \lambda w.\text{Bill came to the party in } w$
     b.   ⤳ $\neg \exists p[p \in C \& p(w) \& p \neq \lambda w.\text{Bill came to the party in } w]$
          $\approx$ It is not true that someone other than Bill came to the party

For *Obligatory Implicatures*, on the other hand, it is crucial that *Bill*—due to the contrast with *John*—is in focus and thus is obligatorily exhaustified with regard to the QUD *Who came?* This yields the inference that Bill and nobody else came to the party, which contradicts (17). As a result, (17-a) is degraded. This is formally demonstrated in (20).

(20) $[_S \text{EXH } [[\sim C]\ [_{VP} \text{Bill}_F \text{ came to the party}]]]$
     a. $g(C) = \text{QUD} = [\![\text{Who came to the party}]\!] = \{\text{Bill came, John came, Mary came,}$
          Susi came… }
     b. $[\![\text{EXH}]\!]([\![\text{Who came to the party}]\!])\ ([\![\text{Bill came to the party}]\!]) =$
          $= 1 \text{ iff } [\text{Bill came to the party}](w) \&$
          $\forall q[(q \in [\lambda p.\exists x[p = \lambda w.\text{person}(x)(w) \& \text{at-the-party}(x)(w)]] \&$
          $[\text{Bill came to the party} \nRightarrow q]) \rightarrow \neg q(w)]$
          $\approx$ Bill and no one else came to the party

Note that the crucial difference between *Maximize Presupposition* and *Obligatory Implicatures* is not whether they assume an exhaustivity operator to be behind the exclusion of relevant alternatives but which alternatives are relevant for exclusion. While *Maximize Presupposition* assumes presuppositionally stronger alternatives to be relevant, *Obligatory Implicatures* assumes focus alternatives to be the relevant ones. In fact, there are several proposals working with *Maximize Presupposition* that derive the inference of the sentence without the trigger by exhaustification on the presuppositional level (Magri 2009; Singh 2011; Marty 2017; Elliott & Sauerland 2019). They still assume, however, that the relevant competitors are presuppositional alternatives, not focus alternatives, and hence they make the same predictions for projection as non exhaustivity-based accounts of *Maximize Presupposition*.[18]

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16   *C* is the variable introduced by focus (the $\sim$ operator) which must satisfy the focus constraint stating that *C* must be a subset of the focus value of the proposition it combines with.

17   We are following Heim & Kratzer (1998) in writing presupposed material between a colon and a dot.

18   This is not to say that it is impossible for these theories to incorporate focus as a factor to activate the presuppositional alternatives. We will return to these issues in Section 7 where we discuss our experimental results.

Given that under *Obligatory Implicatures* focus alternatives are relevant, a connection between focus based exhaustivity and the insertion of additive particles is predicted. That is, additives should be more obligatory if an exhaustivity inference is made prominent by the context. If no contradiction arises, the trigger is predicted to be optional. This is not predicted by *Maximize Presupposition*, as under this approach presuppositional alternatives, not focus alternatives, are relevant.

3.2 Insertion of additives under negation

The predictions of the two theories diverge with respect to the insertion of presupposition triggers in embedded structures, in particular under negation (Bade 2016; Bade & Tiemann 2016). Consider (21).[19]

(21)   Context: Mary came to the party.
     a.   It's not the case that Bill came to the party.
     b.   It's not the case that Bill came to the party, too.
       ⇝ *Somebody other than Bill came to the party*   PRESUPPOSITION

As for *Maximize Presupposition*, (21-a) and (21-b) are competitors which are contextually equivalent, but they are not equal regarding presuppositional strength. That is, (21-b) but not (21-a) presupposes that somebody other than Bill came to the party. Assuming that by uttering (21-a) the speaker obeys *Maximize Presupposition*, the hearer concludes that the speaker believes the presupposition of (21-b) not to be true, which contradicts the context in (21). As a result, *Maximize Presupposition* predicts (21-b) to be preferred over (21-a).

By contrast, *Obligatory Implicatures* predicts (21-b) to be preferred over (21-a) only if (21-b) leads to an exhaustivity implicature which contradicts the context in (21). Under the assumption that the EXH operator can only take propositions of type $\langle s,t \rangle$ as an argument, there are two syntactic positions where EXH can attach: above or below negation. When it attaches above negation and focus remains on *Bill*, the corresponding QUD is *Who did not come to the party?* Interpreting the sentence in (21-a) exhaustively with regard to this question conveys that only Bill did not come to the party, which does not contradict the context. As a result, the insertion of an additive particle is not predicted to be obligatory in that case. As for the second option, the insertion of EXH under negation is ruled out for independent reasons. Since entailment relations reverse under negation, calculating an implicature would weaken the meaning. This, however, is excluded under a grammatical approach to implicatures by an economy constraint which disallows insertion of EXH if it leads to incremental weakening (Fox & Spector 2018).

3.3 Intermediate Summary

Summing up, *Maximize Presupposition* assumes competition on the level of presuppositions. Therefore, the insertion of additives is predicted to be obligatory both in unembedded contexts and under negation. By contrast, according to *Obligatory Implicatures*, insertion of the additive is related to focus exhaustivity inferences which must be blocked or canceled if they contradict the context. As a result, the insertion of an additive particle is obligatory in unembedded contexts but not under negation, where exhaustification is either blocked or does not lead to a contradiction for independent reasons.[20] Furthermore, *Obligatory Implicatures* but not *Maximize Presupposition* predicts the insertion of additives to be dependent on the strength of focus exhaustivity effects.

We designed two experiments to test these predictions in two different languages. Before we turn to reporting them, however, let us briefly discuss previous experimental studies on the insertion of presuppositional additive markers.

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[19]   In many languages, it has been observed that-either due to intervention effects or additives being a positive polarity item (PPI) or both-sentences such as (21-b) are degraded (Beck 2006). For that reason, we used high negation both in examples and experiments.

[20]   The same diverging predictions of the two theories regarding the obligatory insertion of presupposition triggers under negation hold for other triggers. The experimental results show that while the predictions of *Obligatory Implicatures* come closer to the empirical picture for the insertion of *know*, *again*, and *too* (Bade & Tiemann 2016; Bade 2016), the predictions of *Maximize Presupposition* are borne out regarding the insertion of definites. These observations constitute a key argument for proposing two classes of presupposition triggers and a division of labour between *Maximize Presupposition* and *Obligatory Implicatures* (Bade 2016).

4 Previous experimental work

It is a longstanding observation that additives are obligatory to a gradient degree (Kaplan 1984). The source of this gradience has been related to various factors in the literature, most notably to discourse and information structure (Kaplan 1984; Krifka 1999; Sæbø 2004). One of the main claims is that if additives are left out in contexts that satisfy their presupposition, the topic of the sentence is interpreted as contrastive, yielding an inference which is contradictory to the context. Corpus and experimental studies have confirmed that the discourse structure of the text plays an important role in the insertion of additives (Sæbø 2004; Winterstein & Zeevat 2012; Eckardt & Fränkel 2012). One crucial discourse factor regulating the pressure to insert additive markers is their distance to the relevant focus antecedent. A rating study on French (Amsili et al. 2016) shows that the pressure to insert the additive marker also aligns with the similarity of segments between two sentences with contrastive topics: the more reduced the comment in a contrastive topic/comment configuration, the more obligatory is the insertion of French additive particle *aussi* 'too'. In other words: the more reduced the comment, the less acceptable is leaving out *aussi* 'too'. Based on these data, Amsili et al. (2016) argue that similarity is marked more strongly by ellipsis or anaphora than by repeating lexical material. An example of their rating item is given in (22).

(22)   Jean   a   montré   sa   voiture   à   Paul,   et   Léa …
       Jean   has   shown   POSS.FEM   car   to   Paul   and   Lea …
       'John has shown his car to Paul and Lea …'

    a.   a   montré   sa   voiture   à   Paul   (aussi)
        has   shown   POSS.FEM   car   to   Paul,   ADD
        'has shown his car to Paul (too).'

    b.   lui   a   montré   sa   voiture   (aussi)
        3SG.DAT.MASC   has   shown   POSS.FEM   car   ADD
        'has shown him her car (too).'

    c.   la lui   a   montré   (aussi)
        it 3SG.DAT.MASC   has   shown   ADD
        'has shown him (too).'

    d.   aussi
        ADD
        'too.'

Based on these and similar observations, additional constraints have been proposed to play a role in regulating the insertion of additives, such as global discourse relations and similarity constraints (Amsili & Beyssade 2009; Amsili et al. 2016). For example, Winterstein (2009) and Winterstein & Zeevat (2012) argue that the insertion of *too* is dependent on *argumentative identity*. Essentially, the more identical the complement of *too* and its referent are and the more they argue for the same conversational goal—for example in answering the same QUD—the more obligatory *too* is.

Eckardt & Fränkel (2012), in turn, report on a study in which participants were asked to produce a narrative introduced by a series of images in which the same character did the same action twice or the same action was done by different characters. Participants were divided into the two groups: they were either asked to write a story like in a children's book (story task) or write a report as a secret agent (report task). Results show that participants in the story task group were much more likely to use additive particles than in the report task group, suggesting that the text type plays a role in the insertion of additives. The authors endorse the proposal by Amsili & Beyssade (2009) and argue that the obligatory insertion of *too* is dependent on discourse structure. Taken together, the outcome of these studies suggests that the discourse structure as well as emphasis play a role in the insertion of additives. As for the analyses, they involve a modification of the presupposition of additives but keep the idea that their insertion is governed by *Maximize Presupposition*.

The most relevant previous results for our experiments come from a study by Bade (2016) who explicitly tested the predictions of both *Maximize Presupposition* and *Obligatory Implicatures* for the insertion of German additive *auch* 'too'.[21] In that study, the contexts strongly suggested that certain critical sentences, i.e., those making the presupposition of *auch* 'too' true, required

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21   See also Renans et al. (2017).

exhaustive interpretation.[22] Exhaustive interpretation was induced by embedding the critical sentence in a discourse which was then wrapped-up suggesting its finality. For example, the context in (23) suggests that the issue of who was greeted by Rita is fully resolved.

(23)   Rita ist ins Büro gekommen, hat Kaffee gekocht, **Stefan und Sabine begrüsst**
         Rita is in office come   has coffe cooked Stefan and Sabine greeted
         und sich an ihren Schreibtisch gesetzt.
         and REFL on her desk   sat.
         'Rita came to work, made coffee, **greeted Stefan and Sabine**, and sat down at her desk.'

   a.   Sie hat auch Lisa begrüsst.
         3SG has ADD Lisa greeted
         'She greeted Lisa, too.'   (+ADDITIVE)

   b.   Sie hat Lisa begrüsst.
         3SG has Lisa greeted
         'She greeted Lisa.'   (–ADDITIVE)

   c.   Sie hat Lisa nicht begrüsst.
         3SG has Lisa NEG greeted
         'She did not greet Lisa.'   (NEGATION)

   d.   Sie hat Stefan begrüsst.
         She has Stefan greeted
         'She greeted Stefan.'   (CONTROL)

The context was followed by a target item in one of the following four conditions: a new sentence with the additive particle *auch* 'too', as in (23-a); a new sentence without an additive, as in (23-b); a new negative sentence without an additive, as in (23-c); and a sentence entailed by the context, as in (23-d). The participants' task was to judge the acceptability of the target sentence in the context on a scale from 1 ('not acceptable') to 7 ('fully acceptable'). Importantly, participants were advised to read the target as a continuation of the context ('How appropriate do you think it is that a native speaker would follow up the text by the following sentence?'). The results are summarized in *Figure 1* below.
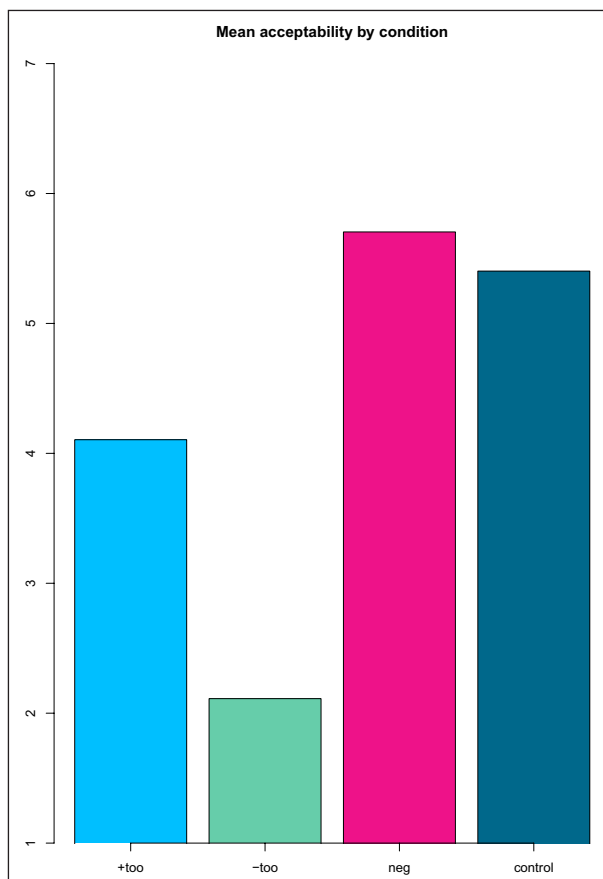
Figure 1 Mean acceptability of sentences with the additive, without the additive, with negation, and the control condition.

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22   Note that it is still under debate which structural and contextual factors make exhaustivity implicatures mandatory or the default. For discussion, see e.g., Magri (2009); Chierchia et al. (2012).

As predicted by both *Maximize Presupposition* and *Obligatory Implicatures*, sentences without an additive marker were judged significantly worse than sentences with an additive and sentences entailed by the context. As for sentences with negation, they were more acceptable than positive sentences with and without an additive particle, and as acceptable as the sentences entailed by the context (controls).[23] The data suggest that the inference resulting from not using an additive does not project, which is more in line with an implicature based analysis. Moreover, even sentences with the additive were degraded compared to sentences entailed by the context (control) and sentences with negation. This strongly suggests that the additive *auch* 'too' is sensitive to the exhaustivity effects made strong by the context. Overall, the results are compatible with *Obligatory Implicatures*: additives are not obligatory under negation and interact with exhaustivity.[24] Note, however, that there is no independent evidence that the contextual manipulations used indeed yield a stronger exhaustivity effect, which is problematic for the experimental design.

Given previous experimental results, the aim of our experimental studies on the insertion of additive particles in Ga and German was two-fold. The first goal was to test the predictions of *Maximize Presupposition* vs. *Obligatory Implicatures* with a different design, thereby avoiding problems of previous experiments. The second goal was to test whether *Obligatory Implicatures* is cross-linguistically stable. For that purpose, we tested the obligatoriness of the insertion of additives in Ga and German in exhaustive contexts compared to non-exhaustive contexts, as well as under negation in Ga. The results of the last experiment were compared to the results of a previous and analogous study run on German (Bade & Tiemann 2016).

5 Experiment 1 — exhaustivity and insertion of additives

We designed an acceptability judgment task to check the predictions of *Maximize Presupposition* vs. *Obligatory Implicatures* regarding how obligatory the insertion of additives in exhaustive versus non-exhaustive contexts is in two unrelated languages: German and Ga.[25] Unlike in previous experimental studies, the exhaustivity effect was evoked by using cleft sentences, which have independently been shown to come with a stronger exhaustivity effect than SVO sentences in both languages (see De Veaugh-Geiss et al. 2015 for German; and Renans 2016a; b; Grubic et al. 2019 for Ga).

5.1 Exhaustivity and insertion of additives in Ga

5.1.1 Methods

5.1.1.1 Participants

We tested a total of 26 undergraduate students (female: 18; male: 22; range: 17–29) from the University of Ghana at Legon, all native speakers of Ga. All participants were multi-lingual to varying degrees, and many reported that they were native speakers of at least one other language spoken in Ghana (e.g., Twi, Ewe, or English). Participants received monetary compensation for their time.

5.1.1.2 Procedure and Materials

The experiment was conducted off-line using a pen-and-paper questionnaire. Participants were asked to judge the target sentences as presented in context on a scale from 1 ('totally unacceptable') to 7 ('totally acceptable'). For the context, we manipulated the strength of exhaustivity via the SENTENCE TYPE (2 levels: SVO, Cleft); for the target, we manipulated

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23 The high average rating of the controls is at least puzzling, if not worrisome. It may be that participants misinterpreted the task as asking for truth in the context, rather than for appropriateness. The main findings of the study, however, are unaffected by this concern: sentences without an additive are less acceptable than sentences with an additive, but only if they do not contain negation.

24 Unlike Bade & Tiemann (2016), who used very high negation ('it is not the case that…'), Bade (2016) used sentential negation in her study. It is possible that the insertion of *auch* 'too' under negation was blocked for independent reasons, e.g., because *auch* 'too' is a positive polarity item. There are presuppositionally stronger additive markers in German, however, which are completely acceptable under negation, such as *noch* 'still', and could have been used instead. As a result, *Maximize Presupposition* would still predict the sentence to be degraded.

25 Ga is a Kwa language spoken in the Greater Accra Region in Ghana by ca. 745,000. Its basic word order is SVO and it has two tones, Low and High (Lewis 2009).

the presence/absence of the ADDITIVE particle *hu* 'also' (2 levels: ± Additive), as exemplified below.[26]

(24) **Sentence Type:**

a.   Tɛtɛ ba   shia. E-ye   banku.
  Tɛtɛ come home 3SG-eat banku(=Ghanaian dish)
  'Tɛtɛ came home. He ate banku.'   [SVO]

b.   Tɛtɛ ba   shia.   Banku ni   e-ye.
  Tɛtɛ come home banku PRT 3SG-eat
  'Tɛtɛ came home. It was banku he ate.'   [*ni*-CLEFT]

(25) **Additive:**

a.   E-ye   blofoŋme hu.
  3SG-eat pineapple ADD
  'He ate pineapple, too.'   [+ADDITIVE]

b.   E-ye   blofoŋme.
  3SG-eat pineapple
  'He ate pineapple.'   [–ADDITIVE]

For example, a participant might see a context-target pair in the [SVO, +ADDITIVE] condition as in (26). Their task was to judge the acceptability of the target sentence in the context.

(26) **Context**: Tɛtɛ ba shia. Eye banku.
  Target: Eye blofŋme hu.
  Context: 'Tɛtɛ came home. He ate banku.'
  Target: 'He also ate pineapple.'   [SVO, +ADDITIVE]

In total there were 24 context-target pairs plus 24 filler items, randomized and distributed in a Latin square design across 4 lists. Each list was presented in two versions, with the stimuli from version one reversed in version two. This was done in order to balance out any effects of the order of presentation.

5.1.2 Predictions

As discussed above, *Maximize Presupposition* predicts the trigger to be obligatory if its insertion is contextually licensed (i.e., its presupposition is fulfilled). Since both context conditions, using an SVO structure and using a cleft, make the presupposition of the additive true, a main effect of ±ADDITIVE is predicted. Leaving out the trigger should be equally bad in both conditions and inserting it should be equally good; crucially, no interaction of the factors SENTENCE TYPE and ADDITIVE is predicted.

Obligatory Implicatures, on the other hand, predicts the obligatory insertion of the trigger to be dependent on how reliable the exhaustivity effect is: if exhaustivity is obligatory, so is the trigger. If no exhaustivity inference that could lead to a contradiction arises, the trigger is predicted to be superfluous. That is, the pressure to insert an additive particle is predicted to vary with the context. Since the focus exhaustivity effect has been shown to be stronger with the *ni*-cleft in Ga, leaving the additive out in the sentence following the *ni*-cleft should be worse than leaving the additive out after the SVO sentence. Thus, *Obligatory Implicatures* predicts an additional interaction between the presence or absence of the additive particle and context type.

5.1.3 Details of statistical analysis (for all experiments)

For all our analyses, we ran a linear-mixed effects model with maximal random effects structure as recommended in Barr et al. 2013, including random intercepts and random slopes for participants and items. We report the simpler model structure when the more complex one did not converge, or a model comparison (ANOVA) did not show a significant difference between the models. Analyses were implemented using the *lme4* library (GPL-2|GPL-3, v.1.1-13; Bates et al. 2015) in the R environment (GPL-2|GPL-3, v.3.3.3; R Core Team 2017). We report estimates,

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26   For empirical evidence that *hu* 'too' is indeed an additive particle with the properties similar to those of its German counterpart *auch* 'too', see Renans et al. 2017. As the German *auch hu* in Ga has a projective additive meaning component and comes with a strong contextual felicity constraint.

standard errors, and t-values from the *lmer* output, with a t-value exceeding 1.96 considered statistically significant.

5.1.4 Results

There was a significant interaction between SENTENCE TYPE and ADDITIVE ($\hat{\beta} = 0.6$, $SE = 0.28$, $t = 2.127$). There was no significant main effect of contextual SENTENCE TYPE ($\hat{\beta} = 0.24$, $SE = 0.16$, $t = 1.463$); however, there was a highly significant main effect for the ADDITIVE predictor ($\hat{\beta} = –1.76$, $SE = 0.147$, $t = –11.77$) – that is, participants overall judged sentences with an additive particle more acceptable than those without (for cleft structure with the additive: $M = 6.07$; cleft structure without the additive: $M = 4.05$; SVO with the additive: $M = 6$; SVO without the additive: $M = 4.6$).[27] For the interaction, crucially, the absence of the additive particle *hu* had a higher negative effect on the acceptability of sentences in the context of strong exhaustivity (*ni*-clefts) than in the context of weak exhaustivity (SVO). This is the most important finding, as it suggests that the additive is more obligatory in the *ni*-cleft than in the SVO condition. The results are depicted in *Figure 2*.
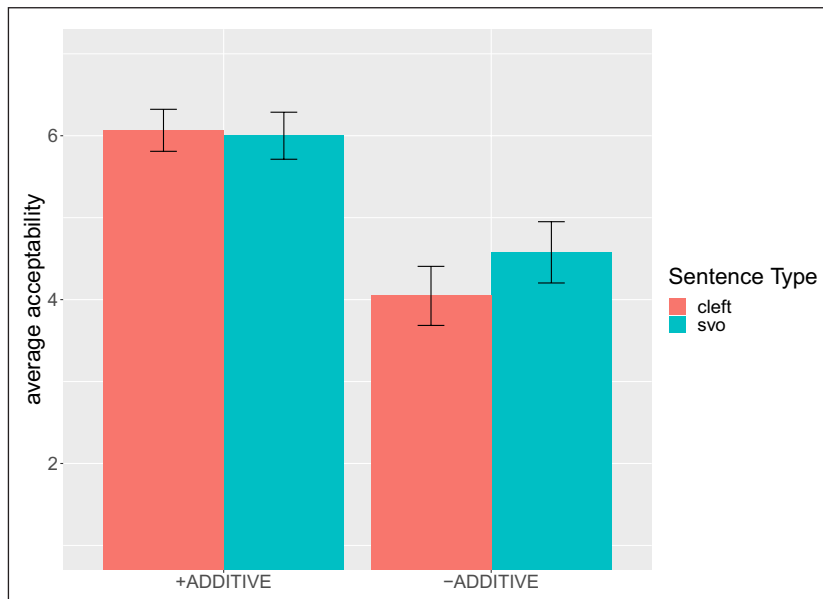
5.2 Exhaustivity and insertion of additives in German

5.2.1 Methods

5.2.1.1 Participants

30 native speakers of German were tested for the experiment. They received 5 Euros compensation for their participation.

5.2.1.2 Procedure and Materials

The German experiment was programmed using the free software OnExp (GNU General Public License) hosted at the Universität Göttingen (*https://onexp.textstrukturen.uni-goettingen.de/*). A link to the experiment was sent to the participants after they agreed to participate via e-mail. They did the experiment online and on their own computer. After finalizing the experiment they received a code which they had to send to the investigator to get compensated.

The design of the experiment was the same as for the study on Ga. The lexical material was kept maximally similar. However, as clefts in German require more elaborate contexts than in Ga to be felicitously used, the contexts in the German experiment were richer than in the Ga experiment. This difference, however, has no bearing on the question we are interested in as

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27   Although participants judged exhaustivity violations with *hu* 'too' as relatively acceptable, which is unexpected if the exhaustive meaning component is a presupposition, we nonetheless argue that the results are in line with the previous analysis of the *ni*-structure as yielding a presuppositional exhaustivity effect (Renans 2016a; b). Importantly, the *ni*-cleft gives rise to a conditional presupposition (e.g., the sentence *Kofi ni sele* 'It is Kofi who swam' in rough terms presupposes that if Kofi swam, then Kofi is the only person who swam). In some contexts this conditional presupposition can be targeted by negation.

well as on the analysis and comparison of the results. An example of the lexical material used in the German study is presented in (27).

(27) **Context:**
Peter ist gerade nach Hause gekommen. Er   überlegt, was er   am
Peter is just   PREP home come   3SG think   what 3SG in-the
Nachmittag gegessen hat und erinnert sich.
afternoon   eaten   has and recall   REFL
'Peter just came home. He is thinking about what he ate today and remembers suddenly.'

Sentence type:
a.   Er   hat eine Birne gegessen.
3SG has INDF pear   eaten
'He ate a pear.'   [SVO]

b.   Es war eine Birne, die er   gegessen hat.
It was INDF pear   that 3SG eaten   has
'It was a pear that he ate.'   [CLEFT]

(28) **Additive:**
a.   Er   hat auch eine Ananas   gegessen. Obst isst er   sehr gerne.
3SG has ADD INDF pineapple eaten   fruit eats 3SG very ADV
'He ate a pineapple, too. He loves eating fruit.'   [+ADDITIVE]

b.   Er   hat eine Ananas   gegessen. Obst isst er   sehr gerne.
3SG has INDF pineapple eaten   fruit eats 3SG very ADV
'He ate a pineapple. He loves eating fruit.'   [–ADDITIVE]

For example, a participant might see a context-target pair in the [SVO, +ADDITIVE] condition, as illustrated in (29) below. The task of the participants was to judge the acceptability of the target sentence in the context on the scale from 1 ('totally unacceptable') to 7 ('totally acceptable').

(29) **Context:** Peter ist gerade nach Hause gekommen. Er überlegt, was er am Nachmittag gegessen hat und erinnert sich. Er hat eine Birne gegessen.
Target: Er hat auch eine Ananas gegessen. Obst isst er sehr gerne.
Context: 'Peter just came home. He is thinking about what he ate today and remembers suddenly. He ate a pear.'
Target: 'He ate a pineapple, too. He loves eating fruit.'

In addition to 24 context-target pairs, 24 filler items were included in the experiment. All trials were randomized and distributed in a Latin square design across 4 lists.

5.2.2 Predictions

As was the case with the experiment on Ga, *Maximize Presupposition* predicts a main effect of ± ADDITIVE, i.e., leaving out the trigger should be equally bad in both conditions, inserting it should be equally good. *Obligatory Implicatures* predicts an additional interaction between the presence or absence of the additive marker and the type of context sentence (i.e., SVO or CLEFT).

5.2.3 Results

The linear mixed effects model fitted to the data revealed a significant main effect of contextual SENTENCE TYPE ($\hat{\beta} = -0.40306$, $SE = 0.08353$, $t = -4.826$). Contexts with SVO sentences were overall more acceptable than sentences with clefts. We take this effect to be due to the fact that, unlike in Ga, clefts are rarely used in German in answers to questions. There was also a highly significant main effect for the ADDITIVE predictor ($\hat{\beta} = 0.82129$, $SE = 0.08307$, $t = 9.887$). Participants overall judged sentences with the additive particle to be more acceptable than those without it. Most importantly, there was also a highly significant interaction between the factors SENTENCE TYPE and ADDITIVE ($\hat{\beta} = 0.5234$, $SE = 0.1561$, $t = 3.352$). Leaving out the additive particle decreased the acceptability of sentence significantly more in the cleft context condition than in the SVO context condition (for cleft structures with the additive: $M = 5.04$; cleft structures without the additive: $M = 3.96$; SVO with the additive: $M = 5.2$; SVO without the additive: $M = 4.6$). The results are presented in *Figure 3*.
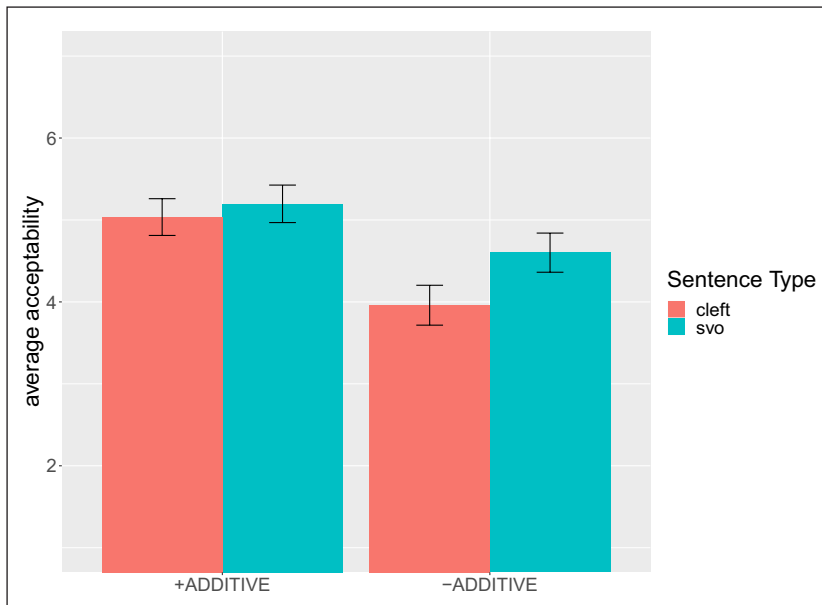
Figure 3 Mean acceptability ratings of sentences with and without the additive *auch* 'too' in contexts with cleft-structures or SVO sentences in German.

5.3 Discussion

The experimental results show that the insertion of additives is sensitive to exhaustivity. In both languages and sentence conditions, the sentence with an additive is preferred over the sentence without an additive. Moreover, in both languages leaving out the additive in the more exhaustive cleft condition is less acceptable than in the SVO condition, i.e., the discourse in (30-a) is perceived as more degraded than the discourse in (30-b).

(30)   a.   #It was an apple that Joe ate. He ate [a banana]$_F$.
         b.   ??Joe ate an apple. He ate [a banana]$_F$.

This result is straightforwardly accounted for by *Obligatory Implicatures*. Under this approach, (30-a) and (30-b) are incoherent discourses, as in both cases *banana* is in focus, leading to the insertion of the EXH operator in the second sentence. As a result, both sentences are exhaustified with regard to the question *What did John eat?*, giving rise to the interpretation that John ate a banana and nothing else. This, in turn, is contradictory to the first sentence which states that John ate an apple, leading to lower acceptability. The effect is stronger in (30-a) since in this case the first sentence with the cleft structure already suggests that Joe ate nothing but an apple.

Obligatory Implicatures can also account for the fact that, at least in German, the cleft structure followed by a sentence with an additive particle is more degraded than its SVO counterpart in the same configuration. For example, (31-a) sounds less coherent than (31-b).

(31)   a.   ??It was an apple that John ate. He ate a banana, **too**.
         b.   John ate an apple. He ate a banana, **too**.

We propose that both in the second sentence of (31-a) and (31-b) EXH is blocked. This leads to a completely coherent discourse in (31-b) but not in (31-a), as there is still an exhaustivity effect triggered by the first sentence in (31-a). In line with the discussion in Section 2.2, the role of the additive in that case is not only to block the exhaustive inference in the second sentence but also to cancel the exhaustivity inference of the first sentence. Even though our data cannot decide on a specific approach to cancellation, they suggest that the two processes involved (blocking alone versus cancellation plus blocking) are qualitatively different, as (31-a) is more degraded in comparison to (31-b), and constitute two separate functions of additives. In the sense that cancellation requires revision—which can be depreciated—whereas blocking does not. This is in line with previous findings (Bade 2016; Renans et al. 2017), which suggested that even sentences with additives can be perceived as degraded in contexts that strongly favour exhaustive interpretations.

Turning to *Maximize Presupposition*, the decrease in acceptability of (30-a) and (31-a) in comparison to (30-b) and (31-b), respectively, poses challenges to it. In order to account for the data, additional assumptions about either the presupposition of additives or the

conditions under which the principle is active must be made. Constraints that have previously been postulated for the use of additives, such as SIMILARITY or ARGUMENTATIVE IDENTITY (Winterstein & Zeevat 2012; Amsili et al. 2016), cannot account for the difference we observe, however. If at all, the two sentences in (31-b) are more similar than in (31-a). Thus, the additive should be more obligatory in (31-b) than (31-a), contrary to fact. Moreover, it is hard to see how ARGUMENTATIVE IDENTITY could be different for (31-a) and (31-b) as both clearly address the same QUD (explicitly spelled out in the experimental materials for German).

Another possible explanation is based on the assumption that the alternative containing the additive is less relevant for clefts, as the question *What else did he eat?* is not warranted if *What did he eat?* was already answered exhaustively.[28] This explanation, however, hinges on the assumptions that SVO sentences can non-exhaustively answer wh-questions, which is a highly debated issue, and that different covert (follow-up) questions were raised by our target sentences. At the moment, we lack independent evidence to support such a view.

Yet another possibility would be to assume that additive particles come with a presupposition about what the QUD is. This presupposition would be much more likely to be satisfied in the case of cleft sentences (as focus is structurally marked and thereby the QUD potentially easier to identify) than SVO sentences. We are, however, hesitant to adopt this idea as in the German version of the experiment the QUD was explicitly given both in the cleft and SVO condition, so the question was already known in both cases and the proposed presupposition was equally satisfied.

By saying that, however, we do not claim that it is impossible to come up with a modification of *Maximize Presupposition* that can account for our experimental data. Our data simply pose challenges for current versions of *Maximize Presupposition*. At the core of the challenge lies the fact that it is non-trivial to make presuppositional alternatives more or less relevant using focus, as they are backgrounded material. Further research is needed on when presuppositional alternatives are relevant to consider. Moreover, any modification of *Maximize Presupposition* must be general enough to carry over to cases for which it currently makes correct predictions, such as the insertion of definite determiners. For now, what emerges from our experimental studies is that additives do not fall under the scope of *Maximize Presupposition*. We will now turn to further data supporting this view.

6 Experiment 2 — negation and insertion of additives

In the second set of experiments, we tested how obligatory the insertion of additive particles is in sentences embedded under negation. In this section, we present novel data from Ga and compare them to previous results on German.

6.1 Negation and exhaustivity in Ga

6.1.1 Methods

6.1.1.1 Participants

We tested 26 Ga native speakers (F: 18, mean age: 23), students of the University of Ghana at Legon. All participants were multilingual to varying degrees and many reported that they were native speakers of more than one language spoken in Ghana. Participants received monetary compensation for their time.

6.1.1.2 Procedure and Materials

The experiment was an off-line study using a pen-and-paper questionnaire. The participants' task was to judge the target sentences presented in the context on a scale from 1 ('totally unacceptable') to 7 ('totally acceptable'). Two factors were manipulated for the target sentences: POLARITY (2 levels: positive vs. negative) and the presence/absence of the additive particle *hu* 'also' (2 levels: ± ADDITIVE), as presented in (32).[29]

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28   Thanks to two anonymous reviewers for this suggestion and the one discussed in the following paragraph.

29   In the experiment, context descriptions were presented in Ga. However for presentational reasons we provide it in English in (32) and (33).

(32) **Context:** Kwao and Akusia are both currently writing their master's thesis. They decided to party together after submitting the thesis. Yesterday, Yakushia submitted her thesis.

[+NEGATION]
a. Jeee nakai ji sane lɛ akɛ Kwao hu nɔ ekaa lɛ eha. [+ADDITIVE]
    'It is not the case that Kwao submited his thesis, too.'

b. Jeee nakai ji sane lɛ akɛ Kwao Nɔ ekaa lɛ eha. [–ADDITIVE]
    'It's not the case that Kwao submitted his thesis.'
    … No hewɔ ni esani amɛfo yeli kɛ numɔ lɛ mli lɛ.
    … 'This is why they have to cancel the party.'

[–NEGATION]
c. Nakai ji sane lɛ akɛ Kwao hu nɔ ekaa lɛ eha. [+ADDITIVE]
    'It is the case that Kwao submitted his thesis, too.'

d. Nakai ji sane lɛ akɛ Kwao nɔ ekaa lɛ eha. [–ADDITIVE]
    'It is the case that Kwao submitted his thesis.'
    … No hewɔ ni amɛje yeli kɛ numɔ lɛ hesaamɔ lɛ shishi ekome lɛ.
    … 'This is why they started to plan the party together.'

An example of the context-target pair in the condition [+NEGATION, +ADDITIVE] is given below.

(33) **Context**: Kwao and Akusia are both currently writing their master's thesis. They decided to party together after submitting the thesis. Yesterday, Yakushia submitted her thesis.
    Target: Jeee nakai ji sane lɛ akɛ Kwao hu nɔ ekaa lɛ eha.
    'It is not the case that Kwao submited his thesis, too.'
    This is why they started to plan the party together.

In total, each participant saw 24 context-target pairs plus 24 filler items, randomized and distributed in a Latin square design across 4 lists. Each list was presented in two versions, with the stimuli from version one reversed in version two. This was done in order to balance out any effects of order of presentation.

6.1.2 Predictions

Under a *Maximize Presupposition* approach, the sentence with an additive particle is always presuppositionally stronger and as such should always be more acceptable, irrespective of the presence of negation. Thus, *Maximize Presupposition* predicts a main effect of the presence or absence of the additive particle (±ADDITIVE): sentences with an additive particle should be judged as more acceptable than sentences without an additive particle, regardless of POLARITY (negative vs. positive). Under *Obligatory Implicatures*, on the other hand, additives are not predicted to be obligatory in negative sentences but in positive sentences, as exhaustivity is blocked under negation but obligatory in unembedded cases. As a result, *Obligatory Implicatures* predicts an interaction: positive sentences will elicit a steeper difference in acceptability between the presence/absence of the additive (±ADDITIVE) compared to negative sentences.

6.1.3 Results

Linear-mixed effects model analyses revealed a significant interaction between POLARITY and ADDITIVE ($\hat{\beta} = -0.6299$, $SE = 0.2661$, $t = -2.367$). Crucially, the absence of the additive particle *hu* had a higher negative effect on the acceptability of positive sentences than negative sentences (targets with negation and with the additive: $M = 5.34$; with negation but without the additive: $M = 5.56$; without negation but with the additive: $M = 5.82$; without negation and without the additive: $M = 5.41$). There was no main effect of POLARITY ($\hat{\beta} = -0.09$, $SE = 0.134$, $t = -0.647$) and no main effect of ADDITIVE ($\hat{\beta} = 0.1712$, $SE = 0.1338$, $t = 1.279$), i.e., sentences with the additive were not overall more acceptable in Ga. The results are shown in *Figure 4*.
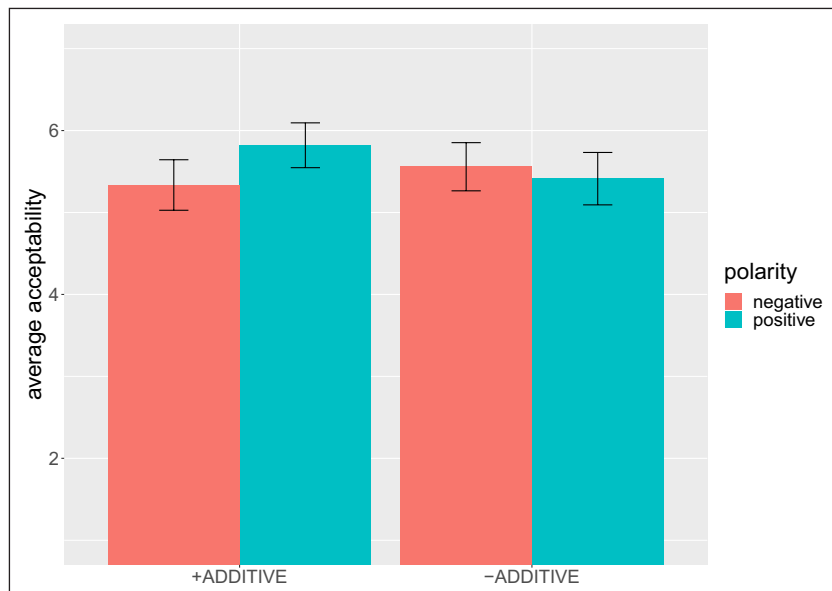
6.2 Negation and exhaustivity in German (Bade & Tiemann 2016)

In this section, we discuss a previous study on German additive particle *auch* 'too' (Bade & Tiemann 2016), which tested the diverging predictions of *Obligatory Implicatures* and *Maximize Presupposition* for insertion of additives under negation.[30]

6.2.1 Methods

6.2.1.1 Participants

36 German native speakers participated in the experiment and they received 5 Euros compensation for their participation.

6.2.1.2 Procedure and Materials

The procedure was identical to the study on clefts reported above, see Bade & Tiemann (2016) for more details. The experiment was programmed using the free software OnExp. A link to the experiment was sent to the participants after they agreed to participate via e-mail. They did the experiment online and on their own computer. After finalizing the experiment they received a code, which they had to send to the investigator to get the compensation. Participants were instructed to first carefully read the context and then the target sentence. Their task was to judge the acceptability of the target within the given context on a scale from 1 ('totally unacceptable') to 7 ('totally acceptable'). The study employed a fully crossed design with two factors: POLARITY (2 levels: positive vs. negative) and the presence/absence of the additive particle *auch* 'too' (2 levels: ± Additive). The target appeared in one of the four conditions in a context where the presupposition of the trigger was fulfilled, as in (34).[31]

(34) **Context**: Lukas and Melanie like to go to the cinema together. They agreed to go to the cinema on Friday, if both have time. Lukas has time to go on Friday.

[+ NEGATION]
a. Es ist nun nicht so, dass auch Melanie am Freitag Zeit hat.   [+ ADDITIVE]
'It is not the case that Melanie has time to go on Friday, too.'

b. Es ist nun nicht so, dass Melanie am Freitag Zeit hat.   [– ADDITIVE]
'It is not the case that Melanie has time to go on Friday.'
… Deswegen überlegen sie sich einen anderen Termin.
… 'This is why they are trying to find another time.'

[– NEGATION]
c. Es ist nun so, dass auch Melanie am Freitag Zeit hat.   [+ ADDITIVE]
'It is the case that Melanie has time to go on Friday, too.'

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30   The paper originally discussing these data focused on the comparison between *wieder* 'again' and *auch* 'too' under negation in German. We re-analysed the data for the purposes of the present paper and refocused the discussion of the results.

31   In the experiment, the contexts were presented in German. We provide it in English for presentational reasons.

d.   Es ist nun so, dass Melanie am Freitag Zeit hat.   [− ADDITIVE]
     'It is the case that Melanie has time to go on Friday.'
     … Deswegen reservieren die beiden Karten für die Spätvorstellung.
     … 'This is why they order tickets for the late show.'

24 experimental items were created, 6 per condition. In addition 48 filler items were used in the experiment. The items were distributed over 4 lists in a Latin square design.

6.2.2 Predictions

Same as in the case of the Ga experiment, *Maximize Presupposition* predicts a main effect of ADDITIVE, whereas *Obligatory Implicatures* predicts an interaction between ADDITIVE and POLARITY.

6.2.3 Results

A linear mixed effects model analysis[32] revealed a significant interaction between POLARITY and ADDITIVE ($\hat{\beta} = -1.2279$, $SE = 0.1819$, $t = -6.751$) (targets with negation but without the additive: $M = 3.6$; with negation and with the additive: $M = 3.5$; without negation and without the additive: $M = 3.9$; without negation but with the additive: $M = 5$). Crucially, leaving out the additive decreased the acceptability of sentences with positive polarity but not the acceptability of sentences with negative polarity. Moreover, there was a main effect of ADDITIVE ($\hat{\beta} = 0.48$, $SE = 0.098$, $t = 4.92$), i.e., sentences with the additive were generally rated higher, and POLARITY ($\hat{\beta} = -0.867$, $SE = 0.095$, $t = -9.147$), i.e., negative sentences were generally judged worse. This last effect is probably due to the fact that structurally high negation had to be used to avoid unacceptability of *auch* 'too', as it is a positive polarity item in German. Furthermore, negation necessarily adds complexity and thus generally decreases acceptability. The results are presented in *Figure 5*.
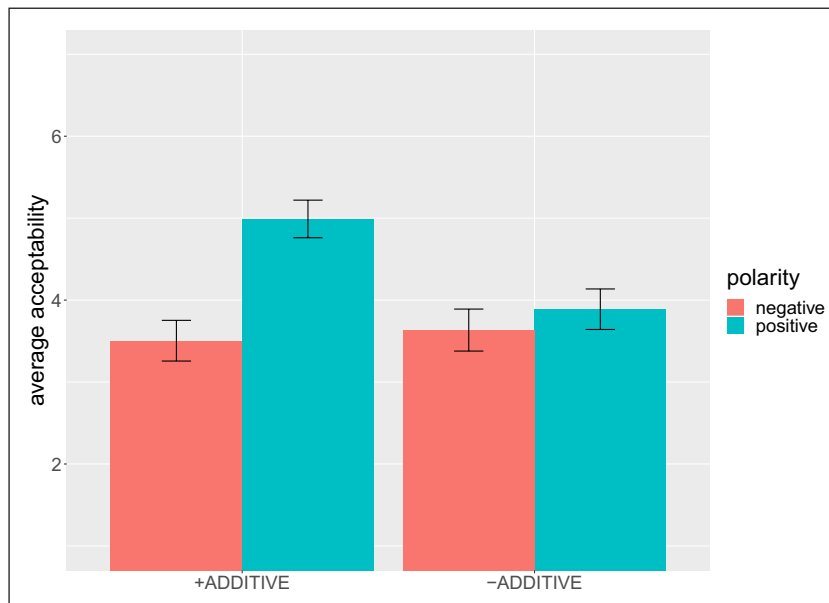
Figure 5 Mean acceptability ratings of sentences with and without the additive *auch* 'too' across polarities in German.

7 General discussion

Our results are overall in line with *Obligatory Implicatures* and pose serious challenges for current *Maximize Presupposition* based approaches to obligatory insertion of additives. The first series of experiments show that the pressure to insert an additive particle aligns with the strength of the focus exhaustivity effect evoked in the context, as predicted by *Obligatory Implicatures*. Further, the second set of experiments shows that the insertion of additives is not obligatory

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32   For the purpose of the present paper, we used the original raw data of the experiment reported in Bade & Tiemann (2016) and re-did the analysis using the same parameters and settings as for the experiments reported above. The main findings are unaffected by this.

under negation, again lending support to an *Obligatory Implicatures* based analysis, but not to a *Maximize Presupposition* based analysis.

As pointed out above, the division of labour between the two mechanisms hinges on what kinds of alternatives are relevant for the obligatory insertion of the trigger and the type of inference that arises when it is not inserted. The results of our experiments point to the conclusion that for the insertion of additive particles focus alternatives are relevant, not presuppositionally stronger alternatives containing *too*. Making presuppositional alternatives relevant would require finding a principled way of explaining why presuppositionally stronger alternative with *too* are pruned or irrelevant in the presence of negation and clefts.[33] In light of our experimental findings, we propose that the obligatory insertion of additives should be distinguished from obligatory presupposition effects for which the presuppositionally stronger competitor *does* play a role. That is, we take these findings not to speak against *Maximize Presupposition* per se, but rather as further evidence that triggers behave systematically differently when it comes to their obligatory insertion. Following Bade (2016), we assume that *Maximize Presupposition* is limited in its empirical scope: it accounts for insertion of triggers with well-defined lexical alternatives, such as definite determiners, but not for the obligatory insertion of additives.

The division of labour between the two principles aligns with a structural view on alternatives, which claims that (presuppositionally stronger) alternatives must not be structurally more complex than the presuppositionally weaker sentence they are competing with. Under this view, a sentence containing an additive particle is thus not a well-defined alternative for a sentence without it.

Moreover, the division of labour between *Obligatory Implicatures* and *Maximize Presupposition* reveals an interesting parallel with syntactic optionality. While presuppositional adverbs like *too*, whose insertion is regulated by *Obligatory Implicatures*, are optional from a syntactic point of view and are usually adjuncts to the VP, the triggers that fall under *Maximize Presupposition* require their own phrase or projection. Furthermore, using one or the other form (e.g., definite or indefinite) is syntactically obligatory in a language that has the relevant marking. See Zeevat (2003) for a similar distinction between obligatory discourse and grammatical marking.

We conjecture that the obligatory insertion of additives as a result of *Obligatory Implicatures* is a cross-linguistically stable phenomenon, as we found similar effects regarding the insertion of additives in two unrelated languages, Ga and German. Moreover, it was observed that other Indo-European languages also display similar patterns (Kaplan 1984; Amsili & Beyssade 2009; Bade 2016). This is unsurprising given that *Obligatory Implicatures* works with focus alternatives and their exhaustification, which seems to be a stable mechanism across languages. By contrast, cross-linguistic stability is not necessarily predicted by theories referring to *Maximize Presupposition*. Because of the possible involvement of lexical scales, the question of what counts as a relevant presuppositional alternative in a given language is more likely to vary (and with it what inferences arise). For example, it is a conceivable possibility that words like *too* or *also* are on a scale of presuppositional strength with a non-presuppositional competitor in some languages that have a richer inventory of focus-sensitive particles. However, to find this kind of variation in obligatory presupposition effects much more cross-linguistic research is needed.

8 Summary

In this paper, we offer a novel, cross-linguistic and experimental perspective on the phenomenon of obligatory presupposition effects by looking at the insertion of additives in different environments in two unrelated languages, Ga and German. We found that the insertion of additives aligns with the strength of focus exhaustivity inferences in the context and is not obligatory under negation. This supports *Obligatory Implicatures* and pose challenges for current *Maximize Presupposition* based analyses of obligatory additive marking. Further systematic cross-linguistic research is needed to shed more light on the mechanism of obligatory insertion of presupposition triggers. In particular, to determine what the scope of *Obligatory Implicatures*

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33   To the best of our knowledge most proposals claim that the alternative is relevant as soon as its presupposition is true (Marty 2017; Marty & Romoli 2020a), mostly to derive obligatory oddness effects for cases like *A father of the victim....* We do not see how this notion of relevance can distinguish between the cases we discuss in this paper.

and *Maximize Presupposition* is and whether both theories can be subsumed under the same basic mechanism. Moreover, the conditions under which presuppositional alternatives are (automatically) active must be further studied to better understand whether they align with the factors identified as relevant for the derivation of scalar implicatures.

Abbreviations

The following glosses are used in this paper: DET = determiner; 3 = third person; SG = singular; ADD = additive; PRT = particle; NEG = negation; COMPL = complementizer; IMPF = imperfective, REFL = reflexive.

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Competing interests

The authors have no competing interests to declare.

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