

Obligatory Presupposition Triggers  
in Discourse

Empirical Investigations of the Theories *Maximize  
Presupposition* and *Obligatory Implicatures*

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# Abstract

The dissertation compares two theories on the obligatory insertion of presupposition triggers. The first theory is based on a principle *Maximize Presupposition* (Heim 1991), the second theory is based on obligatory implicatures (Bade 2014). The empirical predictions of the theories are tested using experimental methods in the main part of the thesis. The presupposition triggers "again", "too", "know" and the definite determiner are tested with regard to their obligatory insertion under negation and in other complex structures. Furthermore, the influence of the broader discourse context on their obligatory insertion is investigated. The empirical findings are summarized in the last part of the thesis and the theoretical consequences for a theory of grammar are discussed. It is argued based on the empirical results that presupposition triggers fall into two classes regarding the mechanisms behind their obligatory insertion. Whereas the obligatory insertion of lexical triggers like "too", "again" and "know" is better explained by making use of *Obligatory Implicatures*, obligatoriness of definiteness and other feature marking should be accounted for by using *Maximize Presupposition*.

presupposition, implicature, exhaustivity, questions, alternatives

# Abstract

Die Dissertation untersucht zwei Theorien zum obligatorischen Einsetzen von Präsuppositionsauflösern. Die erste Theorie basiert auf einem Prinzip *Maximize Presupposition*, die zweite Theorie auf obligatorischen Implikaturen. Die empirischen Vorhersagen beider Theorien werden im Hauptteil der Dissertation getestet. Die Auslöser "auch", "wieder", "wissen", und der definite Artikel werden in Bezug auf ihren Einsatz in negierten Sätzen getestet, sowie in Hinblick auf den Einfluss des Diskurskontextes auf ihr obligatorisches Auftreten. Die empirischen Resultate werden am Ende zusammengefasst und die theoretischen Konsequenzen in Bezug auf die Grammatiktheorie diskutiert.

Basierend auf den Ergebnissen wird argumentiert, dass Präsuppositionsauflöser in zwei Klassen eingeteilt werden können; folgend aus den Mechanismen, die hinter ihrem obligatorischen Einsetzen stecken. Während das obligatorische Auftreten von lexikalischen Auslösern wie "auch", "wieder" und "wissen" eher mit einer Theorie, die mit obligatorischen Implikaturen arbeitet, erklärt werden muss, sollte man obligatorische Definitheit und andere obligatorische morphologische Merkmale mit *Maximize Presupposition* fassen.

presupposition, implicature, exhaustivity, questions, alternatives

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# Chapter 1

## Introduction

### 1.1 Goals of the dissertation

Recently, the maxim *Maximize Presupposition* originally introduced by Heim (1991) has regained attention (Percus 2006, Chemla 2008, Singh 2011, Sauerland 2008a, Schlenker 2012). The purpose of the principle is to account for the fact that if there is a choice between two sentences with identical assertions the one with more presuppositions that are verified by the context has to be used. Using the alternative in that context will result in infelicity. Current approaches provide a more fine-grained formulation of the very general formulation of the original maxim (Heim 1991) and discuss other presupposition triggers besides the definite determiner. Their focus is not only on the fact that in certain contexts sentences with presuppositions have to be used, but that the alternative leads to the inference that the presupposition does not hold. The core assumption of these theories is that sentences or lexical items are ordered with regard to their presuppositional strength. They further assume that sentences are in competition with respect to this ordering. In their view it is due to this competition that a sentence without the presupposition trigger has an inference with a status different from implicatures and ordinary presuppositions ("antipresupposition" (Percus 2006) or "implicated presupposition" (Sauerland 2008a)).

The phenomena that have been explained using *Maximize Presupposition* can be put into three classes. The first class of examples includes the obligatory use of presuppositional determiners like "the" and "both". The second class of examples involves certain types of features, for example gender and number



features (Sauerland 2002, Sauerland 2003, Sauerland 2005). The third class of examples includes the obligatory insertion of "know", "too" and "again".

An alternative explanation for the obligatory insertion of this last class of presupposition triggers has been proposed recently (Bade 2014). It is based on formal non-Gricean approaches to implicatures (Fox 2007, Fox and Hackl 2006, Chierchia, Fox, and Spector 2011). It argues that these presupposition triggers are obligatory when the sentence has an implicature that contradicts the context. The account is motivated by an observation made by Saeboe (2004) and Krifka (1999) for obligatory additives. They claim that additives are inserted to avoid a contrastive implicature from arising. Bade (2014) assumes that the contradiction that is avoided by the insertion of the triggers "know", "too" and "again" arises due to an implicature of the sentence which is the result of obligatory exhaustive interpretation.

The literature has focused on the theoretical side of the issue of obligatory presupposition triggers. The data never been investigated using empirical methods. Most of all, there has been no systematic comparison of the two theories just described and their predictions for the insertion of different presupposition triggers.

The aims of this dissertation are twofold. First, I want to provide an overview over two theories on obligatory presupposition triggers and compare their empirical predictions regarding the circumstances under which a trigger is obligatorily inserted. Second, I want to test some of these empirical predictions for the triggers "too", "again", "know" and the definite determiner.

Based on the empirical findings, I will argue that presupposition triggers fall into two separate classes. I will show that the insertion of presuppositional features and determiners fall into one class and should be subsumed under a principle *Maximize Presupposition*. The insertion of presuppositional factives, iteratives and additives will be shown to follow from the independently needed mechanism of mandatory exhaustive interpretation.

Before I provide a short overview over the structure of the dissertation and content of individual chapters, I want to introduce the basic theoretical background I assume for the discussion.

## 1.2 Preliminaries

The purpose of this section is to introduce the semantic and pragmatic framework I take as a background. It is meant for readers with little background in formal semantics and pragmatics. Readers who are more familiar with the theoretical background should feel free to skip this section.

### 1.2.1 Compositional interpretation

I assume a theory of natural language which takes semantic interpretation to be structure- and type-driven, and to work according to the principle of compositionality (Heim and Kratzer 1998). The principle of compositionality says that the meaning of a sentence is determined by the meaning of its parts and the rules by which they are combined (Frege 1892). The input for semantic interpretation is a syntactic phrase structure tree. The system to derive the meaning of complex structures in the tree consists of three components. It defines a set of basic denotations for terminal nodes of a tree. It provides a lexicon which specifies the denotation of individual lexical items. It provides the rules for how the meaning of non-terminal nodes are derived from the terminal nodes they are built from (rules of composition).

In an extensional semantic system, there are two basic types of denotations: an element is either in the set of individuals or it is within the set of truth-values. The set of truth-values only contains the values 1 (true) and 0 (false). Individuals have the semantic type  $\langle e \rangle$ , truth-values are of type  $\langle t \rangle$ . Denotations can be more complex which is also mirrored in them having more complex types. This is why the more general definitions of types and denotations in (1) and (2) are assumed (Heim and Kratzer 1998, p. 28).

(1) **Semantic Types** (first version)

- a.  $e$  and  $t$  are semantic types
- b. If  $\sigma$  and  $\tau$  are semantic types, then  $\langle \sigma, \tau \rangle$  is a semantic type.
- c. Nothing else is a semantic type

(2) **Semantic denotation domains**

- a.  $D_e := D$  (the set of individuals)
- b.  $D_t := \{0,1\}$  (the set of truth-values)
- c. For any semantic types  $\sigma$  and  $\tau$ ,  $D_{\langle\sigma,\tau\rangle}$  is the set of all functions from  $D_\sigma$  to  $D_\tau$

Two basic rules of composition are of importance for the subsequent discussion. The first one is the rule of Functional Application, see (3).

(3) **Functional Application**

If  $\alpha$  is a branching node,  $\{\beta, \gamma\}$  is the set of  $\alpha$ 's daughters, and  $\llbracket\beta\rrbracket$  is a function whose domain contains  $\llbracket\gamma\rrbracket$ , then  $\llbracket\alpha\rrbracket = \llbracket\beta\rrbracket(\llbracket\gamma\rrbracket)$

The second rule which I will make use of is the rule for pronouns and traces, see (4).<sup>1</sup>

(4) **Pronouns and Traces**

If  $\alpha$  is a proform or a trace,  $g$  is a variable assignment, and  $i \in \text{dom}(g)$ , then  $\llbracket\alpha_i\rrbracket^g = g(i)$ . (Heim and Kratzer 1998, p. 111)

The assumption behind the rule for pronouns and traces is that pronouns are variables. They carry an index and receive a value via a variable assignment function, see the definition of variable assignments in (5).

- (5) A variable assignment is a partial function  $g$  from the set of indices to the set of all denotations, such that, for every  $\langle i, \tau \rangle \in \text{dom}(g)$ ,  $g(i, \tau) \in D_\tau$

A pronoun will always be interpreted with respect to a variable assignment function  $g$ . The assignment function will return an individual as a value, see the examples in (6) (Heim and Kratzer 1998).

- (6)  $\llbracket \text{he}_1 \rrbracket^{g[1 \rightarrow \text{Bob}]} = g[1 \rightarrow \text{Bob}](1) = \text{Bob}$

The definitions in (5) and (6) work for variables of type  $\langle e \rangle$ . Variable assignments can be more complex for variables of higher types. These higher type variables include contextual variables like, for example, quantifier domain re-

---

<sup>1</sup>For a complete overview over the rules of semantic composition that I assume see Heim and Kratzer (1998)

restrictions (von Fintel 1994, Marti 2003). The value the assignment returns for these variables is a set of individuals of type  $\langle e, t \rangle$ . I will return to this point when discussing domain restrictions for quantifiers.

The system introduced so far is an extensional one, where sentences denote a truth value. However, the denotation of a sentence can also be seen as a set of situations in which it is true. This is called the intension of a sentence (von Fintel and Heim 2011). In addition to the semantic types specified above, an intensional system requires there to be a basic type  $\langle s \rangle$  for possible worlds. Possible worlds are considered ways how the actual world might be like (Lewis 1986). The intension of a sentence is a function of type  $\langle s, t \rangle$ , a function from possible worlds to truth values. Denotations are no longer just evaluated with respect to an assignment but with respect to an evaluation world. They come with a world parameter. The extension of an expression is its semantic value in the evaluation world, see some examples in (7) (von Fintel and Heim 2011).

- (7) a.  $\llbracket \text{smart} \rrbracket^{w,g} = \lambda x. x \text{ is famous in } w.$   
 b.  $\llbracket \text{John is smart} \rrbracket^{w,g} = \text{John is smart in } w.$

The intension of an expression is the function from any world to the extension of the denotation of that expression in that world, see (8).

- (8) a.  $\lambda w. \llbracket \text{smart} \rrbracket^{w,g} = \lambda w. \lambda x. x \text{ is smart in } w.$   
 b.  $\lambda w. \llbracket \text{John is smart} \rrbracket^{w,g} = \lambda w. \text{John is smart in } w.$

For a detailed description of an intensional semantic system including a formulation of the rules of composition with intensions, see von Fintel and Heim (2011). I will use the notation in (9) to refer to the intension of an expression, in this case the intension of  $\alpha$ .

- (9)  $\llbracket \alpha \rrbracket^g = \lambda w. \llbracket \alpha \rrbracket^{w,g}$

To capture that proposition are true at a certain point in time in a given world, I further assume a basic type  $\langle i \rangle$  for times. Examples of lexical entries which are sensitive to a time parameter are given in (10).

- (10) a.  $\llbracket \text{thirsty} \rrbracket^{t,w,g} = \lambda x. x \text{ is thirsty at } t \text{ in } w.$   
 b.  $\llbracket \text{John is thirsty} \rrbracket^{t,w,g} = \text{John is thirsty at } t \text{ in } w.$

The inventory of semantic types I assume is thus extended to times and worlds:

- (11) **Semantic Types** (final version)
- a. e, s, i and t are semantic types
  - b. If  $\sigma$  and  $\tau$  are semantic types, then  $\langle \sigma, \tau \rangle$  is a semantic type.
  - c. Nothing else is a semantic type.
- (12) **Semantic denotation domains**
- a.  $D_e := D$  (the set of individuals)
  - b.  $D_t := \{0,1\}$  (the set of truth-values)
  - c.  $D_i :=$  the set of times
  - d.  $D_s :=$  the set of possible worlds
  - e. For any semantic types  $\sigma$  and  $\tau$ ,  $D_{\langle \sigma, \tau \rangle}$  is the set of all functions from  $D_\sigma$  to  $D_\tau$

## 1.2.2 Quantification

There is a huge amount of literature on quantification in natural language. This section is not an attempt to give an overview over the topic. Its purpose is to introduce some basic concepts related to quantifiers which are important for the discussion in the thesis.

Quantifiers are natural language expressions whose meaning does not change depending on the evaluation world. They take two functions of type  $\langle e, t \rangle$  and express a relation between them. A lexical entry for a universal quantifier is given in (13-a.), a lexical entry for an existential quantifier is given in (13-b.) (Heim and Kratzer 1998, von Stechow and Heim 2011).

- (13) a.  $\llbracket \text{every} \rrbracket^{w,g} = \lambda P_{\langle e, t \rangle} . \lambda Q_{\langle e, t \rangle} . \forall x [P(x) \rightarrow Q(x)]$   
 b.  $\llbracket \text{some} \rrbracket^{w,g} = \lambda P_{\langle e, t \rangle} . \lambda Q_{\langle e, t \rangle} . \exists x [P(x) \ \& \ Q(x)]$

The meaning of (14-a.) given these lexical entries is provided in (14-b.).

- (14)  $\llbracket \llbracket \text{Every} \llbracket \text{boy} \rrbracket \rrbracket \llbracket \text{is smart} \rrbracket \rrbracket$
- a.  $\llbracket \text{every} \rrbracket^{w,g} (\llbracket \text{boy} \rrbracket^{w,g}) (\llbracket \text{smart} \rrbracket^{w,g})$
  - b.  $\forall x [\text{boy}(x)(w) \rightarrow \text{smart}(x)(w)]$

Different quantifiers have been associated with different formal properties (see Heim and Kratzer 1998 for extensive discussion). Two properties I would like to

mention are upward and downward monotonicity. They are formally described in (15-a.) and (15-b.).

- (15) a. A determiner is upward monotone if for all A, B, C (which are subsets of D):  $A \subseteq B$  and  $\langle A, C \rangle \in R_{Det}$ , then  $\langle B, C \rangle \in R_{Det}$   
 b. A determiner is downward monotone if for all A, B, C (which are subsets of D):  $A \subseteq B$  and  $\langle B, C \rangle \in R_{Det}$ , then  $\langle A, C \rangle \in R_{Det}$

According to these definitions, "some" is upward monotone, whereas "every" is downward monotone (for the first argument), see how the definition holds in the examples in (16-a.) and (16-b.).

- (16) a. Every tall boy is a smoker  $\not\Rightarrow$  Every boy is a smoker  
 Some tall boy is a smoker  $\Rightarrow$  Some boy is a smoker  
 b. Every boy is a smoker  $\Rightarrow$  Every tall boy is a smoker  
 Some boy is a smoker  $\not\Rightarrow$  Some tall boy is a smoker

It has been noted that a statement like (16) is surely not a claim about every single boy in the world but that the domain of boys talked about is further restricted by the context (von Stechow 1994). This context-dependency has been modeled as a covert domain restriction variable which combines with the meaning of the quantifier (But see also Schwarz 2012) . It receives its value from the variable assignment function, see the modified lexical entry for "every" in (17) below.

- (17)  $\llbracket \text{every}_C \rrbracket^{w,g} = \lambda P. \lambda Q. \forall x [P(x) \& (g(C))(x) \rightarrow Q(x)]$

Let us assume that we are talking about the students in the class I am teaching. Then the value assigned to C will be the one in (18-a.). The meaning of (17) given the modified lexical entry in this context is provided in (18-b.).

- (18) a.  $g(C) = \lambda y. \text{in-my-class}(y)(w)$   
 b.  $\llbracket \text{every}_C \rrbracket^{w,g} (\llbracket \text{boy} \rrbracket^{w,g}) (\llbracket \text{smart} \rrbracket^{w,g})$   
 $\forall x [\text{boy}(x)(w) \& \text{in-my-class}(x)(w) \rightarrow \text{smart}(x)(w)]$

### 1.2.3 Presuppositions

According to a standard semantic view on presuppositions they are restrictions on appropriate contexts (Stalnaker 1973, Karttunen 1973, Heim 1990b, Heim

and Kratzer 1998). A sentence like (19) is only felicitous in a context that entails that John had snored before.

(19) Joe snored again.

Two main characteristics distinguish presupposition from other inferences. They are conventionally triggered and they project through various operators.

The first characteristic describes the fact that presuppositions are encoded in the lexical entries of presupposition triggers. For example, the definition of the presupposition trigger "again" in (19) entails that the truth value of a sentence containing it is undefined in a world where its presupposition does not hold, see the lexical entry in (20).

(20)  $\llbracket \text{again} \rrbracket^g = \lambda p.\lambda t.\lambda w: \exists t'. p(t')(w) = 1 \ \& \ t' < t. \ p(t)(w) = 1$

The definedness conditions encoded in the trigger are inherited by the sentence containing it. The compositional outcome of the example in (19) given this lexical entry of the presupposition trigger in the notation of Heim and Kratzer (1998) in (21). The sentence denotes a partial function from worlds to truth values. It is only defined for those worlds which entail the presupposition.

(21)  $\llbracket \text{Joe snored again} \rrbracket^g = \lambda w: \exists t'. \text{Joe snored in } w \text{ at } t' \ \& \ t' < t. \ \text{Joe snored in } w \text{ at } t.$

The fact that (19) can only be uttered felicitously in a context that entails its presupposition can be expressed more formally. I assume that context is modeled as the "common ground" (Stalnaker 1973), defined as follows:

The common ground of a conversation [...] is the set of propositions that the participants in that conversation [...] mutually assume to be taken for granted [...]. The common ground describes a set of worlds, the context set, which are those worlds in which all of the propositions in the common ground are true. The context set is the set of worlds that for all that is currently assumed to be taken for granted, could be the actual world. (von Stechow 2008, p.1)

The following relation has to hold between the context set  $c$  and presupposition of (19) in order for the sentence to be felicitously uttered:

(22)  $c \subseteq \{w: \exists t'. \text{Joe snored in } w \text{ at } t'\}$

The second characteristic describes the fact that even when a presupposition trigger is embedded in the scope of certain operators, like negation, questions, modals and if-clauses, the sentence inherits its presupposition (see Kadmon 2001). All of the sentences in (23-a.) to (d.) presuppose that Joe snored before.

- (23) a. Joe did not snore again.  
 b. Did Joe snore again?  
 c. It is possible that Joe snored again.  
 d. If Joe snored again, Mary will be mad.

It has been observed that sometimes the presupposition of a sentence can be accommodated if it is not entailed by the context. That means that hearers can just assume that the presupposition holds in the context and add it to common ground. For example, even if the hearer does not know that I have a dog, by hearing (24) s/he can accommodate that I own a dog (see Heim 1990b).

(24) Sorry, I am late. I had to feed the dog.

Moreover, it has been claimed that presuppositions can be accommodated locally, below the scope of an operator. The presupposition is thus visible to the operator and can potentially be cancelled. That is, locally accommodating the presupposition of (23-a.) yields the result in (25).

(25) It is not true that France has a king and that he is bald.

For further discussion on presuppositions, especially projection and local accommodation and its relation to different operators see Kadmon (2001) and the literature cited therein.

#### 1.2.4 Conversational Implicatures

The first theory of implicatures was spelled out by Grice (1989a). He proposed that participants in a conversation are co-operative in a way that makes them follow four basic guidelines, the maxims of conversation. He formulated the *co-operative principle* and these four maxims as follows (Levinson 1983).



(26) **The Co-operative Principle**

make your contribution such as required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged

(27) **The Maxim of Quality**

Try to make your contribution one that is true, specifically:

- a. Do not say what you believe to be false
- b. Do not say that for which you lack adequate evidence

(28) **The Maxim of Quantity**

- a. Make your contribution as informative as requires for the current purposes of the exchange
- b. Do not make your contribution more informative than is required

(29) **The Maxim of Relevance**

- a. Make your contribution relevant

(30) **The Maxim of Manner**

Be perspicuous and specifically:

- a. Avoid obscurity
- b. Avoid ambiguity
- c. Be brief
- d. Be orderly

It has been claimed that, based on the assumption that speakers are co-operative, they can calculate an inference of the sentence that goes beyond its semantic content. This inference is called an implicature. Consider the example in (31) (Levinson 1983).

- (31) A: Can you tell me the time?  
B: Well, the milkman has come.

Given that A assumes B is being as informative as possible and that B's response is relevant to the question asked, s/he might draw the inference that the actual time is after the time the milkman usually arrives.

Grice (1989b) and (1989c) claims that there are four characteristics that distinguish implicatures from other types of inferences, as presuppositions or entailments.

First, they are cancelable. That is, the implicature of (32) that John has exactly three cows can be canceled, as in (32-a.), the entailment that John has two cows cannot be canceled, see (32-b.) (c. Levinson 1983).

- (32) John has three cows.
- a. In fact, he might have four.
  - b. ??In fact, he might have two.

Second, implicatures are non-detachable from the context. That is, (31-a.) does not generally allow for an inference about the time. It only does so in a context where A asks the according question and A and B share a certain knowledge state.

Third, implicatures can be calculated using deductive reasoning. For (31) the reasoning of speaker A might look as follows: I assume that speaker B would have uttered the exact time if he knew it. He does not know the exact time but he and I know that the milkman comes at 11. He stated truthfully that the milkman has already come. So, it must be past 11.

Fourth, implicatures are non-conventional. The inferences of the sentences in (32) and (31) are not related to the lexical items therein but are due to an interaction between the literal meaning with contextual information.

The stability of these properties has been argued (see Levinson 1983 for some discussion). Furthermore, some of these characteristics might be more or less prominent depending on the type of implicature. The two main types distinguished by Grice are conventional and conversational implicatures. Conventional implicatures are related to certain lexical expression. The discourse connective "and", for example, has been argued to generate the implicature that there is a contrast between the two conjuncts it combines. Conversational implicatures are less dependent on lexical material. However, conversational implicatures, too, fall into two classes, generalized and particularized conversational implicatures. Generalized implicatures are claimed to be less dependent on a specific context than particularized ones. The most prominent case of generalized conversational implicatures discussed is the one of scalar implicatures. They arise only with certain lexical items that are part of a lexical scale (Horn 1972). The sentences containing an item of a given scale stand in an entailment relation to one another. For example, the stronger sentence in (33-a.) entails the weaker one in (33-b.)

- (33) a. All boys came to the party.  
 b. Some boys came to the party.

<All, some> has thus been argued to be one of the lexical scales active in our grammar (Horn 1972). A consequence of this assumption is that (33-b.) will always be in competition with the stronger scalar alternative in (33-a.). As a result, (33-b.) has the scalar implicature that all of the boys went to the party is not true. The reasoning behind that is the same as described above. Since the speaker is as informative as possible and did not use (33-a.), the hearer assumes that (33-a.) must be not true.

It is important to note that this traditional Gricean view on implicatures sees the derivation of implicatures as a global pragmatic step. That is, the relevant alternatives considered are sentences (c. Sauerland 2012). This pragmatic view faces obvious problems with examples of implicatures arising locally, as in (34).

- (34) If you take salad or dessert, you pay \$20; but if you take both, there is a surcharge. (Chierchia, Fox, and Spector 2011)

"Or" is taken to be the weaker item on a scale with "and". The scalar implicature resulting from using "or" in (34) arises below the if-clauses: if you take salad or desert but not both, you pay \$20. To account for these data, a lexical theory of scalar implicatures was introduced assuming that the core meaning of "some" is "some but not all" and that the weaker meaning is a case of cancellation (Chierchia 2004b, see Sauerland 2012 and the literature cited therein for further discussion of the lexical theory).

A third theory of scalar implicatures, which captures both local and global implicatures, is the grammatical approach to implicatures. It makes use of an operator, abbreviated O or EXH (for "only" and "exhaust", respectively) which derives the implicature. It exhaustifies a proposition with respect to a set of alternatives, see the definition in (35) (Fox 2007).

- (35) a.  $\llbracket \text{EXH} \rrbracket (A_{\langle\langle s,t \rangle, t \rangle})(p_{\langle s,t \rangle})(w) \Leftrightarrow$   
 $p(w) \ \& \ \forall q \in \text{NW}(p, A): \neg q(w)$   
 b.  $\text{NW}(p,A) = \{q \in A: p \not\Rightarrow q\}$

The exhaustivity operator identifies a proposition as the most informative

proposition out of a set of alternatives. It is the proposition that entails all other true propositions in the alternatives. Alternatives which are non-weaker (not entailed) are thus excluded as false. For scalar terms, the alternatives are defined via the items they are on a lexical scale with. The example given in (36-c.) shows how the exhaustivity operator derives the implicature of the sentences in (36-a.), the relevant alternatives are provided in (36-b.)

- (36) a. John ate some of the beans.  
 b.  $\{\lambda w.\text{John ate some of the beans in } w, \lambda w.\text{John ate all of the beans in } w\}$   
 c.  $\text{EXH}(\lambda w.\text{John ate some of the beans in } w, \lambda w.\text{John ate all of the beans in } w)(\lambda w.\text{John ate some of the beans in } w) \Leftrightarrow \text{John ate some of the beans}(w) = 1 \text{ and John ate all of the beans}(w) = 0$

The exhaustivity operator is a covert operator supposed to be inserted into the syntactic tree. Moreover, it is assumed to move freely, i.e. it can be inserted below the level of the clause. Local and global implicatures arise due to different attachment sites for the operator. For further discussion of the grammatical approach see Chierchia, Fox, and Spector (2011). For a more elaborate discussion of the differences between the grammatical, lexical and pragmatic approach see Sauerland (2012) and the literature cited therein.

### 1.2.5 Focus and questions

By focus I refer to the "part of the sentence [which] is marked by (contains) a peak of prosodic prominence and is involved in the relevant pragmatic and semantic effects" (Kadmon 2001, p. 251). I will describe some of the semantic and pragmatic effects of focus which are crucial for the understanding of the discussion in the chapters to come (see Beck 2016 for a recent overview/introduction).

As a theoretical background for the interpretation of focus, I will assume an alternative semantics as proposed by Rooth (1985), (1992), (1996). According to this theory, every sentence has an "ordinary semantic value" and a "focus semantic value". The latter is the set of propositions "obtainable from the ordinary semantic value by making a substitution in the position corresponding to the focused phrase" (Rooth 1992, p.2). The focus semantic value is the set of relevant alternative propositions. The ordinary and focus semantic value of

(37) are given in (37-a.) and (37-b.)

- (37)  $\llbracket [{}_S [ \text{Mary} ]_F \text{ likes Sue} ] \rrbracket^g$   
 a.  $\llbracket [ [ \text{Mary} ]_F \text{ likes Sue} ] \rrbracket^f = \{ \lambda w. \text{like}(x, s, w) \mid x \in D_e \}$   
 b.  $\llbracket [ [ \text{Mary} ]_F \text{ likes Sue} ] \rrbracket^o = \lambda w. \text{like}(m, s, w)$

The first important semantic/pragmatic effect of focus is question-answer congruence. That is, the focus in (38-b.) must match the question asked in (38-a.). The answer will be infelicitous otherwise, see (38-c.)

- (38) a. What does John like?  
 b. John likes CARROTS<sub>F</sub>.  
 c. #JOHN<sub>F</sub> likes carrots.

Another effect of focus is that it associates with certain adverbs like "also" and "only". This association with focus (Rooth 1985) has a semantic effect. The truth conditions of sentences with "only" and "too" change crucially with different foci, compare (39-a.) and (b.) as well as (40-a.) and (b.).

- (39) a. John only introduced BILL to Sue.  
 b. John only introduced Bill to SUE.  
 (40) a. John also introduced BILL to Sue.  
 b. John also introduced Bill to SUE.

The adverb "only" takes a set of properties C in this case and a property p and says that out of this set C only p is true of the individual it combines with. In addition, there is a constraint that C must be a subset of the focus semantic value of the phrase "only" combines with, see the truth conditions for a sentence with "only" when it combines with a VP in (41) (Rooth 1992, p. 5).

- (41) a.  $[{}_S \text{ John only VP} ]$   
 b.  $\forall P [ P \in C \ \& \ P(J) \rightarrow P = \text{VP} ]$   
 c. Focus-determined constraint:  $C \subseteq \llbracket \text{VP} \rrbracket^f$

This yields the following, different, truth-conditions for (39-a) and (39-b) in (42-a.) and (42-b.).

- (42) a.  $\forall P [ P \in \{ \lambda y [ \text{introduce} (x, y, \text{Sue}, w) ] \mid x \in D_e \} \ \& \ P(\text{John}) ] \rightarrow$   
 $P = \{ \lambda y [ \text{introduce} (\text{Bill}, y, \text{Sue}, w) ] \}$   
 b.  $\forall P [ P \in \{ \lambda y [ \text{introduce} (\text{Bill}, y, x, w) ] \mid x \in D_e \} \ \& \ P(\text{John}) ] \rightarrow$   
 $P = \{ \lambda y [ \text{introduce} (\text{Bill}, y, \text{Sue}, w) ] \}$

According to Rooth (1992), focus has moreover an influence on the interpretation of contrast and scalar implicatures. The following generalizations hold for the interpretation of focus in interaction with adverbs, contrast, scales and questions (Rooth 1992, p. 11).

- (43) Focus Interpretation Principle
- a. Focusing adverb constraint. If  $C$  is the domain of quantification of a focusing adverb with argument  $\alpha$ , then  $C \subseteq \llbracket \alpha \rrbracket^f$ .
  - b. Contrasting phrase constraint. If a phrase  $\alpha$  is construed as in contrast with a phrase  $\beta$ , then  $\llbracket \beta \rrbracket^o \in \llbracket \alpha \rrbracket^f$ .
  - c. Constraint on scales. If  $C$  is the underlying set of a scale used in computing the implicatures of a sentence  $\alpha$ , then  $C \subseteq \llbracket \alpha \rrbracket^f$ .
  - d. Question-answer constraint. In a question-answer pair  $\langle \psi, \alpha \rangle$ ,  $\llbracket \psi \rrbracket^o \subseteq \llbracket \alpha \rrbracket^f$ .

The relation of focus to questions and information structure in discourse is especially important for the subsequent discussion. I will adopt a notion of discourse which assumes that it is structured by questions which are being discussed (Roberts 1996). A proposition is most relevant according to this view if it addresses the last question under discussion (QUD, Roberts 1996). The semantics of question Roberts (1996) assumes follows Hamblin (1973). The meaning of a question is the set of propositions that are true answers. A question like "Who read *War and Peace*?" is the set of propositions of the form "x read *War and Peace*" where x varies over individuals, see (44) (c. Krifka 2011).

$$(44) \quad \lambda p. \exists x [ p = \lambda w. [ \text{person}(x)(w) \wedge \text{read}(W \ \& \ P)(x)(w) ] ]$$

Parallely, the meaning of "When did Bill read *War and Peace*?" is the one in (45).

$$(45) \quad \lambda p. \exists t [ p = \lambda w. [ \text{time}(t)(w) \wedge \text{read}(W \ \& \ P)(\text{Bill})(t)(w) ] ]$$

There are two main moves an interlocutor can make in a conversation. S/he can assert a proposition and thereby add it to the common ground which is the set of propositions all participants of a conversation believe to be true (Stalnaker 1978). Or she can ask a question and add it to the set of QUDs (c. Kadmon 2001). Based on Robert's theory, Kadmon (2001) defines relevance of a move as in (46). The definition of subquestion and partial/complete answer used therein are given in (47) and (48) (Kadmon 2001, pp. 340-341).

- (46) A move  $\alpha$  is directly **relevant** to a question  $Q$  iff
- a. if  $\alpha$  is a proposition, then  $\alpha$  is a partial answer to  $Q$ ; and
  - b. if  $\alpha$  is a question, then  $\alpha$  is a subquestion of  $Q$ .
- (47) A question  $Q_2$  is a **subquestion** of a question  $Q_1$  iff the complete answer to  $Q_2$  contextually entails a partial answer to  $Q_1$
- (48) A proposition is a **partial answer** to a question  $Q$  iff  $p$  contextually entails the truth value of at least one element of the denotation of  $Q$ . A proposition is a **complete answer** to a question  $Q$  iff  $p$  contextually entails the truth value of each element in the denotation of  $Q$ .

The role of focus is to mark the current QUD. There is thus a constraint that the focus semantic value of a sentence must be identical to the ordinary semantic value of the QUD.

The overall theory of discourse I will assume combines a notion of common ground adopted from Stalnaker (1978) with an alternative semantics for focus as developed by Rooth (1992, 1996) with the QUD account from Roberts (1996). For further discussion of such a system see Kadmon (2001).

### 1.3 Outlook

The dissertation is structured as follows. The second chapter provides a theoretical overview over the phenomenon of obligatory presupposition triggers. Two different theories on how to explain this phenomenon will be discussed in sections 2.1. and 2.2. The first theory works with the principle *Maximize Presupposition*. The second theory is based on a grammatical account of implicatures. The two theories will be compared with regard to their empirical predictions in section 2.3. A summary and outlook will be provided in section

2.4. It gives an overview over the predictions which will be tested in the main empirical part of the thesis.

Chapters 3 to 6 are the empirical part of the dissertation. The third chapter discusses empirical studies on the obligatory insertion of the presupposition trigger "too". In section 3.1. a rating study on "too" under negation will be reported. In section 3.2. three experiments on the influence of discourse on the insertion of the trigger "too" will be presented.

The fourth chapter is dedicated to the presupposition trigger "again". An experimental investigation of the insertion of "again" under negation will be discussed in section 4.1..

Chapter 5 discusses the obligatory insertion of the factive verb "know". In section 5.1. the obligatory insertion of "know" under negation will be investigated. The influence of the QUD on the insertion of "know" will be looked at in chapter 5.2.

Chapter 6 examines the obligatory occurrence of presuppositional determiners. Section 6.1. discusses the singular definite and reports a study on its insertion under negation. Section 6.2. revolves around the insertion of the plural definite. A reading time study on the difference between the plural definite and universal quantifier will be presented. It discusses the role of the QUD in the obligatory insertion of the plural definite.

Chapter 7 summarizes the results of the empirical investigations. Given the empirical picture, I propose a two-way distinction between presupposition triggers based on the mechanisms behind their obligatory insertion. Features, including the definiteness feature of certain determiners, are considered one class of triggers to be captured with *Maximize Presupposition*. Factives, iteratives and additives fall into a second class of triggers. Their insertion is directly linked to exhaustivity implicatures. I discuss some additional evidence from acquisition and cross-linguistic data which support this view.





# Chapter 2

## Obligatory Triggers

The following chapter gives a theoretical overview over the phenomenon of obligatory presupposition triggers. Two different theories which offer diverging explanations for why and under which circumstances presupposition triggers are obligatory will be presented in sections 2.1. and 2.2. The first theory is based on the principle *Maximize Presupposition*. The second theory uses obligatory exhaustivity implicatures to explain the insertion of presupposition triggers. The two theories are contrasted with regard to their empirical predictions in section 2.3. Section 2.4. summarizes the chapter and gives an overview over the predictions tested in chapters 3 to 6.

It has been observed (Schlenker 2012, Sauerland 2008a, Percus 2006, Chemla 2008, Singh 2011) that the use of different presupposition triggers is obligatory when their presuppositions are met in the context. In (1) to (6) below some examples of obligatory occurrences of presuppositional items are given.

- (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 yesterday.  
 a. #Today she went ice skating.  
 b. Today she went ice skating, again.
- (6) a. #The suns are shining.  
 b. The sun is shining.

There exist two different explanations for why the presupposition triggers above are obligatory. One standard approach to explaining the data is by making use of the pragmatic principle *Maximize Presupposition* (Heim 1991). The literature on *Maximize Presupposition* first focused on the explanation of obligatory definite descriptions as in examples in (1) and (2). Then, the attention shifted to obligatory features, as for example the number feature in (6) as well as to obligatory additives, factives and iteratives, see (3) to (5) (Percus 2006, Chemla 2008, Sauerland 2008a).

Another explanation for the obligatory occurrence of presuppositions discussed in the literature works on the basis of obligatory implicatures. First, it has been shown to work for the obligatory insertion of additives as in example (4) in contexts with contrastive implicatures (Kaplan 1984, Krifka 1999, Saeboe 2004). Only recently has this proposal been extended to a wider range of presupposition triggers, especially "know" and "again" (Bade 2014). I will take the latter proposal as the background for a theory that works with implicatures in 2.2. I will explain the basic mechanisms these theories assume to be behind the obligatory insertion of triggers in more detail in the following two sections. In section 2.3. I will contrast the predictions of the two theories for the insertion of triggers in embedding structures and the influence of discourse.

## 2.1 Maximize Presupposition

Heim (1991) was the first to observe that the definite determiner is obligatory in contexts that entail its presupposition. Using an indefinite determiner like "a" or "some" in these contexts will result in infelicity, see (7-a.). Using the definite determiner is obligatory in (7-b.) because it is common knowledge that people only have one father.

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

Heim (1991) observes that the assertions of the two sentences in (7-a.) and (7-b.) are identical. Both assert that there exists an individual who is the father of the victim and arrived at the crime scene, see (8).

$$(8) \quad \exists x[\text{father-of-victim}(x) \ \& \ \text{arrived-cs}(x)]$$

The sentences in (1) only differ with respect to what they presuppose. Whereas (7-b) presupposes that the victim has one unique father, see (9) (Heim 2012), (7-a) lacks this presupposition.

$$(9) \quad \exists x[\forall y[\text{father-of-victim}(y)] \rightarrow x=y] \textsuperscript{1}$$

The Gricean maxim of quantity cannot distinguish between the two sentences in (1) because they are equally informative. To explain the contrast in (1), Heim (1991) introduced the additional pragmatic maxim *Maximize Presupposition*. Her formulation of it is given below.

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

Since (7-b) presupposes more than (7-a), the maxim explains why the former is to be preferred over the latter. It furthermore accounts for why speakers assume that the presupposition of the definite is not fulfilled when the indefinite is used. This happens via the same type of Gricean reasoning at play when deriving implicatures. Since the principle tells the speaker to use the definite determiner when possible, the hearer deduces that its presupposition is not true in the context when the indefinite is used. As a result, (7-a) has the inference that the victim has not one unique father ("antiuniqueness") which results in oddness.

Recent accounts of obligatory triggers using *Maximize Presupposition* tried to extend the principle to other presuppositional phenomena besides the definite determiner. The focus of the recent literature is on the lexical alternative to the trigger that systematically leads to the inference that the presupposition is not true (Schlenker 2012, Sauerland 2008a, Percus 2006, Chemla 2008, Singh 2011). The sentence in (3-a) with "believe", for example, has been argued to

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<sup>1</sup>I am choosing this notation for the presupposition of the definite since it extends to its plural version and will be picked up in chapter 6. For the present discussion nothing hinges on this entry, as long as the presupposition expresses uniqueness and existence.

lead to the inference that it is not part of the common ground that Paris is in France. That inference contradicts what we know and therefore results in oddness of the whole sentence. Refinements of the theory and the principle *Maximize Presupposition* have been offered that are sensitive to this observation.

Sauerland (2008) proposes that *Maximize Presupposition* should be formulated in a way that captures, first, that sentences are in global pragmatic competition and, second, that sentences with stronger presuppositions are generally preferred. The mechanism he suggests is an extension of his account of scalar implicatures (Sauerland 2004a) where scalar implicatures are derived from alternative sentences based on sets of lexical sets. The lexical sets for presuppositions he supposes are given in (10) (Sauerland 2008a).

- (10) Scales: {the, every, a, both} , {believe, know} , {SG, PL} , {SPEAKER, HEARER} , {PRES, PAST}

Using these unordered sets of lexical alternatives, he defines a set of alternative sentences as in (11).

- (11)  $\text{Alt}(S) = \{S' \mid \text{the only difference between } S \text{ and } S' \text{ are replacements of one member of one of the sets in } Scales \text{ with another element of the same set}\}$

For Sauerland, competition hence exists between alternative sentences. In order to block a sentence  $S$ , an alternative must satisfy three conditions: its presupposition must be satisfied (12-a.), it must be true according to the speaker (12-b.) and it must have more informative presuppositions (12-c.). This is spelled out in his formulation of *Maximize Presupposition* in (12) below.

- (12) **Maximize Presupposition** (Sauerland 2008)  
Do not use  $S$  in context  $c$  if there is an  $S'$  such that:
- a.  $c \subset \text{domain}(\llbracket S' \rrbracket)$
  - b. you believe  $S'$  to be true
  - c.  $\text{domain}(\llbracket S' \rrbracket) \subset \text{domain}(\llbracket S \rrbracket)$

Not taking the sentence with the strongest presupposition leads to what Sauerland calls an "implicated presupposition", the inference that the presupposition of the competitor is false. I will shortly go through how this version ac-

counts for the contrast between (3-b) and (3-a). The lexical entry for "know" I assume is the one in (13-a.). "Know" presupposes the truth of its complement. It asserts that the individual it combines with believes the complement to be true. The resulting assertion is thus identical to the one of the sentence with "believe". The lexical entry of "believe" in (13-b.) makes use of the function in (13-c.) (von Fintel and Heim 2011). The truth conditions of (13) using this lexical entry are given in (13-d.).

- (13) John believes Paris is in France.
- a.  $\llbracket \text{know} \rrbracket^w = \lambda w. \lambda p. \lambda x. p(w). \text{BELIEF}(p)(x)(w)$
  - b.  $\llbracket \text{believe} \rrbracket^w = \lambda w. \lambda p. \lambda x. \text{BELIEF}(p)(x)(w)$
  - c.  $\llbracket \text{BELIEF} \rrbracket^w = \lambda p. \lambda x. \lambda w. \forall w' [w' \text{ is compatible with } x\text{'s beliefs in } w \rightarrow p(w')]$
  - d.  $\llbracket \text{believe} \rrbracket^w(\llbracket \text{Paris is in France} \rrbracket^w)(\llbracket \text{John} \rrbracket^w) = \forall w' [w' \text{ compatible with John's beliefs in } w \rightarrow \text{Paris is in France in } w']$

Following Sauerland's version of the principle, speakers do not use (3-a) since there is an alternative sentence (3-b) which fulfills all three conditions of *Maximize Presupposition*. The presupposition of (3-b) is met in the context since it is common knowledge that Paris is in France. (3-b) has the same assertion as (3-a) that John believes Paris is in France. If the speaker believes (3-a) then s/he believes (3-b) to be true as well. The domain of (3-b) is smaller than the domain of (3-a) since it is only defined in worlds where Paris is in fact in France whereas (3-a) has no definedness conditions.

Sauerland's definition of the principle works at the level of utterances; sentences are assumed to be in global pragmatic competition. Percus (2006), Sauerland (2008) himself and later Singh (2011) notice that complex sentences are a problem for this analysis. If alternatives are compared at the level of sentences, one cannot explain why triggers are preferred over non-triggers in sentences where the presupposition is locally satisfied, as in (14) and (15) below.

- (14) a. If it was raining, John would know it.  
 b. #If it was raining, John would believe it.
- (15) a. Everyone with exactly two students assigned the same exercise to both of his students.

- b. #Everyone with exactly two students assigned the same exercise to all of his students.

Other proposals therefore advocate that the principle is applying on a local level (Percus 2006, Chemla 2008, Singh 2011). They assume that competition between sentences is only the result of competition between lexical items. They furthermore suppose that these items are parts of lexical scales that are ordered with regard to their presuppositional strength, examples of which are given in (16) below.

- (16) {the, a} , {know, believe} , {too,  $\emptyset$ }, {again,  $\emptyset$ } , {both, all}

Alternatives to choose from are defined via these lexical scales. The competition involves the respective presuppositional content of sentences containing these items. A formulation of the principle *Maximize Presupposition* that is in accordance with these premises is given in (17) below.

(17) **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  $\phi$  if a member of its Alternative Family is felicitous and contextually equivalent to  $\psi$  ( $\phi$  is contextually equivalent to  $\psi$  iff for all  $w$  in the common ground,  $\phi(w) = \psi(w)$ ).

According to this version of the principle, (3-a) cannot be used since "believe" is on a scale with the presuppositionally stronger item "know" such that if you replace "believe" with "know" you get a sentence that is felicitous (it is defined since Paris is in France) and contextually equivalent (it has the same assertion).

These recent formulations of the maxim account for why a presupposition trigger must be used if its presupposition is verified by the context. Moreover, they explain why the alternative is infelicitous in the same context. They operate with lexical scales of presuppositional strength. When the weaker item on the scale is used felicitously, it gives rise to an "antipresupposition" (Percus 2006) or "implicated presupposition" (Sauerland 2008). It says that the presupposition of the competitor is false. The pragmatic reasoning behind it works

parallelly to the one for scalar implicatures. Not using the presuppositional stronger item will lead the hearer to believe that its presupposition is not fulfilled.

They assume that this type of inference has to be distinguished from scalar implicatures and ordinary presuppositions based on two characteristics (Sauerland 2008a). First, they have a weak epistemic status and resist strengthening. Second, they are projective content.

The weak epistemic status of the inference that the alternative to the trigger yields has first been observed for the so called "antiuniqueness" inference of the indefinite (Heim 1991). (18) has the inference that there is not a unique 6ft. long catfish in the context.

(18) Robert caught a 6ft. long catfish. (Heim 1991)

Inferences arising from not using the trigger share the weak epistemic status with implicatures. Unlike implicatures, these inference have been argued to resist strengthening (Sauerland 2008a). That is, the inference of (18) cannot be strengthened to the speaker being certain that there is more than one 6ft long catfish. It must remain that it is not part of the common ground that there is exactly one. However, it has been observed that this is not the case for all presupposition triggers.

The inference arising from not using "know" can be strengthened in the same way as implicatures by taking the "epistemic step" (Chemla 2008). The epistemic step is based on the "Competence Assumption", which says that speakers are opinionated about the truth of sentences and their (scalar) alternatives (Sauerland 2004b). That is, if a speaker utters a weaker sentence *q*, the hearer can assume that the speaker believes the stronger sentence *p* to be false (and not only that it is uncertain whether *p* holds). The same mechanism applies to inferences arising from not using the trigger, if this trigger is not the definite (Chemla 2008). (19) has a strong inference that the speaker does not have a sister.

(19) Peter believes that I have a sister. (Chemla 2008)

This is because the hearer can be sure that in this case the speaker is opinionated about having siblings or not (the truth of the complement). Unlike for presuppositions, the strength of the epistemic status for the inferences result-



ing from not using the trigger is largely dependent on context.

However, another characteristic Sauerland (2006) claims "implicated presuppositions" possess is that they project through negation and other types of embeddings, see (20) and (21). This is a property they share with presuppositions but not implicatures.

- (20) a. #A father of the victim did not arrive at the crime scene.  
 b. #If a father of the victim arrived at the crime scene...  
 c. #Did a father of the victim arrive at the crime scene?
- (21) a. #All arms of John are not broken.  
 b. #If all arms of John are broken...  
 c. #Are all arms of John broken?

The projection behavior of "implicated presuppositions" results from the fact that presuppositions project as well. Leaving out the trigger in sentences with negation and other embedding operators violates *Maximize Presupposition* and leads to the inference that the presupposition does not hold.

Whereas it is very clear for non-presuppositional determiners like the indefinite and universal quantifier that their "implicated presuppositions" survive under negation, it is less clear for the sentences in (a.) in (22) - (24) below.

- (22) Jenna went ice skating yesterday.  
 a. ?Today she didn't go.  
 b. Today she didn't go again.
- (23) 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.
- (24) Peter has a sister.  
 a. ?John does not believe that Peter has a sister.  
 b. John does not know that Peter has a sister.

The sentences without the trigger should be as odd as their unnegated counterparts according to *Maximize Presupposition*. I will return to this point in more detail when comparing the predictions of the two theories with regard to the insertion of the trigger under negation and other operators.

Since the status of the inference resulting from not using the trigger is a point

that differentiates the two theories discussed, I will from now on use the theory neutral term "missing trigger inference" to refer to them.

## 2.2 Obligatory Implicatures

The alternative explanation outlined in this section mostly follows a proposal made by Bade (2014). It is based on a grammatical approach to scalar implicatures (Fox 2007, Fox and Hackl 2006, Chierchia, Fox, and Spector 2011). Thereby it operates only with already existing and independently needed mechanisms. The assumption is that sentences are sometimes mandatorily interpreted exhaustively with respect to the Question Under Discussion (QUD) (Roberts 1996). Focus is taken to mark what that QUD is. Exhaustive interpretations are derived by assuming the presence of a covert exhaustivity operator with a meaning given in (25) (Fox 2007). It takes a set of alternative propositions  $A$  and a proposition  $p$  and identifies  $p$  as the single most informative and true proposition in the set, i.e. it says that all alternatives which are non-weaker than  $p$  are false. The set of non-weaker alternatives includes those propositions which are not entailed by  $p$ , see (25-b.).

- (25) a.  $\llbracket \text{EXH} \rrbracket (A_{\langle\langle s,t \rangle, t \rangle})(p_{\langle s,t \rangle})(w) \Leftrightarrow p(w) \ \& \ \forall q \in \text{NW}(p, A): \neg q(w)$   
 b.  $\text{NW}(p, A) = \{q \in A: p \not\Rightarrow q\}$

It has been successfully argued in various places that an operator of this sort is needed and is covertly present in many structures in natural language. It accounts for a variety of phenomena, for example the interpretation of questions, especially under question embedding verbs (Heim 1994, Beck and Rullmann 1999) or the derivation of scalar implicatures (Fox 2007, Chierchia, Fox, and Spector 2011) and the interpretation of degree constructions (Fox and Hackl 2006). The exhaustivity operator is taken to be responsible for the inferences arising from using the alternative to the presupposition trigger. The insertion of the trigger is seen as a result of this inference.

The proposal will first be outlined for examples involving obligatory "too" and "again". To see how the analysis works, one has to determine what the missing trigger inferences of sentences without "too" or "again" are. If there is a competing sentence with "too" for the sentence in (26-a.) the missing trigger inference of (26-a.) would be the one in (26-b.).

- (26) a. MARY<sub>F</sub> was at the party  
 b. There was no other relevant person at the party besides Mary.

Parallely, assuming that there is a competing sentence with "again" for the sentence in (27-a.) the missing trigger inference of that sentence would be the one in (27-b.).

- (27) a. Peter was in Norway [LAST YEAR]<sub>F</sub>.  
 b. There is no other relevant time before last year when Peter was in Norway.

The proposal follows observations made by Saeboe (2004) and Krifka (1999). They both argue that sentences without "too" generate an implicature and that the insertion of the additive blocks this implicature. Krifka (1999) focuses on stressed additive particles and argues that they are indicators of contrastive topics (Büring 2003), rather than focus. According to Krifka, contrastive topics come with the "Distinctiveness Condition", see (28).

- (28) If [...T<sub>F</sub>...C<sub>F</sub>...] is a contrastive answer to a question Q, then there is no alternative T' of T such that the speaker is willing to assert [...T'...C...].

This condition says that whatever the contrastive topic T of a sentence is, it is the only relevant alternative for which C (the comment) holds. For sentences like (29), where "Mary" is the contrastive topic, this means that there is no alternative T' to "Mary" for which it holds that T' came to the party, see (29-a.).

- (29) MARY<sub>CT</sub> was at the party.  
 a.  $\neg\exists T'[T' \neq \text{Mary} \ \& \ T' \text{ was at the party in } w]$

For Krifka, the condition is a result of the maxim of manner since "if the speaker could assert [...T'...C...], the speaker would have asserted it right away by way of conjoining T and T'", which is shorter. Whatever stressed "too" associates with must be the contrastive topic, according to Krifka. However, "the use of "too" allows to violate distinctiveness by explicitly stating a discourse relation" (Krifka 1999: 15). The insertion of "too" blocks the implicature by explicitly stating, that there is another true alternative T' for which C holds.

According to Saeboe (2004), additives occur obligatorily when a contrastive implicature results in a contradiction with the context. The meaning he assumes for "too" is the one given in (30).

$$(30) \quad \llbracket \text{too} \rrbracket^w = \lambda C. \lambda q. \lambda w. \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \llbracket q \rrbracket^0]. \ q(w)$$

"Too" is focus sensitive according to this lexical entry. It takes a set of focus alternatives  $C$  and a proposition  $q$  and states that there is a true alternative in  $C$  which is not  $q$ . Saeboe (2004) notes that using a sentence  $q$  in a context that verifies the presupposition of "q too" has the implicature in (31), namely that there is no alternative in the set of alternatives that is true except for  $q$ .

$$(31) \quad \neg \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \llbracket q \rrbracket^0]$$

However, contexts that verify the presupposition of "q too" entail that there is a relevant alternative which is represented in (32).

$$(32) \quad \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \llbracket q \rrbracket^0]$$

(31) and (32) together result in a contradiction. For example, if "Mary" is the contrastive topic of the sentence in (33-b.), then the focus alternatives  $C$  are defined as in (34).

- (33)    a. Peter was at the party.  
           b.  $MARY_F$  was at the party.

$$(34) \quad C = [\lambda p. \ p = \lambda w. \ \lambda x. \ x \text{ was at the party in } w]$$

The presupposition of "too" would be true in this context since it is entailed that Peter was at the party. Hence, there is a proposition in the focus alternatives  $C$  that is true and not identical to "Mary was at the party". The contrastive implicature that arises for (33-b.) following Saeboe (2004) is the one in (35) below.

$$(35) \quad \neg \exists p [p = \lambda w. \ \lambda x. \ x \text{ was at the party in } w \ \& \ p(w) \ \& \ p \neq \lambda w. \ \text{Mary was at the party in } w]$$

This contradicts what is entailed by the context since "Mary was at the party" is not the only true proposition in the focus alternatives. There exists an alternative proposition that is also true, namely "Peter was at the party".

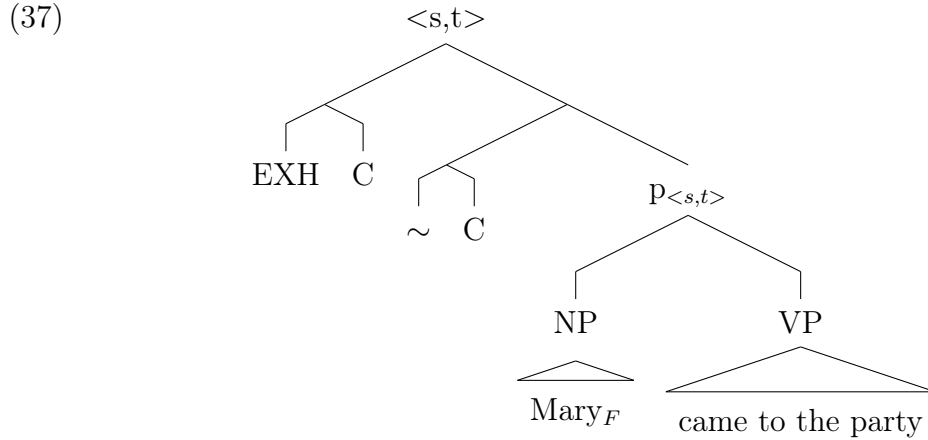
Saebøe (2004) argues that this contradiction is the reason for the obligatory insertion of "too". The contrastive implicature a sentence without "too" has when it is established in the context that its presupposition is fulfilled is equivalent to its missing trigger inference: It says that there are no true propositions in the set of focus alternatives except for the proposition that is the ordinary semantic value of the sentence.

Bade (2014) argues that a general mechanism derives these inferences which does not only force the obligatory insertion of "too" but also "again" and "know". This mechanism makes use of the presence of a covert exhaustivity operator that forces exhaustive interpretation when there is obligatory focus (Fox 2007). More specifically, missing trigger inferences arising from not using additives, iteratives and "know" are argued to occur due to the fact that people interpret sentences exhaustively with respect to the implicit Question Under Discussion (QUD, Roberts 1996). A background assumption made is that focus marks what the implicit QUD is, also in cases of contrastive focus (Beaver and Clark 2008). The alternatives used to derive missing trigger inferences are taken from information structure, not lexical scales. The exhaustivity operator is taken to operate on the question set, the set of propositions that are possible answers to the QUD (Hamblin 1973, Karttunen 1977). It identifies a proposition  $p$  as the most informative answer to the QUD, which means that all other true answers have to be entailed by  $p$ . This operation is defined in (36) below.

$$(36) \quad \llbracket \text{EXH} \rrbracket (Q_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle}) (p_{\langle s, t \rangle}) (w) \Leftrightarrow \\ p(w) \ \& \ \forall q [q \in Q(w) \ \& \ p \not\Rightarrow q \rightarrow \neg q(w)]$$

Another background assumption is that focus is forcing the insertion of an exhaustivity operator into the syntactic tree, see (37). This operator takes as its argument the ordinary semantic value of the proposition it combines with and a question. Focus is interpreted by the squiggle operator which introduces a covert variable  $C$  at LF that receives its value from the context through the variable assignment function  $g_C$  (Rooth 1992). The assignment comes with the restriction that the assigned value must be the QUD, see (38-a.). Furthermore, the question (QUD) has to stand in a specific relation to the focus semantic value of the sentence it combines with. The question set, i.e. the set of possible answers, must be a subset of the focus value of the proposition  $p$  that

the sentences denotes, see (38-b.) (c. Roberts 1996, Rooth 1992).



- (38) a.  $\llbracket C \rrbracket^g = g_c(C) = \text{QUD}$   
 b.  $\llbracket \text{QUD} \rrbracket^o \subseteq \llbracket p \rrbracket^F$

Question-answer congruence is thus assumed to be maintained for the QUD. Moreover, exhaustification of the QUD is considered mandatory with focus. The proposition in (39-a.), for example, will be interpreted as the exhaustive answer to the implicit QUD "Who was at the party?" since the question set of this QUD is a subset of the focus alternatives of (39-a.), see (39-b.). The result of this exhaustification is given in (39).

- (39)  $Mary_F$  was at the party.
- a.  $\llbracket \text{Who was at the party} \rrbracket^o \subseteq \llbracket Mary_F \text{ was at the party} \rrbracket^F$   
 b.  $\llbracket \text{EXH} \rrbracket(\llbracket \text{Who was at the party} \rrbracket)(\llbracket Mary \text{ was at the party} \rrbracket)$   
 $(w) \Leftrightarrow \llbracket \text{Mary was at the party} \rrbracket(w) \ \&$   
 $\forall q \llbracket q \in [\lambda p. \exists x. p = \lambda w. \text{person}(x)(w) \ \& \ \text{at-the-party}(x)(w)] \ \&$   
 $\lambda w. \text{Mary was at the party} \Rightarrow q \rightarrow \neg q(w) \rrbracket$

The exhaustivity operator identifies the proposition "Mary was at the party" as the most informative answer to the QUD, which means that all other true answers have to be entailed. Since the question is about individuals this amounts to saying that Mary was the only person at the party. Hence, the contrastive implicature of the sentence or its missing trigger inference are identical to the result of interpreting the sentence exhaustively with respect to the QUD. By assuming this mechanism to be active in (40) below the obligatory insertion of "too" in the third sentence can be explained straightforwardly.

- (40) Peter was at the party. He was enjoying himself. Mary was at the party #(too).

If "too" is left out in the third sentence, it is interpreted exhaustively with respect to the QUD "Who was at the party?" due to the mandatory focus on "Mary". This focus marking is obligatory since "Mary" is the only discourse new information in the sentence in this context. Exhaustification is hence assumed to be mandatory as well. The idea is that alternatives activated by focus cannot be ignored. Since there is no other operator that uses alternatives the exhaustivity operator is taken to be the default. Interpreting exhaustively, however, yields a contradiction. The result of exhaustification is that "Mary came to a party" is the most informative true answer to the question "Who came to the party?" in a context that entails that Peter came to the party. "Peter came to the party" is an active alternative that is not entailed by "Mary came to the party" but necessarily excluded as false by the exhaustivity operator.

A parallel explanation applies to examples containing "again". If "Peter was in Norway this year" is interpreted exhaustively with respect to the QUD "When was Peter in Norway?" due to obligatory focus on "this year" in (41) the result is (42).

- (41) Peter was in Norway last year. It rained a lot. Peter was in Norway #(again) this year.

- (42)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{When was Peter in Norway?} \rrbracket)(\llbracket \text{Peter was in Norway this year} \rrbracket)(w) \Leftrightarrow [\text{Peter was in Norway this year}](w) \ \&$   
 $\forall q [q \in [\lambda p. \exists t. p = \lambda w [\text{time}(t)(w) \ \& \ \text{Peter was in Norway at } t \text{ in } w]]$   
 $\ \& \ \lambda w. \text{Peter was in Norway this year} \not\Rightarrow q \rightarrow \neg q(w)]$

The result in (42) contradicts what is entailed by the context since it says that "Peter was in Norway this year" is the most informative answer to the question "When was Peter in Norway?". All other true answers in the question set have to be entailed. This means that "Peter was in Norway last year" which is an active alternative and not entailed by "Peter was in Norway this year" is excluded as false.

The insertion of a presupposition trigger will prevent this contradiction from arising. To clarify how that works one has to look at what the presupposition

of a sentence like "Peter was in Norway again this year" would be. Its truth conditions is given in (43) below (c. Beck 2007).

- (43)  $\llbracket \text{Peter was in Norway again}_{t_1} \text{ this year} \rrbracket^w =$  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 dependent on an anaphoric element, it must refer to a time mentioned in the previous context. Accordingly,  $g(1)$  will be mapped onto "last year" in the example in (41) (Beck 2007). Hence, calculating the presupposition and truth conditions of the sentence will yield "Peter was in Norway last year and this year". The alternative that was excluded by the exhaustivity operator before is now presupposed to be true. The definedness conditions of the sentence are only fulfilled without the presence of the exhaustivity operator. Its insertion is thus assumed to be blocked. The covert exhaustivity operator cannot be inserted into the LF and the implicature does not arise. As a result, there is no contradiction and the discourse is not infelicitous. A similar effect is assumed to be yielded by the insertion of "too" in (44-b.) below.

- (44) a. Peter came to the party.  
b. Mary came to the party, too.

"Too" is focus sensitive and makes use of the alternatives in the context. The compositional outcome for (44-b.) is given in (45).

- (45)  $\llbracket \text{Mary came to the party, too}_C \rrbracket =$  is defined only if  $\exists p \in C \ \& \ p(w) \ \& \ p \neq \lambda w.$  Mary came to the party in  $w$ . If defined, it is true iff Mary came to the party in  $w$ .

Since the only salient alternative in  $C$  in this context is "Peter came to the party", it is presupposed to be true. Hence, the exhaustivity operator does not have to be activated to make use of this alternative and a contradiction does not arise.

In sum, assuming that sentences are interpreted exhaustively with respect to the QUD explains the obligatory occurrence of "again" and "too" without making use of an additional principle like *Maximize Presupposition*. It can also explain the inferences arising from not inserting the trigger: they are



implicatures following from exhaustive interpretation.

The account predicts that additives and iteratives are not obligatory under negation. The mechanism of exhaustifying with respect to a QUD is assumed to also be active under negation. However, the QUD crucially changes with negation. Consider the examples in (46) and (47) below.

- (46) a. Peter went to Norway last year.  
       b. Peter did not go to Norway this year.
- (47) a. Peter came to the party.  
       b. Mary did not come to the party.

Focus can either fall on "this year" in (46-b.) and "Mary" in (47-b.), or on negation in both cases. The QUD hence either changes to "When did Peter not go to Norway?" (for (46-b.)) and "Who did not come to the party" (for (47-b.)) or to polar questions ("Did Peter go this year or not" in (46-b.) and "Did Mary come to the party or not" in (47-b.)). Obligatory exhaustification of both sentences with regard to these questions is triggered due to this focus. However, exhaustifying with respect to the possible answers to these questions does not result in a contradiction with the sentences in (46-a.) and (47-a.). "This year" being the only time when Peter did not go to Norway does not contradict that he went to Norway last year. And Mary being the only person that did not come does not contradict that Peter came. It is predicted under the present proposal that the triggers do not have to be inserted. Their obligatory insertion is motivated by a contradiction which does not arise with negation. The first sentences in (47-a.) and (47-b.) are not in the question set and hence the exhaustivity operator cannot exclude them as false. I will return to this point when comparing the predictions of *Obligatory Implicatures* with the ones of *Maximize Presupposition* with regard to the insertion of the trigger under negation and other embedding operators in the next section.

The core properties of the two theories, their theoretical differences and empirical predictions will be reviewed in the next section (2.3.). This general theoretical overview and comparison will serve as the background for the theoretical discussion and empirical investigation of individual triggers which will be discussed in the following chapters of the dissertation.

## 2.3 Comparison and predictions

The main theoretical differences between the two approaches outlined above will be discussed and compared in this section. Subsequently, these theories will simply be referred to as *Maximize Presupposition* and *Obligatory Implicatures*. The differences between both theories mainly concern the theoretical points in (48-a.-d.), which I will examine in more detail in the following subsections.

- (48)
- a. Missing trigger inferences
  - b. Alternatives
  - c. The role of context
    - (i) Syntactic context
    - (ii) Discourse
  - d. Different triggers

Whereas the points in (48-a) and (48-b) mainly address conceptual issues, (1-a) and (48-d) concern the empirical predictions resulting from these conceptual differences. I will summarize the result of the comparison of the theories at the end of this section and will outline the scope of this thesis with regard to the predictions the theories make.

### 2.3.1 Inferences resulting from not using the presupposition trigger

Before discussing the different views of *Obligatory Implicatures* and *Maximize Presupposition* on the status of the inference resulting from a missing trigger, one has to look again at the points that are standardly assumed to distinguish presuppositions from implicatures.<sup>2</sup> Presuppositions are definedness condi-

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<sup>2</sup>The traditional view on the differences between presuppositions and implicatures has recently been challenged. On the one hand, it has been argued for certain presupposition triggers that they do not always yield a presupposition (so called "soft triggers" (Abusch 2002, Abusch 2010) or "part-time triggers" ("Presupposed Entailments: The Triggering Problem Revisited")). On the other hand, it has been shown for some generalized conversational implicatures, especially scalar implicatures, that they do occur automatically, irrespective of contextual information. Moreover, scalar implicatures have been argued to show up both globally and locally (Chierchia, Fox, and Spector 2011). I will adopt a traditional view and standard analysis of presupposition triggers and conversational implicatures for the purpose of keeping the discussion simpler for now. The issue of soft versus hard triggers and local and global implicatures will come up in the subsequent discussion, where I will review some

tions that impose restrictions on how the context has to look like in order for a sentence with a presupposition trigger to be felicitously uttered (Stalnaker 1973, Heim and Kratzer 1998). They are lexically triggered and non-cancelable inferences. Moreover, they project under negation and other types of embeddings (Heim 1983, Heim 1990a, c. Kadmon 2001).

Conversational implicatures are inferences which enrich the sentence meaning only under certain contextual conditions. They are non-conventional, i.e. they do not arise with certain lexical material or semantic forms but rather attach to a meaning of a sentence in a specific context (c. Levinson 1983). They are cancelable inferences which do not survive under negation and other types of embedding.

*Maximize Presupposition* predicts sentences without the trigger to create an inference that is a mixture of both presuppositions and implicatures. These special inferences are said to project under negation and from other embedding structures. However, they are also epistemically weak. For *Obligatory Implicatures* the inferences resulting from the missing trigger are exhaustivity implicatures. They are predicted to be weak inferences which can, however, be strengthened and do not project.

The difference between the two theories with regard to the status of the sentence without the trigger can thus be seen as a conceptual one. Whereas *Maximize Presupposition* assumes there to be another type of inference due to the existence of a special pragmatic principle for the insertion of presuppositions, *Obligatory Implicatures* claims that the missing trigger inference is a conversational implicature which can be canceled or avoided by insertion of the trigger. This conceptual difference also leads to a difference in empirical prediction regarding the circumstances under which the trigger should be inserted. *Maximize Presupposition* predicts the trigger to be obligatory in embedding structures, *Obligatory Implicatures* makes no such prediction. I will return to this point below when discussing context and insertion of the trigger.

### 2.3.2 Alternatives

The second important difference between the two theories concerns the type of alternatives that are assumed to be involved in the insertion of obligatory presupposition triggers.

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of the arguments for these distinctions.

*Maximize Presupposition* works with lexical alternatives, more precisely scales of presuppositional strength. The lexical alternative to the presupposition trigger shares its assertion but lacks its presupposition. The lexical competition is activated and relevant as soon as this alternative is used. Since presuppositions are by definition not at-issue content, focus and information structure are not considered factors in the activation of these lexical alternatives. The insertion of the trigger follows from a pragmatic principle which tells speakers to always use the presuppositionally stronger item on a scale when possible. *Obligatory Implicatures* assumes that information structure, more precisely focus and the QUD corresponding to that focus, provides the alternatives relevant for the insertion of the presupposition trigger. The insertion of the presupposition trigger is necessary when an implicature arises which is the result of interpreting a proposition exhaustively with respect to the QUD.

### 2.3.3 The influence of context

The different assumptions of the two theories regarding the relevant alternatives and the status of the inference arising from not using the trigger result in different predictions for how context influences the insertion of the trigger. I will talk about two different types of contexts in this section. The first notion of context I consider is a very narrow one, meaning the syntactic structure of the sentence the trigger does (or does not) occur in. The second notion of context is a broader one and refers to the immediate linguistic context the sentence with the trigger is appearing in.

#### Syntactic context

Considering the syntactic context first, *Maximize Presupposition* assumes triggers to be obligatory in embedding structures and complex sentences. This is because lexical competition with the non-trigger arises locally and presuppositions project. Accordingly, the trigger has to be inserted obligatorily under negation, in if-clause, questions as well as compound sentences with a coordinating conjunction.

*Obligatory Implicatures* does not predict triggers to be obligatory in these embedding structures since the exhaustivity implicatures arising with negation, if-clauses and questions do not yield a contradiction with the context. Un-

wanted exhaustivity implicatures are the reason for inserting the trigger under *Obligatory Implicatures*. Since they are canceled or do not arise in embedding environments or compound sentences, inserting the trigger into these structures is considered superfluous.

The relevant data are presented in (49) – (52) below.

- (49) Jenna went ice skating yesterday.
- a. Today she did not go (again).
  - b. If she went ice skating (again) today, she will be exhausted.
  - c. Did she go ice skating today, (again)?
  - d. And she went ice skating today (again).
- (50) Mary came to the party.
- a. It is not the case that Peter came to the party, (too).
  - b. If Peter came (too), John must have been upset.
  - c. Did Peter come (too)?
  - d. And Peter came (too).
- (51) Peter has a sister.
- a. John does not believe/know he has one.
  - b. If John believes/know that Peter has a sister, he wants to meet her.
  - c. Does John believe/know it?
  - d. And John believes/knows it.
- (52) a. A/ The father of the victim did not arrive.
- b. If a/the father of the victim arrived, we don't have to call the mother.
  - c. Did a/ the father of the victim arrive?
  - d. And a/ the father of the victim arrived.

To see whether *Maximize Presupposition* or *Obligatory Implicatures* makes the right prediction for the occurrence of the trigger in complex sentences, the obligatoriness of the insertion of the trigger into the structures in (a.) to (d.) must be tested for (49) to (52), respectively.

## Discourse

I will now turn to the predictions of the two theories regarding the influence of the broader discourse context on the obligatoriness of the trigger. The two theories presented differ with regard to the sensitivity of the trigger to discourse level factors, especially the presence of an implicit or explicit QUD. To illustrate this, an example of a sentence with and without a trigger in a context with and without an explicit QUD is given in (53).

- (53) C: Who came to the store?
- a. Peter came to the store.
  - b. John came to the store.
  - c. John came to the store, too.

*Maximize Presupposition* does not predict the insertion of the trigger to be dependent on discourse factors like focus and the QUD. Irrespective of whether a question is given in the context as in (53), (53-c.) should be preferred over (53-b.). This is because *Maximize Presupposition* is a general pragmatic principle requiring the presuppositionally strongest item to be chosen. The trigger should be equally obligatory in all contexts since competition with the weaker sentence without the trigger generally arises due to the activation of lexical scales.

For *Obligatory Implicatures*, the alternatives the sentence with the trigger is competing with come from the question set of the QUD. These alternatives are only activated if the QUD is explicitly mentioned like in (53) or implicitly marked by focus. The trigger is obligatory if an exhaustivity implicature mandatorily arises with the presence of focus or an overt QUD. Accordingly, (53-a.) is exhaustified if a question is present in (53). Since the question is already assumed to have a complete answer a contradiction arises with (53-b.) and the trigger is inserted obligatorily in (53-c.). Thus, for this case, *Obligatory Implicatures* also predicts (53-c.) to be the preferred option. If the question is not present, the contextual pressure to exhaustify would be lower. Still, focus would be required and mark what the question is implicitly. However this should have a smaller effect.

It is important to note at this point that *Obligatory Implicatures* makes the prediction that the type of question that is in the context plays a role in how

obligatory the trigger is. It has been argued that not all questions require an exhaustive answer but that some questions can be answered felicitously by naming one relevant true alternative (Groenendijk and Stokhof 1984, Beck and Rullmann 1999, van Rooij 2004, George 2011). These answers have been referred to in the literature as "mention-some" answers.

*Obligatory Implicatures* would only predict the trigger to be obligatory in contexts where the QUD is expected to receive an exhaustive answer. (54-a.) below would be a standard example of a question allowing a "mention-some" answer, whereas (54-b.) would be an example of a question that requires an exhaustive answer.

- (54) a. Where can I buy a newspaper?  
 b. Who is working in the project?

The example in (54-b.) represents the uncontroversial case. Most question types are taken to require a complete answer as a default. However, it is less clear what kind of questions and circumstances allow for "mention-some" answers, or if they are allowed at all (c. van Rooij 2004, c. George 2011). The empirical picture described in the literature is puzzling and reflects the complexity of the issue. One question that is debated is whether it is encoded in the semantics under which circumstances a question requires an exhaustive answer or whether it is a purely pragmatic issue. There are accounts which assume that there is a genuine ambiguity between "mention-all" and "mention-some" readings and that this ambiguity is resolved pragmatically (van Rooij 2004). Under this assumption an answer will be exhaustive when the pragmatic needs of the person who is asking the question demand it. In fact, it has been observed that in most situations where (54-a.) is asked it would be inappropriate to give a complete answer. However, pragmatic accounts do not capture the fact that "mention-some" readings are often linguistically marked and very limited in their distribution. The presence of existential modals and existential quantifiers seems to be a trigger of "mention-some" readings, for example (c. George 2011).

Another approach taken to "mention-some" answers is that they are, in fact, exhaustive answers but with a very narrow domain. However, as George (2011) argues, this kind of explanation is not able to capture the readings (54-a.) has in embedded questions. Domain narrowing is less acceptable for embedded

questions like "John knows where you can buy a newspaper". In general, the debate is complicated by the fact that research on exhaustivity in questions has focused on question embedding. Given the wide range of data that need to be captured when considering both different embedded and matrix questions a flexible approach to exhaustivity seems reasonable (c. Beck and Rullmann 1999, c. Groenendijk and Stokhof 1984).

Beck and Rullmann (1999) note that the facts might be quite different for embedded and unembedded questions. Without the semantic contribution of the embedding verb, "mention-some" answers might be more readily available. It remains an open question whether a unified account of exhaustivity in embedded questions and unembedded questions is possible. In addition, the picture that presents itself for implicit questions might yet be distinct from that. There is to my knowledge no systematic discussion on the question whether an answer to the implicit QUD is understood as exhaustive or non-exhaustive as a default or as a rule. Whereas Rooth (1992) and Roberts (1996) already pointed out the relation between alternatives generated by focus and questions, there is no investigation on whether exhaustification is the default to evaluate alternatives provided by the QUD.

Another context where exhaustification of a proposition with respect to a question might be dispreferred is one where people provide a list of propositions that are answers to the QUD. This list-reading of an answer usually comes with a specific intonation. English distinguishes between two main intonation contours: a falling intonation beginning with a high tone followed by a low tone (H-L) and a rising intonation beginning with low tone followed by a high tone (L-H). The pitch accent falls on the first tonal element and is marked by a star (H\*-L, L\*-H) (Truckenbrodt 2012).<sup>3</sup> The rising contour is usually associated with new information and assertive content. A sentence like (55-a.) would receive the contour below in a context like (55).

- (55) Who ate the cookies?
- a. PETER ate the cookies.
  - b. H\* - L - H

---

<sup>3</sup>Rather non-trivially, I will assume that the facts regarding English intonation extend to the intonation of German phrases.



A falling contour is usually attributed to non-assertive content like a statement turning into a question, see (56) (c. Truckenbrodt 2012).

- (56) Who ate the cookies?  
 a. LISA might know?  
 b. L\* - L - H

Interestingly, the intonation in (56-a.) is the one chose for list readings as well, compare (57).

- (57) Who ate the cookies?  
 a. PETER ate some of them, RITA ate some of them, and FRANK ate some of them...  
 b. L\* - L - H // L\* - L - H // L\* - L - H

The intonation in lists is thus the same as for discourse-old and non-assertive content. Since individual sentence are intonationally marked like this, hearers do not anticipate a full answer right away and do not exhaustify the individual propositions. This reading must be considered a special case of providing a (possibly exhaustive) answer to the question that blocks exhaustification on the sentence level. For the purposes of the studies I report in the subsequent chapters, I assume that the default (also in reading a sentence) is to put a falling intonation on discourse-new information. This intonation is associated with a specific semantics (Truckenbrodt 2012). It evokes semantic alternatives (Rooth 1992) that require to be evaluated by an operator.

In sum, giving an exhaustive answer is taken to be the pragmatic default for an implicit QUD. "Mention-some" answers are considered to only arise under special circumstances. In any case, *Obligatory Implicatures* predicts the answer strategy chosen to interact with the insertion of the trigger. The cases where "mention-some" readings are allowed should be the same cases in which leaving out the trigger is felicitous even when its presupposition is fulfilled in the context.

### 2.3.4 Empirical coverage

In this section, the empirical coverage of the two theories shall be discussed. As became obvious in the last sections, the underlying principles and mecha-

nisms the two theories assume for the obligatory insertion of triggers are quite different. Accordingly, the set of phenomena they capture differs as well.

*Maximize Presupposition* is able to account for the whole range of presuppositional phenomena since the insertion of the presupposition triggers follows from a general pragmatic principle. All presuppositional items are considered to form a homogeneous group with regard to their obligatoriness. They are always the strongest item on a scale of presuppositional strength.

*Obligatory implicatures* assumes that the insertion of the trigger follows from another underlying mechanism - the exhaustification of a set of alternatives with regard to a question. The theory is thus dependent on the competing sentence without the trigger to generate an implicature, however, that is the result of exhaustifying an explicit or implicit QUD. The trigger does not have to have a lexical alternative or be on a scale. Its insertion is a discourse-managing operation signaling non-exhaustivity.

### 2.3.5 Experimental evidence

Before I summarize and compare the predictions of the two theories, I want to give a short overview over the experimental findings that support the view that *Obligatory Implicatures* and *Maximize Presupposition* can be distinguished based on experimental data.

Not using a presupposition trigger in a context where its presupposition is satisfied leads to different types of inferences according to *Obligatory Implicatures* and *Maximize Presupposition*. Based on previous experimental work the status of the inference should have an impact on how people understand and process sentences without a trigger.

According to *Obligatory Implicatures*, the missing trigger inferences are conversational implicatures. There has already been quite an amount of experimental work on the processing of conversational implicatures. Most of this work focuses on implicatures related to scalar items like “some” (not “all”) or “or” (not “and”). There is a growing body of experimental evidence showing that whatever mechanism is behind the computation of implicatures, it is accessed in incremental on-line interpretation (Katsos 2009, Huang and Snedeker 2009, Grodner et al. 2010, Degen 2007, Breheny, Ferguson, and Katsos 2013a). An open question is the time course of the computation of conversational implicatures. Breheny, Ferguson, and Katsos (2013a) found in an eye-tracking

study that the scalar implicature of “some” can be made immediately and in anticipation of disambiguation. That is, the computation of the implicature arises even before the reader knows whether drawing the inference is justified. However, both Degen (2007) and Huang and Snedeker (2009) in eye-tracking studies found a delay of scalar implicature processing.

There is considerably less psycholinguistic research on implicatures which are of particular interest for *Obligatory Implicatures*. These are implicatures which do not operate with lexical scales but other alternatives, e.g. resulting from information structure (particularized conversational implicatures). There is one interesting result from Breheny, Ferguson, and Katsos (2013b), who, again in an eye-tracking study, found that hearers can access context specific particularized implicatures in on-line comprehension as well.

According to *Maximize Presupposition*, the missing trigger inference is a special type of inference resulting from competition with a stronger item on a presupposition scale. There is some support for the view that inferences arising from competition of items on a presupposition scale behave differently from ordinary implicatures. Kirsten et al. (2011) report an experiment on the felicitous use of the definite and indefinite determiner using the self-paced reading paradigm. They created two different types of contexts, one where the (uniqueness) presupposition of the definite is fulfilled, see (58-a.), and one where it is violated, see (58-b.).

- (58) a. Antje visited the Duesseldorf Zoo yesterday and saw a polar bear.  
 b. Antje visited the Duesseldorf Zoo yesterday and saw several polar bears.

The test sentence appeared in either of two conditions, with the definite and with the indefinite determiner, see (59).

- (59) a. Antje noticed that the polar bear was very aggressive.  
 b. Antje noticed that a polar bear was very aggressive.

They found reading time effects of a violated presupposition with the definite determiner on the word right after the trigger and two words after the trigger. Reading times were higher on these regions in contexts where the uniqueness presupposition was not fulfilled, as in (58-b.), compared to when it was verified by the context, as in (58-a.). Acceptability judgments mirrored this effect. The

sentences with a definite were less acceptable in contexts where the presupposition was violated than in contexts where it was not (Kirsten et al. 2011).

They observed a rather different behavior of sentences with the indefinite in the same contexts. They found that the sentences with the indefinite were less acceptable and took longer to read in contexts where one polar bear was introduced than in contexts where several polar bears were introduced. The higher reading times were found on the first, the second, and the third word after the trigger and the final word.

The study was conducted in German where the indefinite "a" and the numeral "one" are the same word ("ein"). For contexts with several polar bears, the numeral interpretation was most likely the one chosen so that "a polar bear" meant "one of the polar bears". The indefinite thus picked up one of the polar bears in the context and introduced it as a new discourse referent. This was impossible in the contexts where only one polar bear was introduced. The indefinite could not refer to this polar bear due to the novelty condition for indefinites (Heim 1982). A completely new referent had to be introduced. Competition with the definite is activated since its presupposition is fulfilled and the familiarity condition satisfied in the context. That is, in addition to the introduction of a new referent, the inference had to be drawn that there is not exactly one polar bear (missing trigger inference).

Kirsten et al. (2011) speculate that this inference was the reason for the higher, and more persistently higher, reading times for sentences with the indefinite in contexts where the presupposition of the definite was fulfilled.

In sum, the experimental literature on implicatures has shown that they produce measurable effects with a variety of methods. I will discuss some of the results of the studies in more detail when they are relevant. Data from the on-line and off-line comprehension of sentences with missing trigger inferences are thus a way to distinguish between the *Obligatory Implicatures* and *Maximize Presupposition* theory. Whereas *Obligatory Implicatures* would predict these inferences to pattern with conversational implicatures, *Maximize Presupposition* would predict these to be inferences with a different status and pattern more with the results found by Kirsten et al. (2011).

## 2.4 Summary and outlook

A systematic empirical investigation of obligatory presupposition triggers is so far missing. This dissertation aims to fill this gap. The goal is to provide a clear empirical picture of the phenomenon by including experimental evidence. It will be shown that based on the empirical findings, it is possible to distinguish between which of the two theories *Maximize Presupposition* and *Obligatory Implicatures* make the more accurate predictions for the insertion of different triggers. I will demonstrate that this evidence is of importance beyond deciding between *Obligatory Implicatures* and *Maximize Presupposition*. Given the different explanations the theories provide for the obligatory insertion of presupposition triggers, they conceptually diverge with regard to two main points. Whereas *Maximize Presupposition* makes use of competition between lexical items and assumes inferences arising from not using the trigger to have a special status, *Obligatory Implicatures* assumes competition between contextual alternatives and missing trigger inferences to be implicatures.

These conceptual differences result in different predictions with regard to the insertion of triggers under embedding structures and with regard to the influence of broader discourse level concerns on the insertion of the trigger. *Obligatory Implicatures* predicts the QUD to have an influence and triggers to not be obligatory in embedding structures. *Maximize Presupposition* predicts the trigger to be obligatory in embeddings and assumes no influence of the larger discourse on the insertion of the trigger. The comparisons with respect to these conceptual and empirical points are summarized in the table in 2.1 below.

| Theory                  | Missing trigger inferences | Alternatives | Embedding              | QUD                                      |
|-------------------------|----------------------------|--------------|------------------------|--|
| Maximize Presupposition | "Antipresupposition"       | Lexical      | Trigger obligatory     | Does not affect insertion of the trigger |
| Obligatory Implicatures | Implicature                | Focus        | Trigger not obligatory | Affects insertion of the trigger         |
| Conceptual Points       |                            |              | Empirical Predictions  |  |

Figure 2.1: Overview over the comparison between *Maximize Presupposition* and *Obligatory Implicatures*

The empirical predictions of the two theories are the basis for the empirical investigations discussed in the following chapters of this dissertation. The predictions will be tested for individual triggers. Each chapter will be dedicated to one of the triggers. By doing that, the empirical coverage of *Maximize Presupposition* and *Obligatory Implicatures* will be under scrutiny.

The individual chapters are structured as follows. The first part of each chapter discusses empirical evidence for or against the predictions of the two theories for the trigger under negation. The second part looks at empirical evidence for or against the predictions of the theories regarding the influence of the QUD and contextual alternatives.

Chapter 3 is dedicated to the presupposition trigger "too" (German "auch"). In the first part, a study by Oesterle (2015) will be reported on the obligatory insertion of "too" under negation. The second part focuses on the influence of the QUD on the insertion of "too". One on-line and two off-line studies on the obligatory insertion of "too" will be reported. The studies test the influence of contextual factors, including presence of the QUD and presence of explicit alternatives, on the insertion of the trigger. By doing so, this chapter will also discuss the contextual factors for the arising of exhaustivity implicatures. It will add to the current debate of where and under which conditions a covert exhaustivity operator is, maybe mandatorily, active. Especially the issue of the influence of different types of alternatives - triggered by focus and questions or triggered by lexical scales - on exhaustification and insertion of the trigger will be addressed. Since the experimental research has so far focused on scalar implicatures, the data presented are an important supplement to the debate on conversational implicatures. This regards the theoretical as well as the processing side. It will be shown that the insertion of "too" is first, not obligatory under negation and, second, sensitive to the contextual factors for exhaustification. The most important finding regarding these contextual factors for exhaustification is that first, exhaustification is not mandatory in every matrix clause and, second, that contrast is the crucial factor for the mandatory insertion of an exhaustivity operator into the LF.

In chapter 4, the obligatory insertion of the iterative "again" will be discussed. The first part is concerned with the insertion of "again" under negation. An off-line study on the insertion of "again" under negation will be reported which shows that "again" is not obligatory under negation. It will be argued that indeed "again" and "too" fall into the same group of triggers when it comes to obligatory insertion, they block the insertion of an exhaustivity operator.

In chapter 5, the obligatoriness of the factive "know" will be investigated. In the first part, the obligatory insertion of "know" under negation will be discussed. In the second part, the influence of the QUD on the insertion of "know" will be in focus. I will argue that the presuppositional status of "know"

depends on what is at issue in a conversation (c. Simons et al. 2011). This discussion will add to the recent debate on "know" being a "soft" presupposition trigger (Abusch 2002). Accordingly, its obligatory insertion will be shown to depend on other factors than presuppositionality, especially the QUD. My conclusion is that "know" thus also falls into the class of triggers that should be accounted for by *Obligatory Implicatures*.

In chapter 6, I will address the issue of obligatory definite determiners. The first part focuses on the singular definite and its obligatory insertion under negation. It demonstrates that the singular definite, indeed, is obligatory under negation. *Obligatory Implicatures* falls short in accounting for the whole range of empirical facts since it neither predicts the definite to be obligatory in affirmative sentences or under negation.

The second part of chapter 6 is dedicated to the influence of the QUD on the insertion of the plural definite. I will present a study on the difference between the plural definite and universal quantifier. I will argue that presuppositionality alone cannot explain why one is used over the other. I claim that presuppositionality, however, does play a role in deciding what the QUD is. I will argue that different constraints and conditions hold for answering this QUD for the plural definite and the universal quantifier, respectively. Discussing the relation between the QUD and the felicitous use of the definite versus quantificational determiner, will shed new light on their lexical competition. It will be seen that *Maximize Presupposition* alone cannot account for whole range of data.

Obligatory definiteness will be shown to not be dependent on the presence of an exhaustivity operator. It is less dependent on contextual factors. It will be argued that definiteness is a feature and, along with other presuppositional features, should be accounted for using *Maximize Presupposition*.

The structure of the chapters treating individual triggers is summarized in the table in 2.2 below.

| Prediction | "too"   | "again"                                | "know"                                | definites  |
|------------|---|--|---------------------------------------|--|
| Embedding  | "too" under negation<br>chapter 3.1.              | "again" under negation<br>chapter 4.1. | "know" under negation<br>chapter 5.1. | singular definite under negation<br>chapter 6.1. |
| QUD        | "too" and contextual alternatives<br>chapter 3.2. |  | "know" and the QUD<br>chapter 5.2.    | plural definite and the QUD<br>chapter 6.2.      |
|            | chapter 3   | chapter 4                              | chapter 5                             | chapter 6  |

Figure 2.2: Overview over the empirical predictions tested in individual chapters of the dissertation

In the final chapter 7, I will summarize the results by discussing the empirical coverage of both theories. On the basis of the empirical evidence provided, I will argue that obligatory triggers fall into two groups. *Maximize Presupposition*, I claim, is a grammatic constraint on presuppositional features which require one or the other setting. It is operative on a morpho-syntactic level and can account for obligatory definiteness. The obligatory insertion of the triggers "again", "too" and "know" follows from *Obligatory Implicatures*. Inserting these triggers into the structure is related to the contextual factors for exhaustification. They thus have a discourse managing function.





# Chapter 3

## Obligatory Additives

The following chapter is dedicated to the additive particle and presupposition trigger "too" (German "auch"). I will present empirical data on why and when the insertion of "too" is obligatory. I will argue that, based on these data, one can distinguish between the theories *Maximize Presupposition* and *Obligatory Implicatures*.

In the first part of this chapter, I will discuss an empirical study by Oesterle (2015) on the insertion of German "too" into negated sentences. Whereas *Maximize Presupposition* predicts "too" to be obligatory under negation, *Obligatory Implicatures* predicts "too" to be not obligatory under negation. It will be shown that inserting "too" in negated sentences is dispreferred.

The second part of the chapter addresses the question whether the insertion of "too" is influenced by the presence of the QUD and contextual alternatives. In section 3.2.1., an acceptability rating study on the German additive "too" will be reported. It tested the acceptability of sentences with and without the trigger in simple affirmative sentences, in compound sentences with "and", and in contexts that provide an explicit QUD. In section 3.2.2., a reading time study will be presented which tests the influence of explicit alternatives in the context on exhaustification and insertion of the trigger. Another acceptability rating study on the insertion of "too" will be reported and discussed in section 3.2.3. It tested the effect of contrastive focus and wrap-up sentences on the insertion of the trigger.

I will argue that the results overall suggest that *Maximize Presupposition* is not the right principle to explain the distribution of obligatory additives. An account based on obligatory implicatures makes more accurate predictions re-

garding its insertion. It predicts "too" not to be obligatory under negation. Moreover, it predicts the inferences arising from leaving out the trigger to be exhaustivity implicatures which show up more or less reliably depending on context. Furthermore, the prediction is that "too" can cancel this implicature. These predictions find empirical support by the studies presented.

### 3.1 "Too" under negation

In the following section I discuss a study by Oesterle (2015) which tested the predictions of *Obligatory Implicatures* and *Maximize Presupposition* regarding the insertion of "too" under negation. I will first revisit the predictions of the two theories for the insertion of "too" in simple affirmative sentences and then look at the predictions for the insertion of the trigger under negation. Then I will present the material and result of the study conducted. Last, I will discuss the results and their theoretical consequences.

#### 3.1.1 Idea and predictions

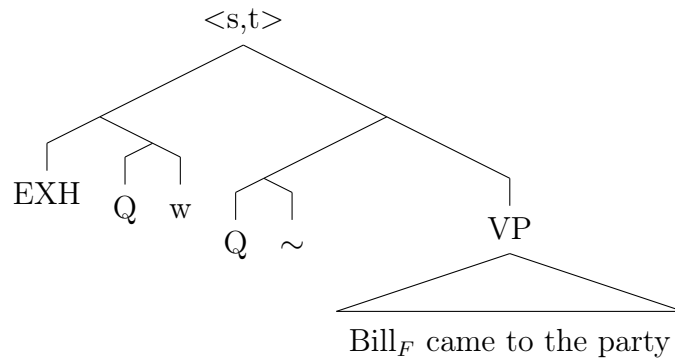
Even though the two theories differ with respect to the explanation why "too" is obligatory in simple affirmative sentences, they both predict the sentence to be degraded without the trigger, as in (1-b.) below.

- (1) a. Mary came to the party.  
       b. #Bill came to the party.

According to *Obligatory Implicatures* the oddness of (1-b.) is due to its exhaustivity implicature that Bill was the only one who came to the party which is contradictory to (1-a.). The derivation of this implicature is given in (2).

(2) *Obligatory Implicatures*

a.



- b.  $\llbracket \text{EXH} \rrbracket (\llbracket \text{Who came to the party} \rrbracket) (\llbracket \text{Bill came to the party} \rrbracket) (w)$   
 $\Leftrightarrow \llbracket \text{Bill came to the party} \rrbracket (w) \ \&$   
 $\forall q \ [ \ q \in \ [ \lambda p. \exists x. p = \lambda w. \text{person}(x)(w) \ \& \ \text{came-to-the-party}(x)(w) ] ]$   
 $\ \& \ \lambda w. \text{Bill came to the party} \not\Rightarrow q \rightarrow \neg q(w)]$   
 'Only Bill came to the party'

For *Maximize Presupposition* the oddness of (1-b.) is due to the fact that there is a competitor with the trigger, see (3-a.) which has the same assertion but more presupposition. The result is that the inference arises that the presupposition of the competitor does not hold, see (3-c.).

(3) *Maximize Presupposition*

- a.  $\llbracket \llbracket \text{Bill came to the party} \rrbracket \rrbracket^{o,g} = \lambda w. \text{Bill came to the party in } w$   
 b.  $\llbracket \llbracket \text{[too C] [Bill}_F \text{ came to the party]} \rrbracket \rrbracket^{o,g} = \lambda w: \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \lambda w. \text{Mary came to the party in } w]. \text{Bill came to the party in } w$   
 c.  $\Rightarrow \neg \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \lambda w. \text{Bill came to the party in } w]$

The theories both explain the oddness of the sentence without the trigger by assuming that the sentence without "too" has an inference which is contradictory to the context. Accordingly, they cannot be distinguished empirically based on the need to insert the trigger in affirmative matrix clauses.

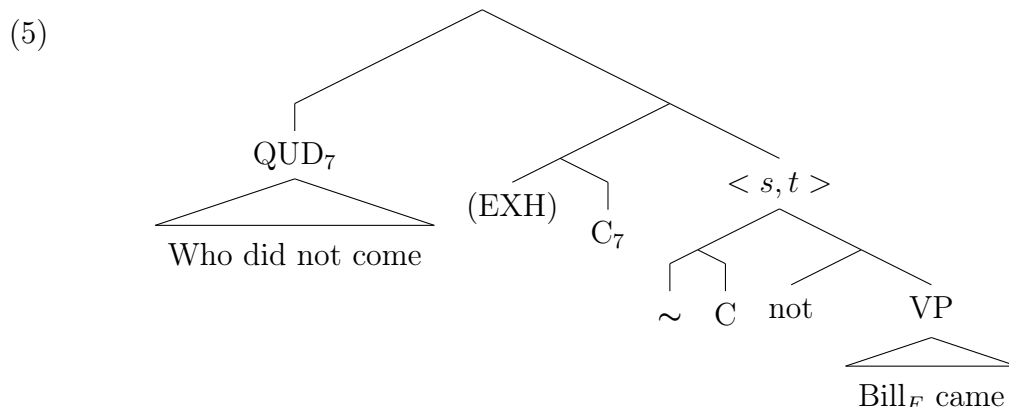
However, the two theories *Maximize Presupposition* and *Obligatory Implicatures* make crucially different predictions regarding the insertion of the presupposition trigger "too" under negation.

The negated sentence without the trigger in (4-b.) would violate *Maximize Presupposition* since the presupposition of "too" is still fulfilled in the context. There is a competitor, (4-c.), which has more presuppositions and the same assertion as (4-b.). The trigger is predicted to be obligatory when its presup-

position is fulfilled and thus (4-c.) should be preferred. The meaning of (4-c.) is given in (4-d.). The inference arising from using (4-b.) is given in (4-e.). It says that the presupposition of (4-d.) is false.

- (4) a. Mary came to the party.
- b. Bill did not come to the party.
- c. Bill did not come to the party, too.
- d.  $\llbracket \text{not} [\text{too C} [\text{Bill}_F \text{ come to the party}]] \rrbracket = \lambda w: \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \lambda w. \text{Bill came to the party in } w]$ . Bill didn't come to the party in  $w$
- e.  $\Rightarrow \neg \exists p [p \in C \ \& \ p(w) \ \& \ p \neq \lambda w. \text{Bill came to the party in } w]$

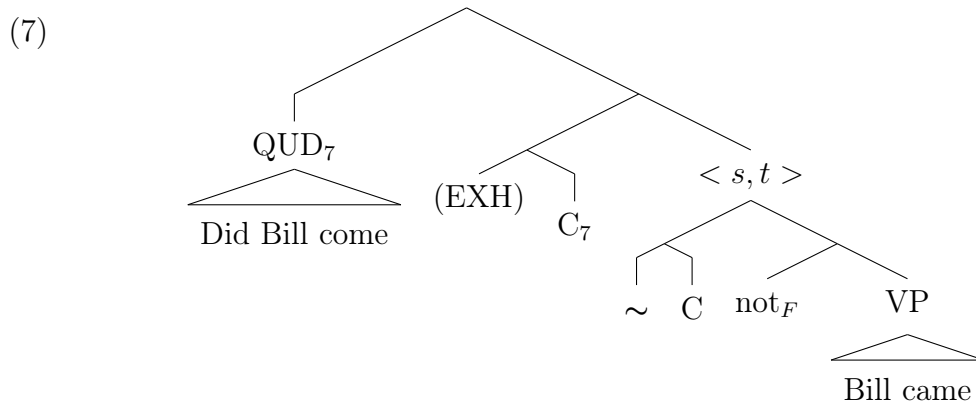
However, according to *Obligatory Implicatures* "too" should only have to be inserted if the sentence in (4-b.) yields an exhaustivity implicature which is contradictory to (4-a.). There are two possible attachment sites for the exhaustivity operator for (4-b.), above and below negation. If the operators is above negation, as in (5), and focus remains on "Bill", the QUD must change to "Who did not come?" to satisfy question-answer-congruence.



However, this configuration does not yield an implicature which is contradictory to a context which establishes that Mary came. The result of exhaustification is given in (6), the implicature that Bill was the only person who did not come is not contradictory to the fact that Mary came.

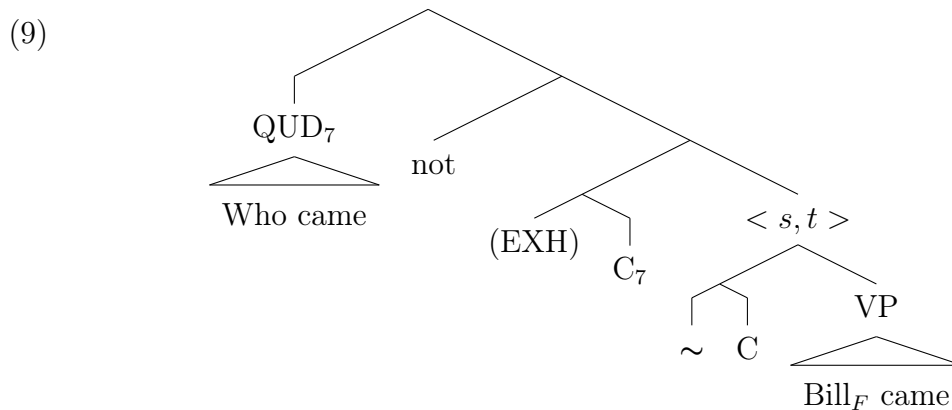
- (6)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{Who did not come to the party} \rrbracket)(\llbracket \text{Bill did not come to the party} \rrbracket)(w) \Leftrightarrow [\text{Bill did not come to the party}](w) \ \&$   
 $\forall q [ q \in [\lambda p. \exists x. p = \lambda w. \text{person}(x)(w) \ \& \ \neg \text{at-the-party}(x)(w)] \ \& \ \lambda w. \text{Bill}$   
 $\text{did not come to the party} \not\Rightarrow q \rightarrow \neg q(w) ]$   
 'Only Bill did not come to the party'

Another possibility is that focus now falls on negation itself, see in (7). The QUD then changes to the polar question "Did Bill come?". The implicature arising from this configuration is also not contradictory to the fact that Mary came, since it simply says that Bill did not come, see (8).



- (8)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{Did Bill come to the party?} \rrbracket)(\llbracket \text{Bill did not come to the party} \rrbracket)(w) \Leftrightarrow [\text{Bill did not come to the party}](w) \ \&$   
 $\forall q [ q \in [\lambda p. p = \lambda w. \text{Bill did not come to the party in } w \vee p = \lambda w. \text{Bill came}$   
 $\text{to the party in } w] \ \& \ \lambda w. \text{Bill did not come to the party} \not\Rightarrow q \rightarrow \neg q(w) ]$   
 'Bill did not come to the party'

The second option is that the exhaustivity operator is attached below negation, see (9).



Given that the exhaustivity operator is assumed to be a syntactically fully flexible operator according to grammatical theories of implicatures, this syntactic configuration is not ruled out per se. However, if focus remains on "Bill", the QUD has to be "Who came to the party". Exhaustifying the sentence with respect to this question and then negating the result leads to the reading in (10).

- (10)  $\llbracket \text{NOT} \rrbracket(\llbracket \text{EXH} \rrbracket(\llbracket \text{Who came to the party} \rrbracket)(w)(\llbracket \text{Bill came to the party} \rrbracket)) \Leftrightarrow$   
 $\neg [ \llbracket \text{Bill did come to the party} \rrbracket(w) \ \& \ \forall q [ q \in [\lambda p. \exists x [p = \lambda w. \text{person}(x)(w) \ \& \ \text{at-the-party}(x)(w)]] \ \& \ \lambda w. \text{Bill came to the party} \Rightarrow q \rightarrow \neg q(w) ] ]$   
 $\#$  'It is not the case that Bill was the only person at the party'

The reading in (10) is a reading the sentence does not have and thus this configuration should be ruled out. It has been argued for scalar implicatures that this reading exists and involves meta-linguistic negation (Horn 1989, Chierchia, Fox, and Spector 2011), see (11).

- (11) John didn't see Mary or Sue, he saw both. (Chierchia, Fox, and Spector 2011)

As Chierchia, Fox, and Spector (2011) notes this reading involves special contextual circumstances and requires that the implicature is made explicit immediately after. However, even under these circumstances this reading seems to be ruled out for cases of particularized conversational implicatures like (10), compare (12).

- (12) ??John didn't come to the party, Mary and John came.

The syntactic configuration where the exhaustivity operator has scope below negation is thus not available since the corresponding reading is unattested. The option where the exhaustivity operator is attached above negation changes the QUD and thus yields an implicature which is not contradictory to the context. Since the contradiction is the reason for the insertion of the trigger under *Obligatory Implicatures*, it is not expected to be obligatory in (4-b).

### 3.1.2 Material and design

Oesterle (2015) notes that creating the material for an acceptability rating study testing the insertion of "too" under negation is complicated by the fact that "too" and negation are ungrammatical when appearing in one sentence, both in German and in English, see (13-a.) and (13-b.).

- (13) Peter came to the party. / Peter ist zur Party gekommen.  
 a. #John did not come to the party, too.  
 b. #Johannes ist nicht auch zur Party gekommen.

The only available and grammatical version of the two sentences in (13-a.) and (13-b.) is one where "auch" and "too" have scope over negation. For English, "too" would have to be changed to "either", see (14-a.). For German, word order would make this scopal relation transparent by having "too" precede negation, see (14-b.).

- (14) a. John did not come to the party, either. not >> either  
 b. Johannes ist auch nicht zur Party gekommen.

This, however, is not the reading that satisfies the presupposition in (13) but instead presupposes that someone else did not come. I assume that the ungrammaticality of (13-a.) and (13-b.) is due to the fact the "too" and "auch" are Positive Polarity Items and cannot appear in the scope of negation. Association of the additive with the focus across negation is impossible since it would yield an intervention effect (see Beck 1996, Beck 2006, Beck 2016). Negation is an intervening operator in this case, disturbing the association of "too"/"auch" with the focus on "John"/"Johannes", see (15).<sup>1</sup>

- (15) #[ too C [ NEG [ [~ C] John<sub>F</sub> come ] ] ]

These facts are confounding factors for testing the acceptability of sentences with "too" under negation. It can, however, be avoided with using sentential negation like in (16-b.). Negation is high enough to not block the association of "too" with focus which is why adding the particle is not unacceptable.

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<sup>1</sup>Under the assumption that negation is a focus-sensitive or evaluating operator



- (16) a. Peter came to the party.  
 b. It is not the case that John came to the party, (too).  
 c. It is the case that John came to the party (too).

To contrast (16-b.) with the positive affirmative case in (16-c.) in an experimental study, one has to find contexts where both the negated and affirmative version of this sentence are equally acceptable.

Oesterle (2015), in his study on the German trigger "auch", used contexts in which two individuals were introduced and made a plan to do something together. One of the individuals was picked up again in the context, the other one was mentioned in the target. He included the discourse particles "nun" and "so" in the target to make the discourse sound more natural. For the design of the study the two factors TOO and NEGATION were crossed. The first factor TOO appeared in the conditions "with too" and "without too". The second factor NEGATION appeared in the conditions "with negation" and "without negation". The target thus appeared in four conditions. A sample item in all four conditions is given below (Oesterle 2015, p.17-18).

- (17) Context: Lukas und Melanie sind beide passionierte Kinogänger. Sie haben vereinbart, am Freitag gemeinsam ins Kino zu gehen, wenn sie beide Zeit haben. Lukas hat am Freitag Zeit.

'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.'

- a. Es ist nun so, dass auch Melanie am Freitag Zeit hat. Deswegen reservieren die beiden Karten für die Spätvorstellung.

'It is the case that Melanie has time to go on Friday, too. This is why they order tickets for the late show.' (-NEG, +TOO)

- b. Es ist nun so, dass Melanie am Freitag Zeit hat. Deswegen reservieren die beiden Karten für die Spätvorstellung.

'It is the case that Melanie has time to go on Friday This is why they order tickets for the late show.' (-NEG, -TOO)

- c. Es ist nun nicht so, dass auch Melanie am Freitag Zeit hat. Deswegen überlegen sie sich einen anderen Termin.

'It is not the case that Melanie has time to go on Friday, too. This is why they are trying to find another time.' (+NEG, -TOO)

- d. Es ist nun nicht so, dass auch Melanie am Freitag Zeit hat. Deswegen überlegen sie sich einen anderen Termin.  
 It is not the case that Melanie has time to go on Friday, too. This is why they are trying to find another time.' (+NEG, +TOO)

Participants saw and were asked to read the context carefully. They were then presented with the target sentence in one of the conditions in a gray box. They were asked to rate the acceptability of the target within the context on a scale from 1 to 7, where 7 meant "completely acceptable" (Oesterle 2015). They were advised that "acceptable" meant that the sentence made sense in the context and could be uttered by a native speaker.

### 3.1.3 Results

Oesterle (2015) found a significant interaction between the factors TOO and NEGATION. Without negation, the sentences with "too" were judged significantly better ( $p < .01$ ,  $M = 5$  with "too",  $M = 3,9$  without "too"). With negation, the sentences without "too" were judged better ( $M = 3,6$  without "too",  $M = 3,5$  with "too"). There were significant main effects for both TOO and NEGATION, but in opposite directions. The presence of the trigger generally increased the acceptability of the sentences ( $p < .01$ ), the presence of negation generally decreased the acceptability of sentences ( $p < .01$ ). There was a significant simple effects for negation in the conditions -TOO and +TOO. The +NEGATION condition was significantly worse than -NEGATION both with the trigger ( $p < .01$ ) and without the trigger ( $p < .05$ ). There was no simple effect of TOO for +NEGATION. For +NEGATION there was a significant simple effect, the sentence with the trigger were judged significantly better than without the trigger ( $p < .01$ ).

The results are summarized in the table in 3.1 below (c. Oesterle 2015: 21-22).

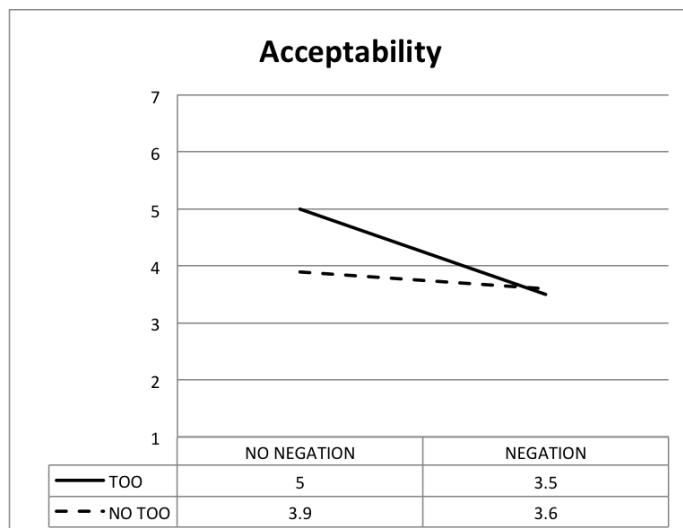


Figure 3.1: Mean average acceptability for sentences with or without "too" in sentences with or without negation

### 3.1.4 Discussion

The interaction between the insertion of "too" and negation is expected under *Obligatory Implicatures*. Since no implicature arises with negation which contradicts the context, the insertion of the trigger is not obligatory. The fact that inserting "too" under negation even leads to a decrease in acceptability can also be explained with *Obligatory Implicatures*. Negation and "too" evoke questions of different kinds. Whereas "too" suggest that the QUD is the one in (18-a.), negation makes the QUD either (18-b.) or (18-c.), as discussed above.<sup>2</sup>

- (18) a.  $\llbracket \text{Who was at the party} \rrbracket = \lambda q. \exists x [q = \lambda w. \text{person}(x)(w) \ \& \ \text{at-the-party}(x)(w)]$
- b.  $\llbracket \text{Who was not at the party} \rrbracket = \lambda q. \exists x [q = \lambda w. \text{person}(x)(w) \ \& \ x \text{ was not at the party in } w]$
- c.  $\llbracket \text{Was Peter at the party?} \rrbracket = \lambda q. q = \lambda w. \text{Peter was not at the party in } w \vee q = \lambda w. \text{Peter was at the party in } w$

The sentences with "too" and negation signal the relevance of different sets of alternatives. Readers are confused as to which of these questions to answer

<sup>2</sup>The fact that two different questions seem to be introduced through the presence of "too" and negation already hints at the idea the contrastive topics (Büring 2007, Büring 2015, Constant 2014) might play a role in the interpretation of these examples. I will return to this point in the general discussion at the end of the chapter.

and which set of alternatives to exhaustify. As a result, sentences are perceived as pragmatically odd and receive a lower rating.

The interaction is not predicted by *Maximize Presupposition*. Inserting "too" should have improved ratings according to *Maximize Presupposition*, irrespective of the presence of negation (c. Oesterle 2015).

It is not expected under either of the two theories that the main effect negation had a greater (negative) impact on acceptability than leaving out the trigger in positive sentences (M=3,9 -TOO, -NEGATION, M= 3,6 -TOO, +NEGATION). However, the result is also not surprising given that the negation used is not the preferred way to express negation in German. In fact, Oesterle (2015) notes that participants commented on the fact that negation with a matrix clause did not sound natural to them in the targets. However, since the same structure was used for the positive sentences, this is not considered to be a problem for the results overall.

The interaction is the most important finding of the study. It supports the view of *Obligatory Implicatures* that the inferences arising from not using the trigger are exhaustivity implicatures resulting from exhaustifying a sentence with respect to the QUD (c. Oesterle 2015). It speaks against an analysis of the insertion of "too" making use of *Maximize Presupposition*.

According to *Obligatory Implicatures*, the additive is only obligatory where the exhaustivity operator is. But when looking at the results from negation, the relationship must be considered to be even stronger: the additive cannot occur where the exhaustivity operator cannot. Take again into consideration (19). It was argued that the interpretation in (19-a.) is ruled out since it yields an unattested reading.

(19) Peter ist nicht gekommen.

a. #[ NEG [ EXH C [  $\sim$  C Peter<sub>F</sub> ist gekommen ] ] ]

The additive is impossible in this position, too, since it is a PPI and cannot occur in the scope of negation. The only possible attachment site for the exhaustivity operator is the same as for the additive, above negation. However, like the additive, it cannot evaluate the focus on "Peter" since this association is blocked by negation, which leads to an intervention effect, see (20).

- (20) #Peter did not come, too.  
 a. #[ too C [NEG [ [~ C] Peter<sub>F</sub> come ] ] ]

Explaining the non-availability of (20-a.) with covert intervention still entails that the exhaustivity operator is not syntactically flexible in a way that enables it to move across negation since movement would be an obvious way to avoid intervention (c. Beck 2006). However, it does not speak against the assumption that a covert exhaustivity operator is present in the structure in (19) as a default.

This view has obvious consequences for the predictions regarding other downward-entailing (DE) operators besides negation. *Obligatory Implicatures* predicts that any embedded occurrences of the exhaustivity operator also allow for the embedding of the additive. If further evidence is found for this predictions then a reliable measure for the positions and the obligatoriness of the exhaustivity operator opens up: the (obligatory) insertion of the additive.

I will now turn to the second important predictions of *Obligatory Implicatures* that the presence of the QUD and contextual alternatives make a difference for when these inferences show up and affect the insertion of the trigger.

### 3.2 The additive particle and contextual alternatives

As was discussed in chapter 2, the two theories *Maximize Presupposition* and *Obligatory Implicatures* make different predictions with regard to the influence of the broader discourse, especially the presence of a QUD and contextual alternatives, on the insertion of the trigger. Whereas *Maximize Presupposition* does not predict an influence of the discourse context, *Obligatory Implicatures* predicts the contextual circumstances under which the trigger is obligatorily inserted to align with the circumstances under which a proposition is interpreted as an exhaustive answer to the QUD.

The hypotheses of the two theories regarding the influence of the broader discourse on the insertion of additive particles have never been tested empirically. One exception is Eckardt and Fränkel (2012) who tested how likely it is that participants used an additive in a production task. The participants were divided into two groups with different instructions. One group was asked to give

a protocol-like description of a comic, the other group was asked to tell a story. In both cases, the story-line of the comic included two protagonists carrying out the same action at some point. The authors note that the task influenced the use of the trigger. However, they also note that the results are not conclusive based on the fact that there is quite some inter-speaker variation (Eckardt and Fränkel 2012).

The three studies presented in the next section aim to provide more solid empirical evidence for the contextual factors influencing the insertion of "too".

### 3.2.1 The additive particle and the QUD

#### Goals and predictions

The overall purpose of the study reported in this section is to test the empirical predictions of the two theories presented in chapter 2 with using an acceptability judgment task (also c. Bade 2014).<sup>3</sup>

Three main aims are behind the design of the experiment. A first goal of the study was to empirically verify the hypothesis that the presupposition trigger "too" (German "auch") is obligatory in contexts where its presupposition is fulfilled. The two theories presented in chapter two do not differ in their predictions regarding this point. They both predict the sentence without the trigger in these contexts to result in oddness. However, the data have never been investigated systematically. They are important to get the full empirical picture even though *Maximize Presupposition* and *Obligatory Implicatures* cannot be distinguished based on these findings alone.

The second aim of the study was to test the different predictions of *Obligatory Implicatures* and *Maximize Presupposition* regarding the obligatoriness of the trigger "too" in complex sentences with the conjunction "and". The data are repeated in (21) below.

- (21) a. Mary came to the party and Peter came, too.  
b. Mary came to the party and Peter came.

*Obligatory Implicatures* predicts (21-b.) to be as acceptable as (21-a.) whereas *Maximize Presupposition* predicts it to be degraded compared to (21-a.). The

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<sup>3</sup>The material, design, procedure and results of the study I report here are mostly similar to what I present in Bade (2014). The analysis and the discussion of the results are modified to fit the purpose of the theoretical discussion of this dissertation.

source of this difference is the explanation either of these two theories entertain for the reason the trigger is inserted.

*Obligatory Implicatures* predicts the insertion to be a result of an unwanted exhaustivity implicature. That is, according to this theory, the trigger would only be obligatory when an exhaustivity operator is inserted into the second conjunct in (21-b.) and yields the contradiction "Mary came to the party and only Peter came". However, exhaustification of this kind is blocked due to the assertion of (21-b.). Under a standard analysis for "and" it takes two propositions and *asserts* that both are true, see the lexical entry for "and" in (22-a.) and the analysis of (21-b.) in (22-b.).<sup>4</sup>

- (22) a.  $\llbracket \text{and} \rrbracket = \lambda p.\lambda q.\lambda w. p(w) \ \& \ q(w)$   
 b.  $\text{attend}(\text{party})(P)(w) \ \& \ \text{attend}(\text{party})(M)(w)$

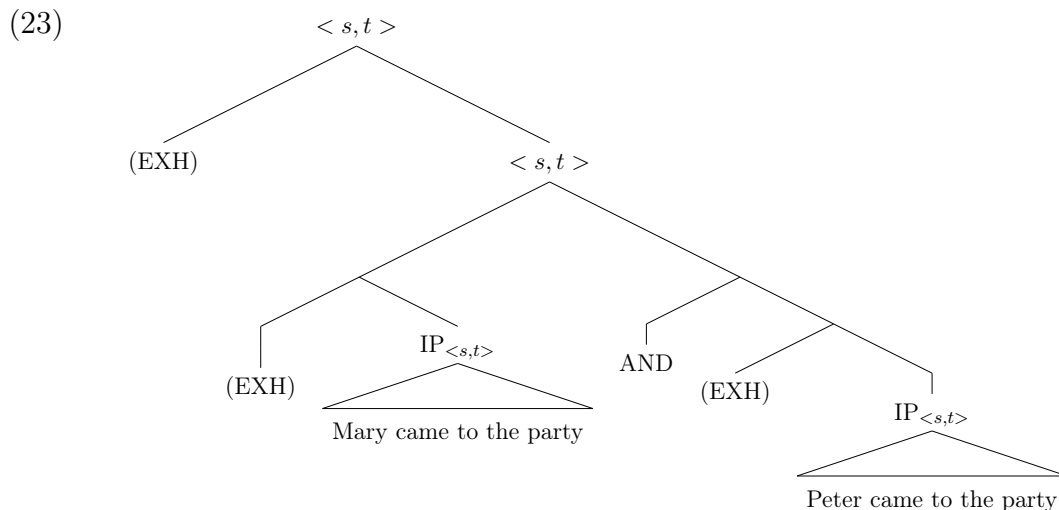
Inserting the exhaustivity operator in the second conjunct would exclude the alternative that Mary came. However, inserting the operator in any conjunct would not yield a stronger meaning but would make the sentence contradictory. The only available possibility is to attach the exhaustivity operator high. The potential syntactic position of the operator are given in the tree in (23).

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<sup>4</sup>An alternative view is one where "and" is an additive particle that carries a presupposition (Zeevat 2007). I agree that "and" expresses additivity. However, I don't think that it should be considered a presupposition. This presupposition would be rather unrestrictive in saying that another proposition (of any kind) has to be true (whereas for "too" this proposition must be part of the focus alternatives). Accordingly, the presupposition of "and" would be fulfilled in all contexts where it combines with (any) two propositions. If it is not, that is if a sentence with "and" just occurs out of the blue with one argument, the sentence would not just be infelicitous but ungrammatical, see the contrast in (i).

- (i) (It is flu season)  
 a. Peter is sick now, too.  
 b. \*And Peter is sick now.

I will continue to assume that in the case where "and" only combines with one proposition, it is not a case of presupposition failure. "And" is missing an argument in (i-b.) which results in unacceptability.



Given that the relevant alternatives are the one in (24-a.) (same as generally assumed for disjunction, see e.g. Fox 2007) the only reading the sentence can have is outlined in (24-b.), whereas the configurations in (24-c.) and (24-d.) lead to a contradiction.

- (24)
- a.  $\text{Alt} = \{M \text{ came, } J \text{ came, } M \ \& \ J \text{ came, } M \text{ or } J \text{ came}\}$
  - b.  $\text{EXH}(\text{Alt})(M \ \& \ J \text{ came}) = M \ \& \ J \text{ came}$
  - c.  $M \text{ came} \ \& \ \text{EXH}(\text{Alt})(J \text{ came}) =$   
 $M \text{ came} \ \& \ (J \text{ came} \ \& \ \neg M \text{ came}) \Rightarrow \text{Contradiction}$
  - d.  $\text{EXH}(\text{Alt})(M \text{ came}) \ \& \ J \text{ came} =$   
 $(M \text{ came} \ \& \ \neg J \text{ came}) \ \& \ J \text{ came} \Rightarrow \text{Contradiction}$

Since exhaustification of one of the conjuncts is blocked the trigger is not obligatory according to *Obligatory Implicatures*.

According to *Maximize Presupposition*, there is a competitor to (21-b) which is (21-a). However, (21-b) does not have more presuppositions than (21-a). The presupposition of "too" gets filtered since it is locally satisfied and thus does not project to end up being a presupposition of the whole sentence. To capture this, a dynamic semantic system as, for example, introduced by Heim (1982) has to be considered. In such a system, meanings of expressions are defined via their potential to change and update the context, their context change potential (see als Kadmon 2001) for an overview). The context change potential of conjunction is defined in a way that captures that a context is first updated with the information of the first conjunct before the presupposition of the second conjunct is considered. This definition is given in (25) (c. Kadmon



2001: 44), where  $c$  is the context set, the set of worlds where all propositions the participants of a conversation believe to be true are true (Stalnaker 1978).

(25) Updating a context with conjunction

$$\text{a. } c + (S1+S2) = (c+S1)+S2$$

Since *Maximize Presupposition* applies locally according to most accounts<sup>5</sup> there are now two competitors for  $S2$  at the point where  $S1$  has already been added to the context set: the two competitors are given in (26-a.) and (26-b.) below.

- (26) a.  $\llbracket \text{[IP Peter came]} \rrbracket = \lambda w. \text{ Peter came in } w.$   
 b.  $\llbracket \text{[IP [NP Peter too] [VP came]]} \rrbracket = \lambda w. \exists x[x \neq \text{Peter} \ \& \ x \text{ came in } w].$  P came in  $w$

If (26-a.) is chosen over b. as in (21-b), then a missing trigger inference arises that the presupposition of the competitor ((26-b.)) is not true:

$$(27) \quad \neg \exists x[x \neq \text{Peter} \ \& \ x \text{ came in } w]$$

Combined with the first conjunct in (21-b) this leads to a contradiction, namely Mary came and no one besides Peter came. This contradiction is avoided when (26-b.) is chosen for the second conjunct which has the same assertion but more presuppositions. (21-a) is thus predicted to be better than (21-b) according to *Maximize Presupposition*.

A third purpose of the study was to test the influence of an explicit QUD on the insertion of the trigger "too". The prediction of *Obligatory Implicatures* is that the obligatoriness of the trigger depends on whether a sentence is interpreted as an exhaustive answer to the QUD. Only if an implicature that is the result of this exhaustification arises, is the trigger considered obligatory. The presence of an explicit question in the discourse is assumed to make

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<sup>5</sup>It is not clear that global versions of *Maximize Presupposition* (Sauerland 2008a) make the same prediction. However, when assuming that the context is not updated with information in the first conjunct by the time that the reader experiences the second conjunct, the prediction would be that inserting the trigger into the second conjunct should be unacceptable since its presupposition is not entailed by the context. That does not seem to be true. According to *Obligatory Implicatures*, inserting the trigger is not expected to be degraded due to an unfulfilled presupposition, just unnecessary, since it is trying to avoid an implicature that would not occur in the first place. At most the sentences is predicted to sound redundant.

exhaustification more or less prominent. Depending on the strategy chosen, the trigger should be more or less obligatory. That is, an interaction between interpretation of the sentence without the trigger and its acceptability should be found. If an exhaustivity implicature arises, leaving out the trigger should be less acceptable.

*Maximize Presupposition* does not predict the presence of a QUD to affect the obligatoriness of the trigger. As long as the presupposition of "too" is fulfilled, the sentence without the trigger should always result in the same oddness due to the activation of a lexical scale.

The predictions of the two theories for the interpretation and acceptability of the last utterance are summarized in table 3.1. The columns represent what the theories each predict for the acceptability and interpretation of the target sentences, depending on the factors which were manipulated in the experiment, i.e. whether the utterance of the last speaker contained no expression, the trigger, or "and".

| Condition                      | Maximize<br>Presupposition      | Obligatory<br>Implicatures      |
|--------------------------------|---------------------------------|---------------------------------|
| Target with the trigger        | not contradictory<br>acceptable | not contradictory<br>acceptable |
| Target without ex-<br>pression | contradictory<br>not acceptable | contradictory<br>not acceptable |
| Target with "and"              | contradictory<br>not acceptable | not contradictory<br>acceptable |

Table 3.1: Predictions of *Obligatory Implicatures* and *Maximize Presupposition* for obligatory "too" in discourse

### Method and design

36 experimental items in German were created for the study. The stimuli were presented as comic-like pictures depicting a dialog between 3 participants in a conversation. The first part of the comic showed one of the participants (speaker A) making a general, introductory statement. In the second part the speaker B replied to the first statement with either a general remark like "nice!" or by asking a question. Speaker A responded with another statement (an answer to the question in the question condition). This sentence always verified the presupposition of the following sentence with the presupposition trigger (when it contained one). In the fourth part of the comic the third participant of the conversation, speaker C, gave a parallel answer/made a parallel statement to the one given by speaker A in the third picture. His/Her answer either had "auch" ("too") in it, or it started with "und" ("and") or it had no additional expression in it. The pattern of the dialog is given in the sample item in (28).

- (28)
- 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: Julia came to the party, too.  
C': And Julia came to the party.  
C'': Julia came to the party.

A corresponding comic that functioned as the stimulus (in the condition no question and no expression) is given in 3.2.



Figure 3.2: Visual Stimulus

The study had a 2x3 and between-subjects design. The factor CONTEXT appeared in the two conditions "with question" and "without question". The second factor EXPRESSION appeared in one of the three conditions "last sentence contained "auch"", "last sentences contained "und""/"last sentence contained no expression". Items were pseudo-randomized over six lists so that every item appeared in one of the six conditions in each list. 72 filler items were created. 24 German native speakers participated in the experiment. The stimuli were presented visually, on a computer screen. After reading the instructions, participants were presented with one of the comic-like dialogs. They were then asked how they interpret the utterance of the last speaker in the dialog. They were given two options for the interpretation: they could either say that the last speaker is agreeing with what the speaker before him/her said ("both"-reading), or they could say that the last speaker contradicts the speaker before her/him ("only"-reading). After choosing an interpretation, participants were asked to judge the last speaker's utterance on an acceptability scale ranging from 1 (unacceptable) to 5 (completely acceptable).

## Results

I will first discuss the results for the acceptability judgments. Then I will report the results for interpretation.

Acceptability judgments were subjected to a repeated measure analyses of

variance (ANOVA). They were aggregated across items and within participants and condition. No significant main effect of the factor CONTEXT was found ( $F < 1$ ). The factor EXPRESSION had a highly significant effect on acceptability ( $p < 0.001$ ). A difference contrast (reverse Helmert contrast) was calculated for the factor EXPRESSION. It compared "too" against "and" in a first step and then compared the mean of these two conditions with "no expression". The contrast revealed that the main effect of EXPRESSION is due to a difference between the conditions no expression versus "and" and "too" ( $p < .001$ ). There was no difference between "and" and "too" ( $F < 1$ ). The results are summarized in the tables and diagrams in 3.3 and 3.4.

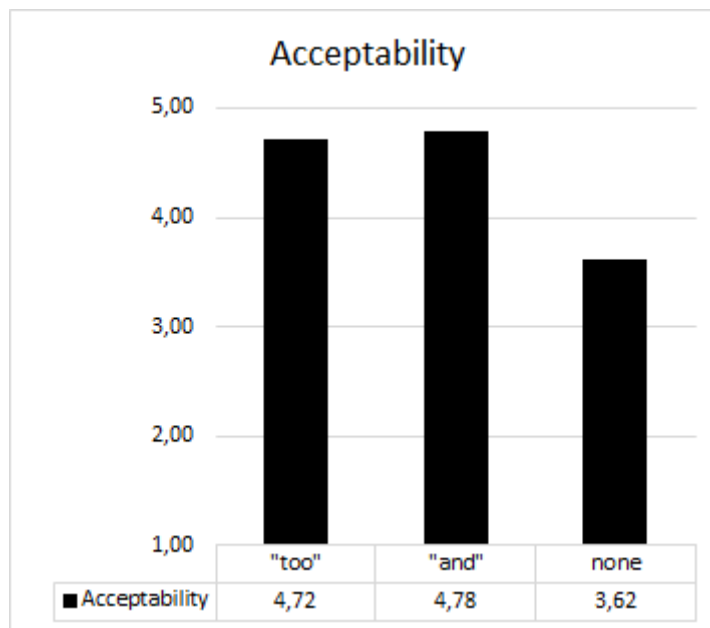


Figure 3.3: Mean average acceptability for sentences with "too" and "and" and no expression in all contexts

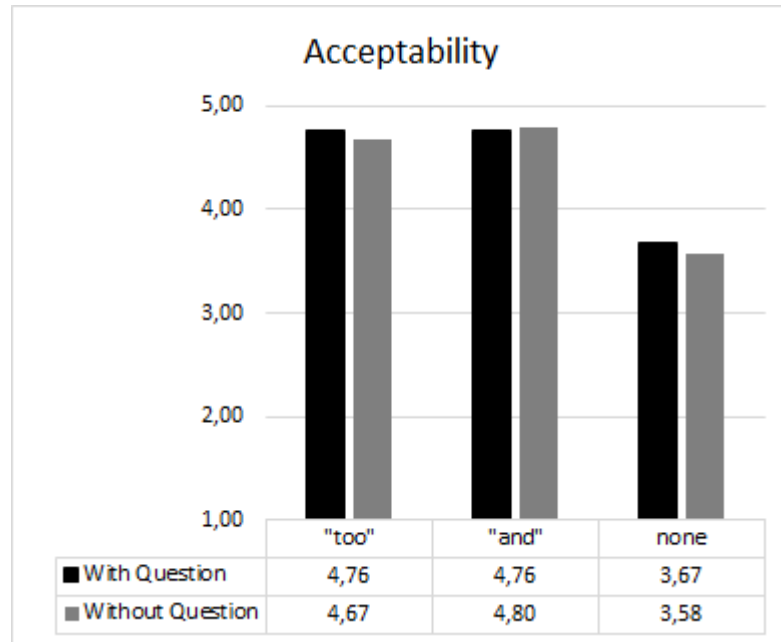


Figure 3.4: Mean average acceptability for sentences with "too" and "and" and no expression in context with a question and without a question in the dialogue

The data for interpretation 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 EXPRESSION chosen had a highly significant main effect on interpretation ( $p < .001$ ). For the three level factor EXPRESSION a difference contrast was calculated. It showed that the effect is due to a difference between the conditions "no expression" and "too"/"and" ( $p < .001$ ). There was no difference between "and" and "too" in interpretation ( $F < 1$ ). The factor CONTEXT 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" ( $p < .02$ ). There were more non-contrastive readings with the presence of a question for the sentences that had no expression. Contrastive readings became available for the sentences with "and" and "too" when there was a question. There was no contrast between "and" and "too" ( $F < 1$ ). The results are summarized in the tables and diagrams in 3.5 and 3.6.

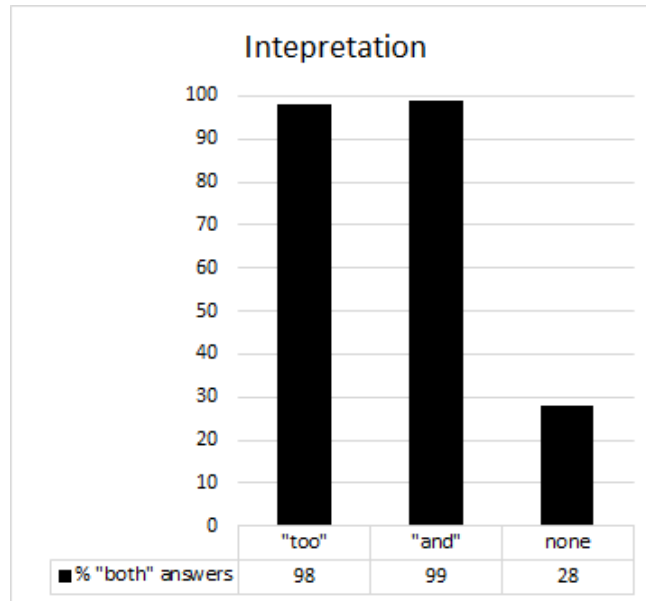


Figure 3.5: Untransformed mean percentage of non-contrastive interpretation ("both"-readings) of sentences with "too", "and" and no expression in all contexts

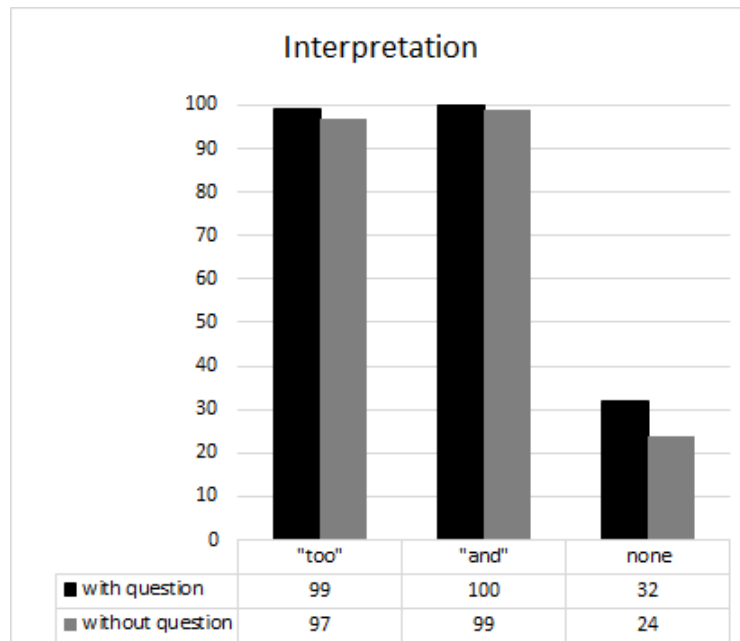


Figure 3.6: Untransformed mean percentage of non-contrastive interpretation ("both"-readings) in contexts with a question and without a question for sentences with "too", "and" and no expression

## Discussion

The predictions of both *Maximize Presupposition* and *Obligatory Implicatures* regarding the sentence without the trigger are borne out. A sentence like (29-b.) is most often (72% of the time) read as a contradiction in a context like (29-a.), where the presupposition of the sentence is fulfilled.

- (29) a. Mary came to the party.  
 b. Julia came to the party.

Moreover, the sentences without the trigger were significantly less acceptable than the sentence with "too" (M= 3.62 vs. M=4.78) or "and" (M= 3.62 vs. M=4.72). For *Obligatory Implicatures* this is due to the fact that the sentence in (29-a.) has an exhaustivity implicature that is contradictory to the context. An alternative explanation is that (29-b.) violates *Maximize Presupposition*. From the perspective of both theories, however, the average acceptability of the sentences without without the trigger seems relatively high. Moreover, 28% of the time the sentence without the trigger is read as an addition to what the previous speaker said, not a contradiction. There is no correlation between acceptability and interpretation. Contradicting the last speaker as well as agreeing with her/him is approximately equally (un)acceptable (M= 3.6 for the contrastive reading vs. M= 3,67 for the non-contrastive reading). The numbers speak for the fact that the sentences are, in both cases, perceived as pragmatically odd and not as ungrammatical. It is very likely that judgments were influenced by the presentation of the items as a dialog. It is clearly more preferred to contradict others in a conversation than to contradict yourself. In addition, there is no information on what is shared knowledge between speakers and in what kind of relationship they stand. This might have influenced the results since participants could not judge how likely a contradiction is.

Even though the influence of context was not statistically significant for interpretation, looking at the interpretation of individual items revealed that the type of question played a role in how likely people found a contrastive versus non-contrastive reading. It was not the question word per se ("who", "where" or "what") that changed the interpretation. It rather played a role how plausible it was that there is one answer to the question. For answers where it is quite obvious that there is more than one true answer (Who was



at the party? Who went to the concert?), participants were more likely to choose the interpretation where both of the sentences uttered by the last two speakers are considered true. That is, in this kind of context they thought that the speakers gave "mention-some" rather than exhaustive answers. Crucially, the domain of individuals asked about is unknown to the participants. What else might have played a role in giving an interpretation is that participants just considered it unlikely that the speakers *know* an exhaustive answers. It is implausible for someone to know all individuals who attend a party, concert etc. For questions like "What did Mary plant in the garden?" and "Where does Birgit work?" participants more often chose the contrastive interpretation. Participants assumed that the speakers gave a complete answer. This suggests that exhaustification of an answer is a pragmatic default rather than obligatory.

Since the non-contrastive interpretation is as (un)acceptable as the one where the last speaker is contradicting the previous speaker, the question arises whether the results display a genuine availability of "mention-some" readings. It is possible to override the pragmatic default of exhaustification contextually by asking a question that is biased towards only requiring a partial answer. However, it is still not to be considered the preferred strategy due to its low frequency and low acceptability ratings.

The second prediction tested in the study regarded sentences with the conjunction "and" in the last utterance. The prediction of *Maximize Presupposition* is that the sentence with "and" should be less acceptable than the sentences with "too" due to a missing trigger inference. Furthermore, this inference should make the sentence contrastive to the one preceding it according to *Maximize Presupposition*. *Obligatory Implicatures* predicts the sentences with "and" to receive the same interpretation and average acceptability rating as the sentences with "too". The result show that the predictions of *Obligatory Implicatures* are borne out. Sentences with "and" are read as an addition, not a contradiction, to the previous utterance in almost all cases (98% on average). Moreover, they are not significantly less acceptable than sentences with "too" (M= 4.72 vs. M=4.78). This suggests that in the sentences with "and", no inference arises that contradicts the penultimate sentence in the dialog. This is surprising from the viewpoint of *Maximize Presupposition* since the sentence lacks the presupposition and should thus have a missing trigger inference.

Last, the predictions of the two theories regarding the influence of the presence of an overt question in the discourse was tested. *Maximize Presupposition* does not predict an impact of a QUD being overtly expressed in the discourse. However, the assumption of *Obligatory Implicatures* is that the presence of a QUD influences exhaustification and thereby the insertion of the trigger.

As was mentioned above, there was no main effect of the presence of a question on interpretation or acceptability that could straightforwardly support the view of *Obligatory Implicatures*. However, there was an interesting interaction between the type of expression chosen and the presence of a question in interpretation. This interaction resulted from a contrast between sentences with no expression and sentences with "and" or "too". Sentences missing the trigger or "and" were read as a contradiction with the previous sentence more often when there was no question in the discourse (76% of the time) than in contexts where there was a question (68% of the time).

It is surprising from the viewpoint of *Obligatory Implicatures* that the presence of a question makes exhaustification less prominent and allows for more "mention-some" answers. Again, this might be explained with the set-up of the experiment. Nothing is known about the epistemic state of the speakers, whether they share the same knowledge or are equally equipped to answer the question fully. They might even have different sets of individuals in mind. That is, participants interpreted, for example that "John came" according to the knowledge of speaker A and "Mary came" according to the knowledge of speaker B. When assuming that speaker B accumulates knowledge with regard to the question, the discourse might very well be understood as speaker B believing both answers to be true in the end.

As a result, one should be cautious in concluding from these results that the presence of a question generally increases the availability of "mention-some" readings. Even though "mention-some" answers were available in the experiment (on average 30% of the time), and more so with the presence of an explicit question, this interpretation was not the default. Second, as was mentioned above, the percentage of contrastive readings changed with the type of question. Third, the same proportion of "mention-some" readings is not expected if both statements were made by one and the same speaker. This is because in this case, it can be taken for granted the speaker believes both answers to be true from the beginning. The non-even distribution of the two different inter-

pretations chosen by the participants speak in favor of an analysis that makes exhaustification of answers to the QUD the pragmatic default. An approach to exhaustification of QUDs should thus allow for some flexibility, as suggested by Beck and Rullmann (1999), in order to account for the fact that this default can be overridden by contextual factors. Providing an explicit question is one of these factors, as well as having different speakers.

## Conclusion and outlook

The off-line study just presented provides empirical support for the view that the inference arising from the missing trigger is an exhaustivity implicature. This implicature results from interpreting a proposition as the most informative answer to the present QUD. The study shows that having the QUD explicitly in the context influences the availability of exhaustive versus non-exhaustive readings.

Moreover, the type of question word used played a role in whether the two answers were considered contradictory or not in the context. The results suggest that exhaustification of a question is the pragmatic default. It can be overridden by contextual factors like explicitly stating the question. Another factor is having different speakers with possibly different knowledge states answer the question. *Maximize Presupposition* is not able to predict that the stability of a missing trigger inference is related to the presence of a QUD or the fact that different speakers are uttering the sentences. The influence can be explained by adopting the view that missing trigger inferences are exhaustivity implicatures. However, *Obligatory Implicatures* would also predict a correlation between acceptability of the sentence without the trigger and interpretation. This was not borne out. Leaving out the trigger in sentences that were understood as "mention-some" answers to the question was just as unacceptable as contradicting the previous utterance with the sentence without the trigger. Overriding the pragmatic default of exhaustifying an answer was still dispreferred.

Another finding of the study which supports the view of *Obligatory Implicatures* is that there is no difference in acceptability between the sentences with "und" and "auch". The conjunction has the same interpretative effect as presuppositional "auch", but on the level of assertion. It does not yield an implicature and thus makes sentences equally acceptable as sentences with

"too" in contexts where its presupposition is fulfilled. This is surprising from the viewpoint of *Maximize Presupposition*.

To fully confirm the predictions of *Obligatory Implicatures*, one has to identify the contextual factors which not only allow for "mention-some" readings but make them plausible and fully acceptable. Since there is almost no research on exhaustification of answers to the QUD, the next two studies will also focus on the question how and when the context promotes non-scalar exhaustivity implicatures. This line of research is important in its own and regards the ongoing debate on what the status of these inferences is (default, automatic, context-driven). It also provides further evidence for the treatment of types of answers to questions. Crucially, it is important to distinguish between the predictions of *Obligatory Implicatures* and *Maximize Presupposition* regarding the influence of discourse. The contextual factors for an exhaustive reading of an answer to a QUD should influence the insertion of the trigger according to *Obligatory Implicatures*, but not *Maximize Presupposition*.

### 3.2.2 (C)overt "only" and cancellation with the additive

One assumption of *Obligatory Implicatures* is that focus makes reference to at-issue content, more precisely the Question Under Discussion (c. Beaver and Clark 2008, Simons et al. 2011). The study reported in the previous section has shown that exhaustification seems to be the default interpretation of focus. However, saying that this covert operation is the default for evaluating focus or scalar alternatives is not revealing with regard to the question what exactly the contextual factors that trigger or promote the process of exhaustification are. Identifying these contextual factors is not only crucial for the debate whether *Obligatory Implicatures* or *Maximize Presupposition* makes the right empirical predictions for the insertion of presupposition triggers, but is an interesting theoretical issue on its own.

In the next section, I will discuss the main theoretical positions regarding conversational implicatures, especially when and where they arise. I will report previous experimental work on the contextual factors for the computation of implicatures and its time course. Then I will present an on-line study on the influence of contextual alternatives on the cancellation of exhaustivity with the additive particle "auch" ("too") in German.

## Idea and previous work

Most of the theoretical and experimental research on exhaustivity implicatures has focused on the question how obligatory and/or automatic exhaustification is in the domain of generalized conversational implicatures, especially the scalar implicatures of "some" and "or". These scalar items are assumed to be on a lexical scale (Horn 1984) with a stronger term ("all" and "and", respectively). The implicatures they yield are less dependent on the context than particularized scalar implicatures according to standard theories (Levinson 1983). The latter are of importance for the study that will be reported. However, the theoretical and experimental research in the domain of scalar implicatures is crucial for the predictions regarding particularized implicatures.

One can identify two main theoretical positions in the literature on how scalar implicatures arise. One of them sees exhaustification of the lexical scale as a grammatical mechanism (Chierchia 2004a, Spector 2008). Under this grammatical, or neo-Gricean, view to scalar implicatures the exhaustivity operator is present in the syntax and is activated automatically and locally to produce the scalar inference. The implicature is computed immediately as a default, irrespective of context. Only if the context makes clear that the implicature is dispreferred, will it be canceled after it arises. In the experimental literature, this theoretical position is usually referred to as the *default* view on scalar implicatures.

The other position, following the traditional Gricean picture, sees exhaustification as a pragmatic enrichment mechanism that is activated globally and under certain contextual conditions only (Geurts 2009). Scalar implicatures are neither considered to be computed as the default nor are they considered to be automatic. Applying a global pragmatic mechanism to compute the scalar inference is the preferred option according to this view. Local mechanisms only apply in a subset of special cases (Geurts 2009). This type of theories is usually summarized under the term *contextualist view* of scalar implicatures in the experimental literature.

There is a vast amount of experimental research on which of these two theories makes the right predictions for processing and acquisition (Bott and Noveck 2004, Breheny, Katsos, and Williams 2006, Huang and Snedeker 2009, Grodner et al. 2010, Huang and Snedeker 2011, Lewis 2013, Breheny, Ferguson, and Katsos 2013a, Breheny, Ferguson, and Katsos 2013b, Degen and Tanenhaus

2015). For the two theoretical positions just outlined the predictions for processing look roughly as follows: If implicatures are computed as a default and automatically, they should lead to immediate processing effects. If established by the context that the weaker meaning is intended, the implicature is subsequently canceled. The default view thus predicts the literal interpretation to be more complex than the pragmatically enriched one since it requires default computation and cancellation of the implicature.

If implicatures are calculated only under certain conditions, there should be no processing costs for implicature computation when it is clear from the context that the weaker meaning is the intended one. Accordingly, no subsequent processing costs for cancellation is expected. That is, under the contextualist view, the literal meaning should require less processing effort than the pragmatic meaning.

There is, so far, no definitive and satisfying answer with regard to the question what the right view is based on processing data. The findings point in different directions. Some studies found that scalar implicatures lead to processing costs compared to the literal meaning (Bott and Noveck 2004, Breheny, Katsos, and Williams 2006). Bott and Noveck (2004) used truth value judgment tasks for single sentences without providing additional context. They tested sentences like "Some elephants have trunks" with different instructions for the participants. Some participants were instructed and trained to consider the literal meaning of "some" ("some and possibly all") and other participants were instructed to consider the pragmatically enriched meaning "some and not all". They found that the pragmatic group was "exceptionally slow" (Bott and Noveck 2004, p.43) in reading the under-informative statement. They argue that these results speak against a default view. However, as they themselves note, the role of context remains unclear due to the nature of their items, which require world knowledge to make the inference more or less plausible. Breheny, Katsos, and Williams (2006) presented further evidence against a default and for a contextualist view. In a reading time experiment, they provided participants with scalar terms either with a context that favored the upper-bound (pragmatically enriched) reading or the lower-bound (literal) meaning. Their results show that participants only drew the implicature with contextual pressure. In a second experiment, where they provided participants with a neutral context, they found no evidence for the computation of an implicature. Recent studies focused more on the time course of the computation

of implicatures rather than the overall processing difficulties that arise with them.

Huang and Snedeker (2009) found that the scalar inference is not computed immediately but that its computation is delayed in contrast to assertive meaning. They tested, using eye-tracking and the visual world paradigm, whether participants disambiguated a sentence with "some" immediately by drawing the implicature. The results show that fixating the target which requires pragmatic enrichment is delayed for sentences with "some" compared to the sentences with "all". However, in a similar study Grodner et al. (2010) found that the implicature of "some" is computed immediately, upon hearing the scalar item.

Degen and Tanenhaus (2015) suggest that the difference lies in "the different sets of alternatives that participants in those experiments were led to believe were available to speakers" (Degen and Tanenhaus 2015, c. Breheny, Ferguson, and Katsos 2013a). They observe that Huang and Snedeker (2009) offered number terms as alternatives to the quantifiers ("point to the girl with two of the socks") whereas Grodner et al. (2010) did not, as they themselves note. Also, in the experiment of Huang and Snedeker the smaller set was always associated with the existential quantifier whereas the bigger set was always associated with the universal quantifier. Degen and Tanenhaus (2015) tested the hypothesis that those were the crucial factors for the different results Grodner et al and Huang & Snedeker found in their respective studies. In fact they found "that time course of scalar implicature is affected by the availability of context-specific alternatives that cannot be considered members of context-independent scales" They conclude "that the availability of alternatives affects the interpretation of utterances containing quantifiers and the speed with which they are processed" (Degen and Tanenhaus 2015, p.25). They argue that this speak against models of implicature processing that are not able to factor immediate influence of context on the interpretation of scalar terms, like the default model.

Breheny, Ferguson, and Katsos (2013b) found a similar result in an eye-tracking experiment using a "look-and-listen" paradigm. They found that upon hearing "some" participants fixated the right target (that required the implicature), i.e. the fruit such that the water which contained it was only partly poured into a bowl. They report that this reaction was as rapid as in the "all" condition. They argue that the results suggest that the implicature is

computed immediately and with no additional processing difficulty with this rich context that made the stronger alternative relevant. The findings also support a view that makes implicature computation dependent on context. However, the model must also be able to capture the fact that integration of context happens immediately upon experiencing the scalar term. The results from the literature seem to point to a contextualist view on implicatures. However, they do not necessarily speak for a globalist view on implicatures. Scalar implicatures seem to arise with contextual pressure but if contextual information is incorporated immediately in on-line processing then the inference can arise immediately and locally as well.

Lewis (2013) who focuses on data from acquisition claims that calculating implicatures is highly dependent on retrieving the right contextual information (Lewis 2013), which might be even more difficult for children. Children are better in calculating implicatures if the scalar alternative is made explicit in the context or if the question which of the scalar alternatives hold in the context is made prominent (Papafraou 2003).

The data together suggest that the presence of alternatives facilitates the process of exhaustification, at least in the case of scalar implicatures. There is notably less research on the question whether all conversational implicatures are influenced by the presence of alternatives (Breheny, Ferguson, and Katsos 2013b). The two positions regarding exhaustification outlined above extend to other quantity implicatures. One could imagine the insertion of the exhaustivity operator to be a grammatical and default operation, not only for scalar implicatures. However, one could also imagine that exhaustivity implicatures which are not the results of exhaustifying lexical (Horn-)scales (Horn 1984) are computed only with enough contextual input. When adopting the second position, the question that remains is what constitutes enough contextual pressure. Especially the role alternatives play would be expected to be different from a theoretical point of view for particularized versus scalar implicatures. Whereas the scalar alternatives should be predefined for lexical scalar items like "some" and "or" they are completely dependent on context, especially focus and the QUD in the case of other conversational implicatures (c. Breheny, Ferguson, and Katsos 2013b).

Results from Katsos (2009) suggest that for children under-informative sentences with lexical and context-dependent scales are perceived as equally severe violations, whereas for adults lower-bound readings with lexical scales are



perceived as a more severe violation of informativity than lower bound readings with context-dependent scales. Breheny, Ferguson, and Katsos (2013b) found that particularized conversational implicatures behave similarly to generalized conversational implicatures in processing for adults, however. Like in his experiment on scalar implicature the "look and listen" paradigm was used in combination with eye-tracking. The authors conclude that particularized scalar implicatures are rapid and automatic inferences with the right context, that is with the presence of alternatives. However, they point out that salient alternatives are only one factor for this incremental processing of scalar implicatures. The two other factors they mention are (i) the conversational purpose of the task and (ii) the epistemic state of the speaker. They controlled for both in the study. Since participants were asked to give a report, it was expected that they give a complete and accurate description of events. Moreover, participants shared an epistemic state because they saw the same video in the experiment.

The goal of the reading time study that I will report in this chapter was to test the influence of alternatives on the computation exhaustivity implicatures. More precisely, I wanted to test whether the presence of alternatives in the context might change the interpretation and processing of sentences due to the arising of an implicature. The results are relevant for the ongoing debate regarding how automatic quantity implicatures in general are. Moreover, they are important for the empirical distinction between *Obligatory Implicatures* and *Maximize Presupposition*.

The *Obligatory Implicatures* theory predicts that the insertion of the additive "too" prevents an exhaustivity implicature from arising. The insertion of the trigger is dependent on this implicature since it is the resulting contradiction with the context that makes it necessary. Accordingly, the prediction of *Obligatory Implicatures* is that the trigger should be obligatory only in contexts that promote exhaustivity implicatures. Opposed to that view, *Maximize Presupposition* predicts the trigger to be obligatory as soon as its presupposition is satisfied by the context. As a result, the relation between the insertion of the trigger and the arising of exhaustivity implicature is one crucial factor in empirically distinguishing between the two theories.

Based on the experimental data regarding scalar implicatures, the idea behind the experimental set-up was that mentioning explicit alternatives in the context might influence how likely it is that participants draw a quantity im-

plicature. A further reason to believe that there is a relation between giving an explicit domain for exhaustification and exhaustivity implicatures is the fact that the presence of alternatives should create a certain focus structure. It became clear from the first experiment reported in section 3.2.1. that participants prefer to put contrastive focus on discourse new material even when only reading a sentence. In addition to finding contexts where exhaustification is the preferred strategy, the purpose of the experiment was also to see the time course of drawing the inference. If alternatives pose enough contextual pressure to create exhaustivity implicatures, the processing cost of drawing this exhaustivity inference was expected to occur early in the sentence, as soon as the phrase carrying the focus is encountered.

The idea for the study is based on an experiment done by Drenhaus, Zimmermann, and Vasishth (2011). They, in an EEG experiment, tested the different behavior of sentences with *it*-clefts and with overt "only" with regard to exhaustivity. The idea behind the experiment was to show participants sentences with "only" or "it-clefts" and then present them a sentence that contradicted the exhaustivity part of the sentences explicitly by containing an additive. A sample item is given in (30).

- (30) a. Only Mary plays the piano. Peter plays the piano, too.  
 b. It is Mary that plays the piano. Peter plays the piano, too.

The authors found an N400<sup>6</sup> effect for the cancellation of exhaustivity in the case of overt "only". They found a P600<sup>7</sup> effect for the cancellation of exhaustivity in the case of clefts. They argue that this difference in effects is the result of the different status exhaustivity has in the two cases tested. The N400 is a sign for the truth-conditional effect exhaustification has in the

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<sup>6</sup>The N400 is an event-related brain potential (ERP) signaled by an EEG, it "is a broad negative deflection of the ERP that starts 200–300 ms after a word has been presented auditorily or visually and peaks after approximately 400 ms [...]. Although the N400 response is often associated with semantic anomaly, it can be elicited by most meaningful stimuli, including isolated words, pronounceable non-words (such as 'blicket'; also known as pseudowords), faces and pictures." (Lau, Phillips, and Poeppel 2008)

<sup>7</sup>The P600 is an event-related brain potential (ERP) signaled by an EEG, it "is a positive-going wave that onsets at about 500 ms after presentation of the anomalous word and persists for several hundred ms. P600 effects are routinely elicited by anomalies involving grammatical agreement, tense, case, and verb subcategorization. By contrast, the N400 component is sensitive to properties of words (such as lexicality and word frequency), a word's predictability, and the "semantic fit" between a word and its context" (Mehravari et al. 2015)

case of "only", the authors claim. They argue that the lack of an N400 in the case of clefts shows that exhaustivity in this case is just an inference and not part of the lexical meaning. The data also speak against theories treating exhaustivity as a presupposition of clefts, according to the authors.

### Design and material

The experimental design of the following study was inspired by the design used by Drenhaus, Zimmermann, and Vasishth (2011). The idea was to present sentences with overt "only" and contrast them with cases where there was no overt "only". The context was manipulated in a way that it either explicitly mentioned alternatives or not. The alternatives were always individuals of semantic type  $\langle e \rangle$ . "Only" always associated with the subject NP of the target sentence and thus appeared in the sentence initial position. A second target sentence contained the additive "also" and thereby either contradicted the assertion of the first target sentence when it occurred with overt "only" (like in the experiment by Drenhaus et al. 2011) or canceled the exhaustivity implicature of the first target sentence that was expected to arise with a covert exhaustivity operator. Whether this implicature was drawn was expected to be dependent on the presence of alternatives in the context. An example of a context sentence is given in (31-a.). The explicit alternatives are given in brackets. An example of the corresponding target is given in (31-b.).

- (31) a. Petra wants to order pizza for her birthday. She invites her neighbors [Jonas, Rafael and Lukas] to join her.  
'Petra will zu ihrem Geburtstag Pizza bestellen. Sie lädt ihre Nachbarn [Jonas, Rafael und Lukas] zum Pizzaessen ein.'
- b. [Only] Petra's neighbour Jonas is coming to her birthday. Her neighbors Rafael and Lukas are **also** coming and are bringing wine.  
'[Nur] Petras Nachbar Jonas kommt zum Pizzaessen. Ihre Nachbarn Rafael und Lukas kommen auch zum Pizzaessen und bringen Wein mit.'

The study had a 2x2 design. The first factor that was manipulated was whether explicit alternatives were given in the context or not (+/- ALT). The second independent factor was the presence of an overt "only" in the first target (+/-

ONLY). Participants first read the context as a whole and were then presented with the two target sentence word by word. A moving window technique was used for this word by word presentation of the target. That is, participants first saw a series of lines, each corresponding to a word in the two target sentence. They saw the first word by pressing a button. By pressing the button again, the first word disappeared and the second appeared. This procedure was repeated until they read both target sentences. By using this technique, reading times for the sentences are measured on-line. After reading the context and both targets, participants were asked to judge the coherency of the whole discourse on a 5 point scale, where 5 corresponded to the judgment that the discourse was completely coherent and 1 to the judgment that the discourse was not coherent. Thus, two measures were considered for the analysis. As a first dependent factor, the reading times for the targets were analysed. As a second dependent factor, the coherency judgments of the whole discourse were analysed.

### **Predictions**

For the reading times it was expected that effects for the computation of an exhaustivity implicature would occur in the -ONLY sentences when there were alternatives in the context. This effect should start to show up immediately when reading the alternative picked up by the first target. This expectation was based on the assumption that the presence of alternatives in the context require the alternative in the target to carry focus ("Jonas" in the example in (31)) and that this focus should force the insertion of an exhaustivity operator. Based on the previous evidence from experiments on scalar implicatures, it was moreover expected that there would be an effect of cancellation in the second target sentence in this condition (-ONLY,+ALT). The effect of an implicature and its subsequent cancellation was not expected in the -ALT condition. Since the alternatives are not explicitly mentioned in the context, no focus was assumed to be required on the alternative in the target that could trigger exhaustification.

For the sentences with overt "only", exhaustification is considered to be part of the truth conditions and therefore has to take place in both context conditions, with and without alternatives. The reading times for the +ONLY conditions were thus expected to not differ depending on the presence of alternatives.

Since exhaustivity is part of the assertion of the first target with "only", a contradiction arises with the second target sentence where exhaustivity is explicitly canceled by "also". The expectation was that the processing of this contradiction would not differ depending on whether alternatives were explicitly mentioned in the context or not.

As a result, an interaction was expected: whereas the reading time patterns of the -ONLY sentences should change depending on the presence of alternatives, the reading time patterns of the +ONLY sentences should not change with the presence of alternatives. An increase in reading times was expected for the -ONLY/+ALT condition (as opposed to the -ALT condition) on the noun ("Jonas" in (31)) and the following regions due to an implicature arising. Moreover, an increase in reading times was expected on "also" and the following regions in the second target in the -ONLY/+ALT condition but not in the -ONLY/-ALT condition. This increase in reading times was expected for both +ONLY irrespective of the presence of alternatives since a contradiction arises. The expectation for reading times on the two critical regions are depicted in figures 3.7 and 3.8 below.

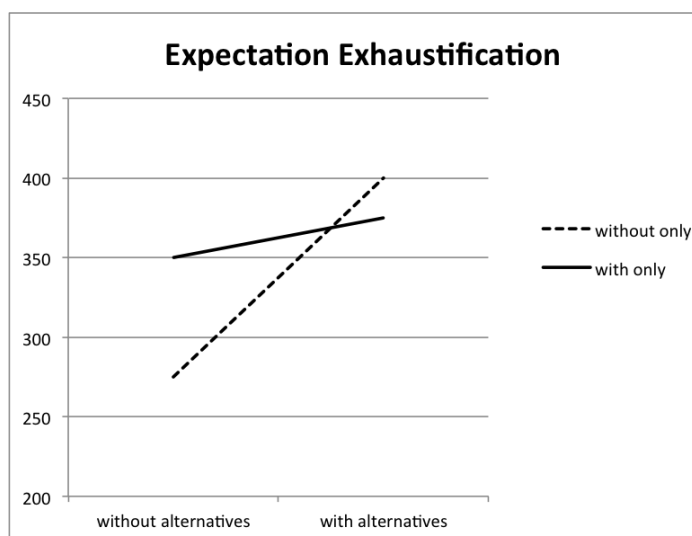


Figure 3.7: Expected reading time effects (ms) for exhaustification of the first sentence (critical region "Jonas" and following regions)

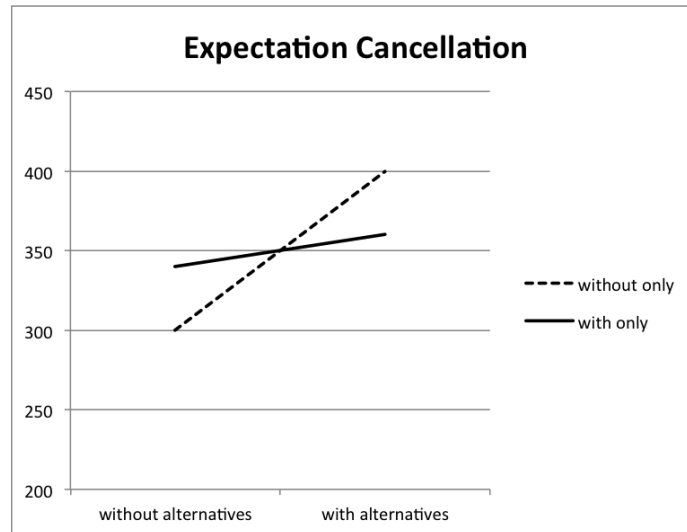


Figure 3.8: Expected reading time effects (ms) for cancellation in the second sentence (critical region "auch" and following regions)

For the coherency judgments, the expectation was that the discourse would be judged less coherent in the -ONLY/+ALT condition than in the -ONLY/-ALT condition. This expectation was, again, due to the assumption that with the presence of alternatives an exhaustivity implicature should arise without "only" that is then canceled in the second target sentence with "also". Without alternatives no implicature was expected to arise and thus no cancellation was expected in the second target. The sentences with overt "only" and "also" should behave alike again in the -ALT condition and the +ALT condition. A contradiction arises in both conditions that should lead to low coherency judgments. Once more an interaction was predicted that results from the assumption that +ONLY sentences do not differ depending on the presence of alternatives whereas the -ONLY sentences do. This expectation is depicted in 3.9.

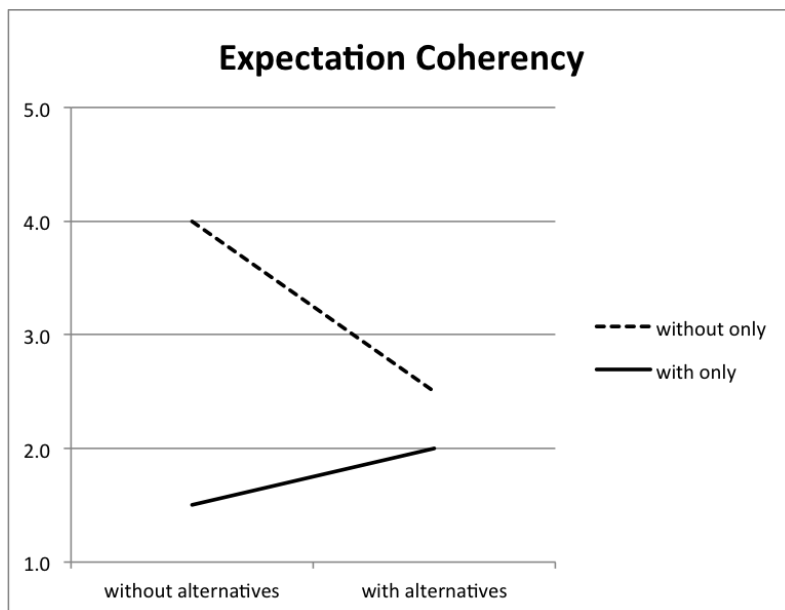


Figure 3.9: Expected coherency judgments for sentences with and without "only" in contexts with and without alternatives

## Results

Analyses were carried out using the R programming language (R Development Core Team) as linear mixed effect models (Baayen, Davidson, and Bates 2008), using the program *lmer* (Bates 2005). The fixed factors were ALTERNATIVES in the context (present/absent) and ONLY in the target (overt/not overt). Random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, the more complex one was chosen.

First I report the results for coherency. There was a significant main effect of the factor ONLY for coherency ( $p < .001$ ). The discourses where the first target sentence had no overt "only" were judged significantly more coherent than the discourses where the first target had an overt "only" ( $M=4.1$  versus  $M=2.1$ ). There was no significant interaction of conditions and no significant main effect of alternatives. There were no simple effects. Results are summarized in figure 3.10 below.

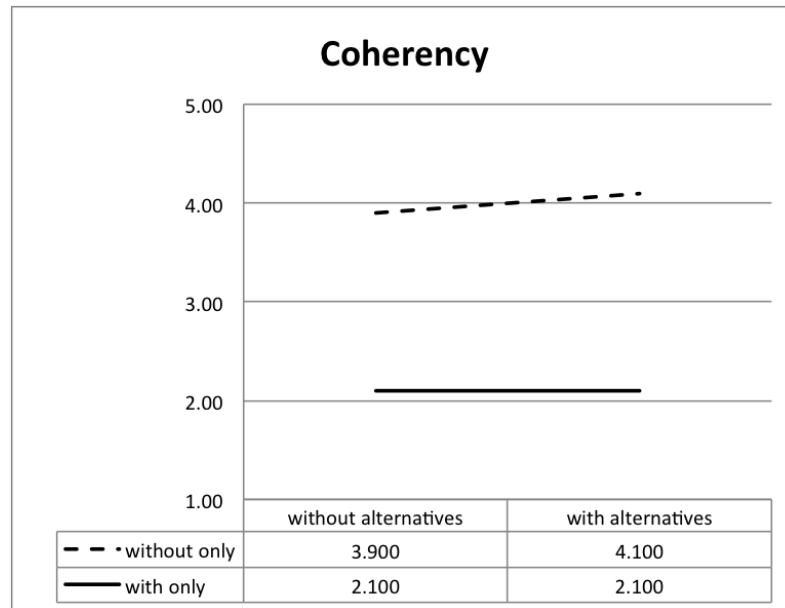


Figure 3.10: Mean coherency judgments for sentences with and without "only" in contexts with and without alternatives

Next, the reading times for the first critical region are reported. The first critical region looked at was the head noun of the subject NP in the first target sentence ("Jonas" in the examples in (31)).

A significant interaction was found between the presence of "only" and the presence of alternatives ( $p < .01$ ) in reading times on this region. There was, moreover, a significant simple effect for alternatives in the case of -ONLY ( $p < .01$ ). With alternatives the sentences without "only" were read faster, without alternatives they were read slower. There was also a marginally significant simple effect of alternatives in the case +ONLY. With alternatives the sentences with "only" were read slower ( $p < .07$ ). There were significant simple effects of ONLY for both context conditions, +/-ALT ( $p < .05$ ). There were no significant main effects of ONLY or ALTERNATIVES. Results are summarized in figure 3.11 below.



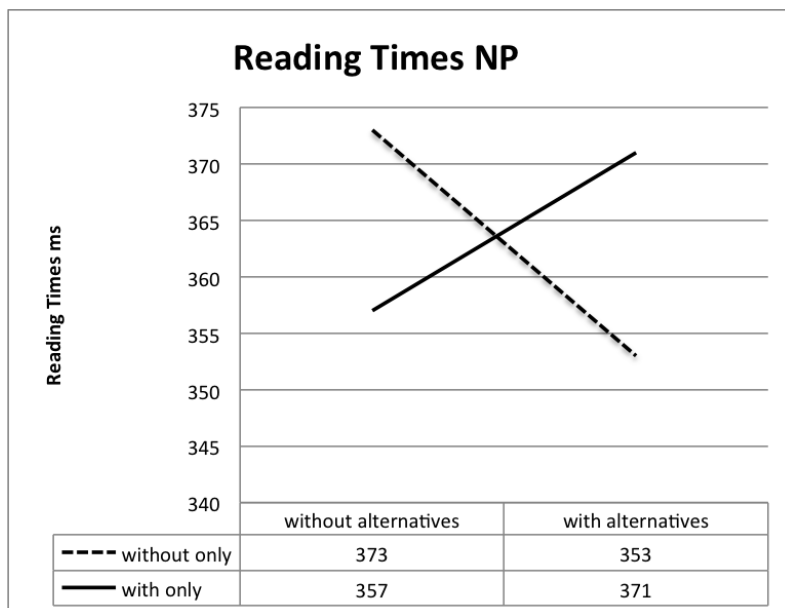


Figure 3.11: Untransformed mean reading times on the right boundary of the NP ("Jonas") with and without "only" in contexts with and without alternatives

Last, I report the results for the reading times for the second critical region looked at. This critical region was the one immediately following the additive "also" in the second target sentence ("zum" in the example in (31)). There was a marginally significant interaction between the presence of "only" and the presence of alternatives ( $p < .07$ ). There was no simple effect for alternatives in the case of -ONLY. There was a significant simple effect of alternatives in the case +ONLY: with alternatives the sentences were read slower ( $p < .05$ ). There was a significant simple effect of "only" for the cases without alternatives ( $p < .05$ ): without alternatives the sentences with "only" were read faster than the sentences without "only". No effect of ONLY was found in the case with alternatives. There were no significant main effect of ALTERNATIVES or ONLY. There were no other significant effect of reading times on any other region of the two target sentences. The results for the second critical region looked at are summarized in figure 3.12 below.

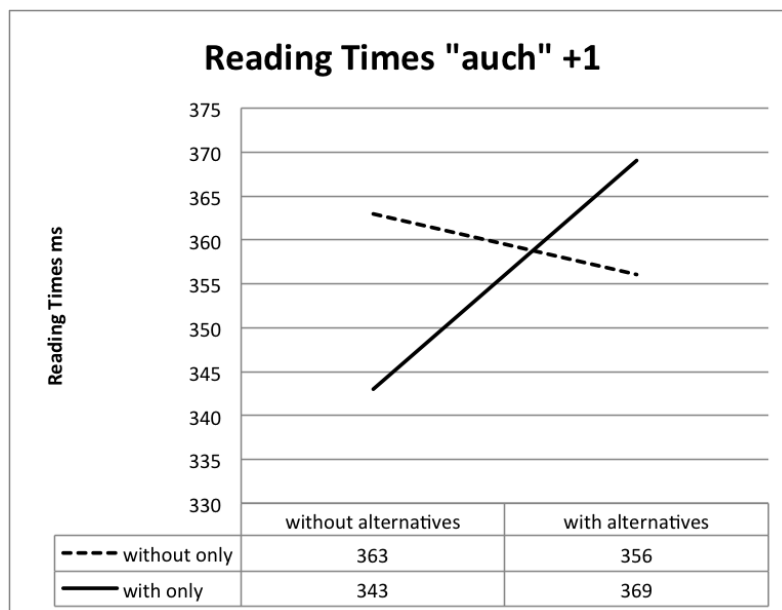


Figure 3.12: Untransformed mean reading times of the word after "also" (auch +1) with and without "only" in the first target and in contexts with and without alternatives

### Discussion

The expectations for the coherency judgments were not borne out. There was no interaction between the presence of "only" and the presence of alternatives. Most importantly, it was not the case that the presence of alternatives played a role in how coherent the discourse was perceived when there was no overt "only" in the first target. This was unexpected from the point of view of *Obligatory Implicatures* since exhaustification was assumed to be triggered with the presence of alternatives and the resulting focus. The discourses were overall judged coherent in the -ONLY condition, irrespective of whether alternatives were explicitly mentioned in the context. Unsurprisingly, there was a main effect of "only" for coherency. The discourses with overt "only" were judged less coherent than the discourses with covert "only". This was expected given that a contradiction arises between the second target with "also" and the first target with overt "only" in both context conditions (with and without alternatives).<sup>8</sup>

<sup>8</sup>A methodological remark is in order at this point. Jesse Snedeker (p.c.) points out that the results for reading times might have been confounded by the fact that people were asked to judge the acceptability of the sentence. Thus, people were aware that they had to judge coherency of the discourse which might have made them more alert when reading "only"

The expectations for reading times were not borne out either. The interaction found was in the opposite direction of what was expected. Whereas alternatives had an influence on the processing of the target sentences when there was an overt "only" they did not play a role in the processing of the sentences without "only". The fact that reading times were faster on the first critical region in the +ALT/-ONLY condition might simply be explained by semantic priming: the fact that the noun was previously mentioned in the context facilitated processing and sped up reading times. However, this effect of previous mentioning disappeared with the overt occurrence of "only". The presence of alternatives slowed down reading times on the first NP significantly when there was an overt "only" even though the noun was previously mentioned. The results suggest that overt exhaustification with "only" was thus affected by the presence of alternatives. Alternatives still played a role in the discourses with overt "only" for the reading times of the second target. Reading times were higher on the second critical region looked at when there was an overt "only" and alternatives in the discourse.

Overall the results suggest that no exhaustification was triggered without "only" when there were alternatives in the context. There is no evidence for an implicature arising in the +ALT/-ONLY condition, neither in coherency judgments nor reading times. This means that the presence of alternatives did not pose enough contextual pressure for an exhaustivity implicature to arise. One possibility to analyze the results is that participants read the first target sentence without the focal stress that was supposed to be triggered by the explicit alternatives. In fact, the mentioning of explicit alternatives in the discourse might have evoked a list reading of the target sentences. This is not implausible given that the alternative mentioned in the target is not discourse new in the +ALT condition. As I mentioned in the last chapter, list-readings and discourse-old information come with the same, falling (L\*-H), intonation contour. Participants might have read the sentences with this intonation contour and developed the expectation that something will be said about all of these alternatives at the end of the discourse. In this case, exhaustification would not be the preferred strategy.

A list-reading is impossible for scalar terms with just one relevant alternative.

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since only in those condition the sentences could end up fully contradictory. For further studies on should therefore look at the acceptability of these sentences and measure their reading times in separate experiments.

This is because in this case the alternatives necessarily stand in an entailment relation to each other. As soon as the stronger meaning is true, the weaker one is automatically true. There is no reason to mention the weaker alternative if the stronger alternative is true; giving a list will always sound redundant. The same is not true for an alternative set of (singular) individuals, see the contrast in (32).

- (32) a. #All students came, some students came...  
 b. Rafael came, Lucas came,...

That is, the influence of alternatives in the discourse on exhaustification might, after all, be different for generalized and particularized implicatures. This has to do with the fact that the alternatives in this domain are not ordered items, or at least their ordering is not fixed by the lexicon as in the case of scalar terms. Hearers or readers might impose an ordering on non-scalar alternatives based on the context. For example, they might order the individuals based on their relevance. Thus, the focus might be interpreted with "even" instead of "only". This kind of interpretation strategy does not yield a contradiction when more than one alternative is mentioned. It might very well be one applied by the participants in the experiment described above. That is, another possibility to explain the results is to assume that even though the first NP carried stress in the +ALT condition, the focus (or the QUD it evokes) is not evaluated by a covert exhaustivity operator but by a silent "even". This would speak against theories assuming that exhaustification is the default mechanism to evaluate focus in every context. The results speak against Magri (2009) who assumes a covert exhaustivity operator which "blindly" (irrespective of context) generates implicatures to be mandatorily present in every matrix clause. It is thus expected under his theory that there is also a mandatory cancellation with "also" in the second target. This should have been visible in the coherency judgments and reading times of the sentences. The lack of an effect can be explained by *Obligatory Implicatures*. Under the assumption that no implicature arose that led to a contradiction, there was no implicature to be canceled with "too". This fits the explanation given above and the observation that additives are not obligatory when providing a list of answers (Amsili and Beyssade 2009). Yet another possibility is to assume that the NP did not carry focus but was interpreted as a contrastive topic instead (Büring 2003). In this

case no exhaustification is expected to take place, either. As a consequence, a further prediction of *Obligatory Implicatures* would be that the trigger could have been left out in this context.

The large influence explicit alternatives had on the interpretation of sentences with "only" is an interesting result on its own. What is especially intriguing is where these effects in reading times showed up depending on the presence of alternatives. It is a standard assumption regarding the interpretation of "only" that it takes the set of alternatives and says that out of these alternatives only the alternative it combines with is true (Rooth 1992). Since "only" is a quantificational adverb, the set of alternatives are modeled as its domain of quantification introduced into the LF via the domain restriction variable C (Rooth 1992, von Stechow 1994). Moreover, "only" mandatorily associates with focus, i.e. what exactly the alternatives look like that "only" combines with is dependent on the focus structure of the sentence. Therefore it has been proposed that the domain of quantification for "only" is subject to the focus determined constraint in (33-c.) (Rooth 1992). The truth conditions for a sentence with "only" where it combines with the VP as in (33-a.) are given in (33-b.) (Rooth 1992).

- (33) a.  $[_S \text{ NP only VP}]$   
 b.  $\forall P[P \in C \ \& \ P(\llbracket \text{NP} \rrbracket)] \rightarrow P = \llbracket \text{VP} \rrbracket$   
 c. Focus-determined constraint:  $C \subset \llbracket \text{VP} \rrbracket^F$

The "only" used in the experiment above always associated with the subject NP, as in (34-a.). The truth conditions of these sentences are that all alternatives in the quantificational domain which have the property described by the VP must be identical to the NP, see (34-b.). This is identical to saying that all alternatives "only" associates with which are in C and are not in the NP do not have the property described by the VP, see (34-c.). As before, the quantifier domain restriction was subject to the constraint in (34-d.).

- (34) a.  $[_S \text{ only}_C \text{ NP VP}]$   
 b.  $\forall x[x \in C \ \& \ \text{VP}(x) \rightarrow x = \llbracket \text{NP} \rrbracket]$   
 c.  $\forall y[y \in C \ \& \ y \neq \llbracket \text{NP} \rrbracket \rightarrow \neg \llbracket \text{NP} \rrbracket(y)]$   
 d. Focus-determined constraint:  $C \subset \llbracket \text{NP} \rrbracket^F$

It is clear from (33-b.) and (34-b./c.) that the truth conditions of sentences like

(34-a.) and (33-a.) can only be known after the whole structure is interpreted and the content of the VP is known. It is only then when it is obvious which property the alternatives not mentioned in the sentences are excluded from having.

However, the reading time effects evoked by the presence of alternatives for the sentences with "only" occur well before the whole sentences is read and processed. It seems that readers reconstruct what the alternatives are they have to exclude as soon as they know the constituent "only" combines with, in this case the subject NP<sup>9</sup>. In other words it seems that people define what is in C as soon as they know the restrictor of "only". That is, for the sample item discussed above - a simplified version of which is repeated in (35) below - participants form the representation in (35-b.) at the point when they hear (35-a.). Since they have explicit alternatives at their disposal they already know at this point that (35-c.) holds, i.e. that Lukas and Rafael do not have the relevant property. Interpreting the sentences with "only" in contexts with explicit alternatives would thus be a case of predictive processing (Altmann and Mirkovic 2009, Farmer, Brown, and Tanenhaus 2013, Kutas, DeLong, and Smith 2011).

- (35) (C: Petra invited her neighbors Jonas, Lukas and Rafael.) Only her neighbor Jonas came.
- a. Only her neighbour Jonas
  - b.  $\{P:\forall y[y \in \{\text{Jonas, Lukas, Rafael}\} \& y \neq \text{Jonas} \rightarrow \neg(P)(y)]\}$
  - c.  $\neg(P)(\text{Lukas}) \& \neg(P)(\text{Rafael})$

Looking at the condition of the sentence without explicit alternatives, it becomes clearer why there might be a difference in processing between -ALT and +ALT condition for "only". There is contextual information on what C looks like by saying that the invitees are neighbors. This information can be incorporated in the representation of the sentence immediately as well, see the representation of (36-a.) in (36-b.). However, the alternatives are less explicit than in the case in (35). Without knowing what individuals are in the set of neighbors there are no specific alternatives to exclude, as was the case in

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<sup>9</sup>With Reis (2005) I assume that, syntactically, German "nur" can be adjoined to all kinds of maximal projections, including NPs, as long as it c-commands its focus. Together "nur" and the NP form a constituent of type  $\langle, \langle s, t \rangle, t \rangle$ . Semantically, the type is thus the same type as for quantified NPs, looking for a property as an argument.

(35-c.).

(36) (C: Petra invited her neighbors.) Only her neighbor Jonas came.

a. Only her neighbor Jonas.

b.  $\{P:\forall y[y\in \{x: x \text{ is a neighbor}\} \& y\neq \text{Jonas} \rightarrow \neg(P)(y)]\}$ 

This explanation also accounts for why there is another reading time effect for the presence of alternatives in the second sentence right after the additive "too". After having processed the first sentence readers assume that Lukas and Rafael did not come. That is, they have specific assumptions about these individuals. Reading the names again in the second sentence reactivates these assumptions and tells the reader that s/he gets additional information. However, by also knowing the "too" has a presupposition that has to be fulfilled the contradiction can be anticipated right away. In the case without alternatives readers first have to update their knowledge with the information that Lukas and Rafael are in C as well. That is, only at this point they know that they are relevant alternatives that they should exclude from having property P. The process of explicit exclusion thus happens later than in the case with explicit alternatives in the context. The assumption is that readers becoming aware of the obvious contradiction is delayed as well. This is why they do not perceive the contradiction as as strong.

### Conclusion and outlook

It seems that the focus alternatives relevant for interpreting sentences with "only" are activated as soon as they are discovered. They are incorporated into the semantic representation right away and thus an example of incremental processing. Assuming that covert "only" (if mandatorily activated) behaves just like overt "only" in processing, the same should be true for sentences where a covert exhaustivity operator is mandatorily inserted. The results from overt "only" suggest that exhaustification of non-ordered sets of items should thus happen as rapidly as the exhaustification of ordered alternatives of scalar items. That is, based on the observation about overt "only", the hypothesis is that non-scalar conversational implicatures can be observed in on-line processing in the same way as their scalar counterparts. However, the alternatives must be prominent and the contextual pressure to insert a covert operator high enough. The results suggest that just mentioning the alternatives does not pose enough

contextual pressure to justify this insertion. In fact, mentioning alternatives could allow for a so called "list-reading" of the following sentences that comes with a specific intonation and disallows exhaustification. The same is not allowed for scalar alternatives. The contextual factors for mandatory exhaustification seem to be different for the two types of implicatures. However, the data suggest that the time course of their computation, when they arise, might be identical.

The findings align with the results of the first study. Contexts where an alternative set is made prominent, by either providing a question or providing the alternatives explicitly, seem to open the possibility for "mention-some"/"list" readings.

### 3.2.3 Contrastive focus and "too"

#### Idea and predictions

The idea behind the study reported in this section was to create enough contextual pressure to make the insertion of an exhaustivity operator obligatory. The goal was to identify the contextual clues that force this obligatory insertion. The study reported in section 3.2.1 suggested that the presence of an explicit question had an influence on the arising of exhaustivity implicatures. The second study showed that mentioning of explicit alternatives in the discourse is not a strong enough factor to force exhaustification of the QUD. The study reported in this section investigated the influence of contrast on exhaustivity implicatures. The assumption was that contrastive focus would force exhaustification. Pressure to insert the trigger should be high. Leaving it out should lead to a significant decrease in acceptability according to *Obligatory Implicatures. Maximize Presupposition* does not predict contrastive focus to have an influence on the insertion of the trigger.

#### Material and method

Two context manipulations were used in the present study. First, the clause where an exhaustivity implicature was supposed to occur was embedded in a list of related clauses. Together the clauses described a sequence of events. The purpose of that was to create a contrast between the activity described in the relevant clause and other actions described in the discourse. The contrastive



focus was supposed to make exhaustification more prominent and disallow for a non-exhaustive reading (Gennaro Chierchia, p.c.). As a second manipulation, the last of the clauses in the list was made such that it concluded the discourse in a way that made a continuation unlikely. A sample context is given in (37) below.

- (37) Rita ist ins Büro gekommen, hat Kaffee gekocht, **Stefan und Sabine begrüßt** und sich an ihren Schreibtisch gesetzt.  
 'Rita came to work, made coffee, greeted Stefan and Sabine and sat down at her desk.'

The assumption was that in the context above "greeting Stefan and Sabine" is considered the only relevant greeting event. This is because, first, the contrast between the activities listed forces the reader to put focal stress on the VP "Stefan und Sabine begrüßt". Second, the temporal order evoked by this kind of listing makes it less likely that there were other relevant events. As a consequence, exhaustification is triggered with regard to the question "Who did Rita greet" with the result that "Stefan" and "Sabine" are considered the only people she greeted, see derivation below:

- (38)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{Who did Rita greet} \rrbracket)(\llbracket \text{Rita greet Stefan and Sabine} \rrbracket)(w)$   
 $\Leftrightarrow [\text{Rita greeted Stefan+Sabine}](w) \ \& \ \forall q[q \in [\lambda p.\exists x.p = \lambda w.\text{person}(x)(w)$   
 $\ \& \ \text{Rita greeted } x \text{ in } w] \ \& \ \lambda w.\text{Rita greeted Stefan+Sabine} \not\Rightarrow q \rightarrow \neg q(w)]$   
 'Rita greeted only Stefan and Sabine'

To see whether this prediction was borne out, a continuation was created. It appeared in four different conditions. To keep the idea of the previous experiment, the continuation either appeared with or without "too". It was expected that the sentence without "too" will result in infelicity due to a contradiction with the exhaustivity implicature that is evoked in the context (condition A, without "too"). The sentence with "too" was supposed to cancel the implicature of the previous sentence (condition B, with "too"). This cancellation was supposed to have an effect on the coherency of the whole discourse. Two control conditions were created which neither contradicted the implicature of the previous sentence nor did they cancel it. The first control condition contained negation (condition C, with negation). The second control condition was added that repeated one of the alternatives in the context and was thus

entailed (condition D, entailed). The target item in the four conditions is given in (39) below.

- (39) a. Sie hat Lisa begrüßt.  
           She greeted Lisa. (condition A, no "too")
- b. Sie hat too Lisa begrüßt.  
           She greeted Lisa, too. (condition B, "too")
- c. Sie hat Lisa nicht begrüßt.  
           She did not greet Lisa. (condition C, "neg")
- d. Sie hat Stefan begrüßt.  
           She greeted Stefan. (condition D, "entailed")

Six items were created per condition which made for a total of 24 experimental items. 48 fillers were created and used in the experiment. 24 German native speakers participated in the experiment. The study was conducted online by following a link and was programmed using the free software OnExp (*OnExp 1.2 User Manual*). Participants read the context first and then were presented with the target sentence in one of the four conditions. They were asked to judge how acceptable they found the last sentence within the given context on a 7-point scale. 7 indicated that the sentence was completely acceptable. Participants were instructed that "acceptable" meant that the sentence made sense in the given context and could be uttered by a native speaker like that.

### Predictions

The predictions of both *Maximize Presupposition* and *Obligatory Implicatures* are identical, once more, regarding the sentence without "too" compared to the sentence with "too" (condition A versus B). Both predict the A condition to be significantly worse than the B condition in this context. This is because, as opposed to the B condition, the A condition has a missing trigger inference which is contradictory to the context.

Since A has a missing trigger inference, it should also be significantly less acceptable than the control condition in C according to the *Obligatory Implicature* theory. This is because the implicature of the negated sentence in C is not contradictory to the context. According to *Maximize Presupposition*, the trigger should be obligatory under negation. As a consequence, the sentence in (39-c.) should have the same missing trigger inference which results in oddness

| Contrast   | Maximize Presupposition | Obligatory Implicatures |
|------------|-------------------------|-------------------------|
| A versus B | A<B                     | A<B                     |
| A versus C | A=C                     | A<C                     |
| A versus D | A<D                     | A<D                     |
| B versus C | B>C                     | B<C                     |

Table 3.2: Predictions of *Maximize Presupposition* and *Obligatory Implicatures* for obligatory additives in contrastive contexts

as A.

*Maximize Presupposition* and *Obligatory Implicatures* both predict condition A to be worse than the control condition in D. Since this option is entailed by the discourse and not presupposed, *Maximize Presupposition* does not predict the trigger to be obligatory in D. No exhaustivity implicature is supposed to occur in this sentence since it is already asserted that D is not the only true alternative.

There is another important prediction of *Obligatory Implicatures* regarding the sentence with "too" (condition B) compared to the control with negation (condition C). Since the context tried to force exhaustification, a cancellation effect should be visible in the acceptability judgment for the sentence in B. B is thus predicted to be worse than C according to *Obligatory Implicatures*. The opposite is predicted by *Maximize Presupposition*. Sentences in the C condition should have a missing trigger inference which projects through negation. The sentence in B lacks this inference since it has the trigger in it and should be significantly more acceptable than C as a consequence. Thus predictions for the contrasts are summarized in 3.2 (where ">" means "more acceptable").

## Results

Analyses were carried out using the R programming language (R Development Core Team) as linear mixed effect models (Baayen, Davidson, and Bates 2008), using the program *lmer* (Bates 2005). The fixed factor was the expression used in the target (condition A-D). Random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, the more complex one was chosen.

A contrast was found between condition A (without the trigger) and B (with the trigger). A was significantly less acceptable than B (M=2,1 versus M=4,1,

$p < .001$ ).

Sentences in condition C with negation were judged significantly better than A sentences without negation even though both were lacking the trigger ( $M=5,7$  versus  $M=2,1$ ,  $p < .001$ ). A was also judged significantly worse than the other control condition in D ( $M=5,4$ ).

Another contrast was found between condition B and C. B was significantly less acceptable than C ( $M=4,1$  versus  $M=5,7$ ,  $p < .001$ ). The results are summarized in the diagram in table 3.13.

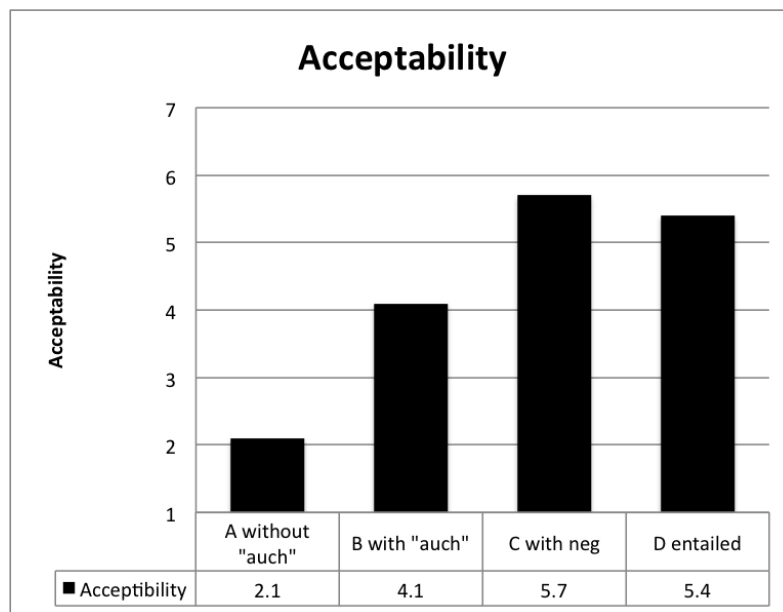


Figure 3.13: Mean acceptability of sentences with and without "too", with negation and with entailed alternative (condition A-D)

## Discussion

The results show, once more, that in fact the two theories presented make the right predictions regarding the obligatory insertion of "too" when its pre-supposition is fulfilled in the context. Leaving out the trigger will lead to a significant decrease in acceptability. Comparing the absolute numbers of the acceptability judgments for sentences missing the trigger of the first study, reported in section 3.2.1., and the present study ( $M=3,62$  on a 5-point scale versus  $M=2,1$  on a 7-point scale), it becomes obvious that people chose the lower half of the scale in the present study but they still used the upper half of the scale in the first study. This suggests that discourse factors do play a role

in how strong the oddness of the sentence without the trigger is perceived. The acceptability for these sentences was extremely low in the present study where exhaustification was made prominent in the context and the discourse was not presented as a dialog. It thus should be considered a crucial factor for exhaustification whether sentences are uttered by one or different speakers. It is more commonly accepted that partner in a conversation contradict each other than when a discourse is contradictory in itself. The decrease in acceptability observed in the first study might rather be due to the fact that contradicting implicitly, with an inference, is a pragmatically dispreferred strategy.

The sentences without the trigger and with negation (condition C) were not judged as unacceptable as the sentences without the trigger and without negation (condition A). This suggests that the missing trigger inference does not project and that "too" is not obligatory under negation. The predictions of *Obligatory Implicatures* regarding the contrast between condition A and C were completely borne out. Since the sentence in the C condition should not contradict the exhaustivity implicature arising in the context, the sentence was predicted to be significantly more acceptable than in the A condition that forced the contradiction.

The most important result regarding the goal of this study is the contrast between condition B with "too" and condition C with negation. Since this time exhaustification was already forced in the context, it was expected under *Obligatory Implicatures* that the sentence with "too" will cancel this exhaustivity implicature. The results suggest that this is, in fact, the case. The sentences with "too" were judged less acceptable than the sentences in control conditions C or D. That is, as opposed to the study before where people accepted the continuation with "too" without problems, making an addition with "too" in this context was dispreferred. This speaks in favour of the analysis presented above that alternatives did not evoke an exhaustivity implicature which needed to be canceled. In the present study, however, contextual pressure to draw the inference was high enough. The results show that people, in fact, computed the implicature and then had to cancel it. This led to significantly decreased coherency of the discourse as a whole.

Overall the results suggest that the way in which the context was set up in this experiment forced an exhaustivity implicature in the third clause. This explains why sentences canceling or contradicting this implicature (condition A and B) were judged significantly less acceptable than sentences which were

not contradicting it (condition C and D). Creating a contrast with other activities like in the present experiment and wrapping up the discourse with a concluding sentence are crucial factors for exhaustification.

### Summary and outlook

The results of the last experiment show that exhaustification is the preferred strategy in a context that requires contrastive focus and contains a sentence creating a wrap-up effect. Contrastive focus is thus taken to be evaluated with a covert exhaustivity operator as a default. This focus seems to behave differently from the one arising with mentioning one alternative out of a set of alternatives, as was the case for the study presented in section 3.2.2.. Focus was not evaluated by an exhaustivity operator. No cancellation effect arose with the presence of "too" accordingly. In the present study the strength of the exhaustivity implicature was high enough to decrease the acceptability of the discourse as a whole when there was a cancellation with "too". Measuring cancellation effects off-line is thus a useful method for identifying the context that require the activation of an exhaustivity operator. The studies together provide important insights into the contextual factors for exhaustification.

To further test the predictions of *Obligatory Implicatures*, the obligatoriness of "too" in contexts which require exhaustification and which do not require exhaustification will need to be looked at. For a follow-up reading time experiment, sentences with and without the trigger should be presented in these different types of contexts. Based on the findings of the studies conducted, the context factors that ought to be manipulated are, first, pre-defining the domain of exhaustification by providing explicit alternatives or not and, second, creating a wrap-up effect by listing different activities that stand in contrast to the focused alternative in the discourse.

When alternatives are provided and activities do not appear in a list, exhaustification should be the dispreferred strategy (like in the context in (40-a.)). When the alternatives are not previously mentioned and activities are given in a list (like in (40-b.)), exhaustification should be the preferred strategy.

- (40) a. Sonja kommt ins Büro, scherzt zur Begrüßung mit ihren Kollegen Tom und **Jana**. Sie gibt ihrer Kollegin **Jana** eine Einladung zu ihrer Hochzeit.  
 Sonja walks into the office, is joking with her colleagues Tom and

- Jana.** She is giving **Jana** an invitation to her wedding.
- b. Sie gibt [auch] Tom eine Einladung zu ihrer Hochzeit. (-exh)  
She is giving Tom an invitation to her wedding, [too].
- (41) a. Sonja kommt ins Büro, scherzt zur Begrüßung mit ihren Kollegen Tom und **Nadine** und gibt ihrer Kollegin **Jana** eine Einladung zu ihrer Hochzeit.  
Sonja walks into the office, is joking with her colleagues Tom and **Nadine** and is giving her colleague **Jana** an invitation to her wedding.
- b. Sie gibt [auch] Tom eine Einladung zu ihrer Hochzeit. (+exh)  
She gives Tom an invitation to her wedding, [too].

The sentences in (40-a.) and (41-a.) satisfy the presupposition of the test sentences with "too" in (40-b.) and (41-b.), respectively. Leaving out the trigger should thus yield a missing trigger inference according to *Maximize Presupposition*. It should be degraded and lead to processing costs in both type of contexts presented.

According to *Obligatory Implicatures* the sentence without the trigger should only result in oddness if it has an exhaustivity implicature which is contradicting the context. No such implicature is supposed to arise with the context in (41-a.). Both alternatives introduced by the first sentence ("Tom" and "Jana") are picked up by the following sentences. They should thus receive no contrastive focus. No obligatory insertion of the exhaustivity operator is required for either of the alternatives. Consequently, no contradiction is expected to arise. For (41-b.), it is expected that the contrast evoked by "Jana" with "Nadine" in the context forces exhaustification. Adding another alternative with the target sentence will yield a contradiction with this implicature. Leaving out the trigger should be less acceptable in (41-b.) than in (41-a.) as a consequence. Parallely, for the reading times, it is expected under *Obligatory Implicatures* that processing costs for the exhaustivity implicature show up for the sentence without the trigger in contexts like (41-b.), but not (41-a.). Based on the findings for overt "only", the processing costs for exhaustification should arise upon reading the focused item in the critical sentence, "Jana" in the case above.

For the sentences with "too" a cancellation effect should occur in contexts like (41-b.) but not (41-a.) according to *Obligatory Implicatures*. This effect is ex-

pected to be mirrored in the reading times and coherency judgments. Reading times should increase on the trigger and following regions due to the anticipation of a fulfilled presupposition. This expectation is based on the effect observed with the overt contradiction of the sentence with "too" and overt "only" in the second study presented in this chapter.

In sum, whereas *Obligatory Implicatures* expects an interaction between the context and insertion of the trigger, no such interaction is expected under *Maximize Presupposition*.

### 3.3 Summary and discussion

There are two main empirical findings in this chapter. First, the empirical data presented in this chapter speak in favor of an analysis of obligatory "too" which is based on obligatory exhaustivity implicatures. Second, the data on the contextual factors for exhaustivity implicatures suggest that not the presence of alternatives, either explicitly mentioned or introduced implicitly via questions, are the relevant factor for making exhaustification mandatory but contrast.

The findings show that the presupposition trigger "too" is in fact obligatory in contexts where its presupposition is fulfilled. Leaving out the trigger leads to an inference that is contradictory to the context. Sentence without the trigger are furthermore less acceptable than sentences with the trigger. This is predicted by both *Maximize Presupposition* and *Obligatory Implicatures*.

The results of a study by Oesterle (2015) reported in section 3.1. show that "too" is not obligatory under negation. This is predicted by *Obligatory Implicatures*, but not *Maximize Presupposition*. The findings suggest that the additive is even dispreferred in environments where the exhaustivity operator is impossible. Both the presuppositional additive and the exhaustivity operator cannot associate with focus across negation. For the overt additive, it leads to an intervention effect. For the covert exhaustivity operator it leads to an implicature which the sentence cannot have.

The results of the three studies reported in section 3.2. together suggest that inferences arising from the missing trigger are in fact implicatures. They are sensitive to the presence of alternatives and an explicit QUD. They interact with the insertion of "too". Leaving out the trigger in contexts where the pressure to exhaustify was higher was clearly less preferred than leaving out



the trigger in contexts where exhaustification was not forced. Moreover, cancellation with the trigger was perceived as less acceptable in context where exhaustification was the preferred strategy.

The results of the first study reported in section 3.2.1. show that exhaustification was the preferred strategy for the sentences without the trigger. However, with the presence of an explicit QUD, the percentage of exhaustive interpretations went down. Most likely, this is connected to the fact that the sentences which were answers to the question in the context were uttered by different speakers. This is supported by the fact that the acceptability of sentences not having the trigger was relatively high compared to the other studies. The fact that the lack of the trigger was perceived and judged differently depending on the discourse is not predicted by *Maximize Presupposition*. It is, however, expected under *Obligatory Implicatures*.

The results of the study presented in section 3.2.2. show that the presence of contextual alternatives does not pose enough pressure for exhaustification. No reading time effects for exhaustification could be observed. This is in line with the observation that the 'cancellation' with "too" was not affecting the coherency judgments.

It could be seen that overt exhaustification with "only" is sensitive to these alternatives and does happen rapidly, upon experiencing focus. For particularized conversational implicatures, it seems that there is another option for treating alternatives other than exhaustification, which is assuming that a list is provided (possibly ordering alternatives by salience or relevance). This option is not available for scalar implicatures. That is, whereas the time course of their processing might be the same, the contextual factors for computing generalized conversational implicatures are different from the factors for computing scalar implicatures. The findings support contextualist views of conversational implicatures. The inference does not automatically occur in the cases discussed. However, they can still be considered the default or even mandatory under certain circumstances, overt contrast being one of them.

The results of the third study reported in section 3.2.3. suggest that contrastive focus is one key factor in creating a mandatory implicature. Another factor is including a sentence which is marking closure of the discourse. The sentence without the trigger was unacceptable in contexts with contrastive focus and a wrap-up sentence. The sentence with the trigger was less acceptable than a sentence containing negation. This is surprising from the point

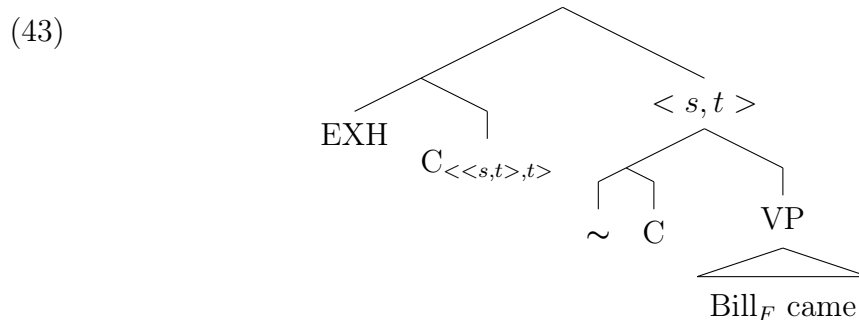
of view of *Maximize Presupposition*. It is expected under *Obligatory Implicatures*. Whereas the sentence with "too" satisfied *Maximize Presupposition*, it also had to cancel an implicature. This cancellation decreased the acceptability of the discourse as a whole. Since no implicature had to be canceled with "too" in the study reported in 3.2.2. no decrease in acceptability could be measured. This difference of acceptability cannot be explained by *Maximize Presupposition*. It furthermore fails to explain why the sentence with negation was not perceived as odd due to a missing trigger inference.

In sum, the results thus support the analysis of *Obligatory Implicatures* for the obligatory insertion of the additive.

Taken together, the data suggest the following picture for the circumstances under which exhaustivity implicatures arise in simple affirmative sentences. A sentence like in (41-b.) is obligatorily exhaustified when "Bill" is understood as contrastive to "John".

- (42) Who came to the party?  
 a. John came.  
 b. Bill came.

The LF yielding this interpretation is given in (43).



In order to explain under which circumstances this LF is chosen for the interpretation of (42-b.) one has to go through the key properties of a focus semantics according to Rooth (1996) again. The following three assumptions are important for the interpretation of focus:

1. On the level of proposition focus introduces a free variable  $C$  which is restricted by the following constraint:  $C \subset \llbracket VP \rrbracket^F$

2. The semantic value of every phrase  $\beta$  is a discourse object which can function as an antecedent for C
3. If  $\llbracket\beta\rrbracket^O \in \llbracket\alpha\rrbracket^F$  holds, then  $\beta$  can function as an antecedent for the variable C which is introduced by focus on the level of phrase  $\alpha$

Focus interpretation is conceptually distinct from assigning a value to the free variable. Both questions and contrastive phrases are appropriate antecedents for assigning C a value (Rooth 1996). The constraints in (44) and (45) have to hold in order for contrastive phrases or questions to be antecedents for focus.

- (44) **Contrasting phrases.** Construe a phrase  $\alpha$  as contrasting with a phrase  $\beta$ , if  $\llbracket\beta\rrbracket^O \in \llbracket\alpha\rrbracket^F$ .
- (45) **Question-Answer-Congruence.**  $\llbracket Q \rrbracket^O \subset \llbracket \alpha \rrbracket^F$

Given these premises, the assumption is that the sentence in (46-b.) is ambiguous. There are two different intonation contours related with two different foci and interpretations.

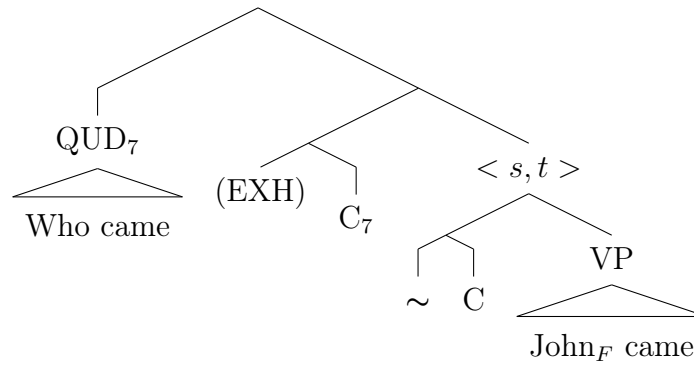
- (46) Who came to the party?
- a. John came.
  - b. Bill<sub>F</sub> came.

The first option is that the question is the antecedent for focus. The free variable introduced by focus receives as the value the QUD, see (47-c.). The QUD has to fulfill question-answer-congruence. The corresponding intonation is in accordance with simple information focus.

- (47) **Option A**
- a. Who came?
  - b. Bill<sub>F</sub> came.
  - c.  $g(7) = \text{QUD} = \lambda p. \exists x [p = \lambda w. \text{person}(w)(x) \ \& \ x \text{ came to the party in } w]$

Exhaustifying is *optional*, see the LF in (49). The interpretation of (48) is given in (49-a.). The optional implicature of the sentence is given in (49-b).

(48)



(49) [[ Bill came to the party ]]

- a.  $\lambda w.$  Bill came to the party in  $w$
- b.  $\forall p [p \in [\lambda q. \exists x. q = \lambda w. \text{person}(x)(w) \ \& \ \text{came-to-the-party}(x)(w)]]$   
 $\& \lambda w. \text{Bill came to the party} \not\Rightarrow p \rightarrow \neg p(w)]$

With this reading there is not necessarily a contradiction with a context where it is established that someone else besides Bill came since exhaustification is not mandatory.

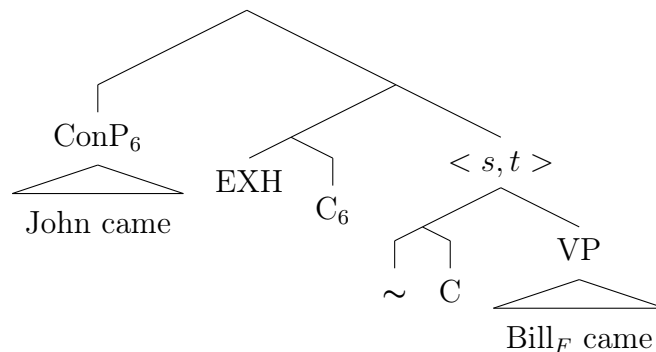
The second option is that "Bill" in (50-b.) is carrying contrastive focus. This makes the contrastive phrase<sup>10</sup> "John came" the appropriate antecedent for the free variable C, see (50-c.).

(50) **Option B**

- a. John came.
- b. Bill<sub>CF</sub> came.
- c.  $g(6) = \lambda p. p = \lambda w. \text{John came to the party in } w.$

In this case, exhaustification is assumed to be *obligatory*. The relevant LF and its interpretation are given in (51) and (52).

(51)



<sup>10</sup>Abbreviated as ConP in the tree below

- (52) EXH(C)([Bill came to the party])  $\Leftrightarrow$  [Bill came to the party]<sub>(w)</sub>  
 &  $\forall p$  [ $p \in [\lambda q.q = \lambda w. \text{John came to the party in } w] \rightarrow \neg p(w)$ ]

With this second reading, there is necessarily a contradiction with the context. Like for other cases of variable assignment, the closeness of the variable to the antecedent plays a role. Taking the immediately preceding sentences as a reference is preferred. This is why the sentence is preferably read as contrastive (exhaustively) if a contrastive phrase is the closest antecedent like in (42). Which focus structure is invoked can only be manipulated by using auditory stimuli. The first study presented in section 3.2.1. suggests that people prefer information focus over contrastive focus.

It seems that in addition to contrastive focus, the notion of contrastive topics is relevant for exhaustification. For the examples used in the first study there was only one possibility to put focal stress (since there was only one discourse new entity in the relevant sentence). For the more complex examples chosen for the last study presented more than item could receive focal stress since whole phrases were contrasted. A contrastive topic-focus contour was possible (Constant 2014), like in the example in (53).

- (53) Manuel ist nach Hause gekommen, hat eine Banane<sub>F</sub> gegessen<sub>CT</sub>, einen Tee<sub>F</sub> getrunken<sub>CT</sub> und sich vor den Fernseher gesetzt.  
 'Manuel came home, ate a banana, drank a cup of tea, and sat down in front of the TV.'

It has been observed that in the presence of a contrastive topic focus is exhausted *obligatorily* (Krifka 1999, Saeboe 2004, Constant 2014). If something is interpreted as a contrastive topic, a set of questions is generated in addition to the of alternatives generated by focus, see the example in (54) (Büring 2015) and its alternative sets in (54-b.) and (54-a.).

- (54) SHE<sub>CT</sub> wants to kick ME<sub>F</sub> out
- a. F-Alternatives: the set of proposition "she wants to kick x out", for some individual  $x = \{\text{She wants to kick me out, she wants to kick her mother out,....}\}$
  - b. CT-Alternatives: the set of question meanings "Who does y want to kick out?", for some individual  $y = \{\text{Who does Peter want to kick out, Who does Lisa want to kick out...}\}$

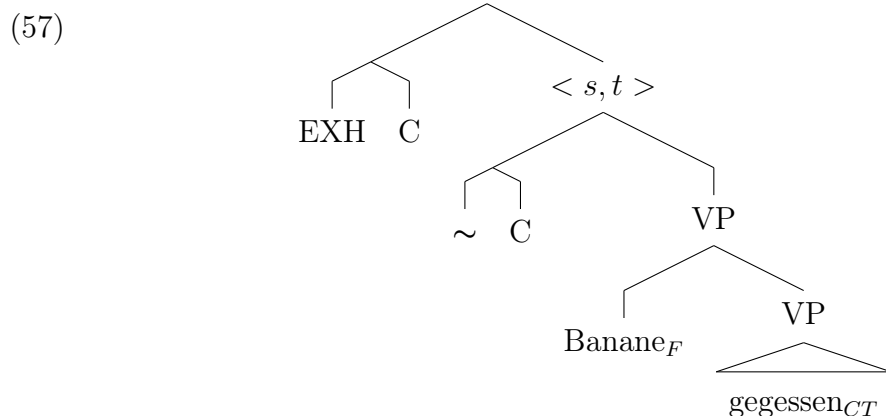
Two inferences are yielded by a sentence with this focus contour. The sentence is interpreted exhaustively with respect to the F-alternatives ("she wants to kick only me out"). In addition, there must be an open question in the CT alternatives which has not been answered yet and the answer to which is distinct from "she wants to kick me out". This first inference is called "Distinctiveness" by Krifka and is repeated in (55).

- (55) Distinctiveness: If [... T<sub>F</sub> .... C<sub>F</sub>...] is a contrastive answer to a question Q, then there is no alternative T' of T such that the speaker is willing to assert [...T'...C...] (Krifka 1999)

What (55) states is identical to saying that the sentence is interpreted exhaustively with respect to its focus alternatives. The second inference, or CT interpretation rule (Büring 2015), is characterized in (56). The question must still be relevant ("at-issue"), see (56-a.), the set of answers it denotes must be independent of the ordinary value of the sentence (it cannot be an answer), see (56-b.), and it must be retrievable from the context, see (56-c.).

- (56) *CT Interpretation Rule* For a sentence S<sup>CT+F</sup> to be felicitous, there must be at least one question meaning in S<sup>CT+F</sup>'s value which is
- currently pertinent, and PERTINENCE
  - logically independent of [[S<sup>CT+F</sup>]]<sub>O</sub> and INDEPENDENCE
  - identifiable IDENTIFIABILITY

Given these assumptions, the relevant phrase "hat eine Banane gegessen" in (53) has the LF in (57).



The set of alternatives introduced are the ones in (58-a.) and [b.].

- (58) a. F-Alternatives:  $[\lambda q. \exists x. q = \lambda w. \text{food}(x)(w) \ \& \ \text{eat}(x)(\text{Manuel})(w)]$   
 'the set of proposition of the form "Manuel ate x", for some x  
 (Manuel ate a banana, Manuel ate an apple...)'
- b. CT-Alternatives:  $\{[\lambda q. \exists x [q = \lambda w. \text{food}(x)(w) \ \& \ \text{eat}(x)(\text{Manuel})(w)]],$   
 $[\lambda q. \exists x [q = \lambda w. \text{beverage}(x)(w) \ \& \ \text{drink}(x)(\text{Manuel})(w)]], \dots\}$   
 'the set of question meanings like "What did he P", for some  
 time P (What did Manuel eat, What did Manuel drink, What did  
 Manuel draw...)'

This explains why the exhaustivity implicature of the sentence, given in (59), was perceived as strong in the experiment. The presence of a contrastive topic made exhaustification mandatory.

- (59) a. Manuel ate a banana (w) &  $\forall p [p \text{ in F-Alt} \ \& \ p \neq \lambda w. \text{Manuel ate a banana in } w \rightarrow \neg p(w)]$   
 'Manuel only ate a banana.'

There are some open questions arising with this analysis. One regards the generation of alternatives for contrastive topics. Constant (2014) offers an elegant solution to getting the relevant alternatives using compositional interpretation. He makes use of Hamblin functional application to derive the set of questions that contrastive topics have been argued to introduce. However, it is unclear how the alternatives focus introduces can be "passed on" to be used for pointwise functional application and at the same time be evaluated by an exhaustivity operator. A way to explain this is to assume that different layers of meaning are involved. I will leave this question for further research. The important upshot of the analysis is that both contrastive focus and contrastive topics are relevant notions for obligatory exhaustification.

# Chapter 4

## Obligatory "again"

### 4.1 "Again" in affirmative sentences

It has already been observed in the literature on *Maximize Presupposition* that the presupposition trigger "again" is obligatory when its presupposition is entailed by the context (Sauerland 2008a, Percus 2006, Chemla 2008). Leaving out "again" in contexts in which its presupposition is satisfied will yield an oddness effect, see (1).

- (1) a. John went to Norway last year.  
b. #He went to Norway this year.

Whereas *Maximize Presupposition* and *Obligatory Implicatures* agree on the fact that (1-a.) is odd they differ with respect to the explanation for *why* it is. Accounts working with *Maximize Presupposition* assume that the principle has been violated in (1-b.). Since the speaker could have uttered the presuppositionally stronger alternative with "again" in (2) the hearer assumes that the speaker believes its presupposition to be false. The presupposition that John went to Norway at a contextually given time before this year is given in the interpretation of (2) in (2-a.).

- (2) He went to Norway this year, again.  
a.  $\llbracket$ [John went to Norway again<sub>t\_1</sub>] this year  $\rrbracket = \lambda w$ : John went to Norway in  $w$  at  $g(1)$  &  $g(1) < \text{this year}$ . Joe went to Norway this year in  $w$ .



In a context like (2), the contextually relevant time is "last year". The assignment function thus assigns the value "last year" to the index of the covert time variable "again" comes with:

- (3)  $\llbracket \llbracket \text{John went to Norway again}_{t_1} \rrbracket \text{ this year} \rrbracket = \lambda w$ : John went to Norway in  $w$  last year. Joe went to Norway this year in  $w$ .

Since the hearer assumes the presupposition of (3) to be false when hearing the presuppositionally weaker (1-b), the following inference arises according to *Maximize Presupposition*.

- (4)  $\neg$  John went to Norway in  $w$  last year.

This inference of (1-b) clearly contradicts the context in (1-a) and thus the whole sentence results in oddness.

The *Obligatory Implicature* approach proposes that (1-b) is odd due to its exhaustivity implicature. The assumption is that (1-b) carries focus on "this year" since it is the only discourse new information in the context in (1-a). This obligatory focus triggers exhaustification of the QUD "When did John go to Norway?". This exhaustification will yield the result that "this year" is the only year where John went to Norway, see (5), thereby contradicting what was asserted by the first sentence.

- (5)  $\llbracket \text{EXH} \rrbracket (\llbracket \text{When did John go to Norway} \rrbracket) (\llbracket \text{John went to Norway this year} \rrbracket) (w) \Leftrightarrow [\text{John was in Norway this year}] (w) \&$   
 $\forall q [ q \in [\lambda p. \exists t [p = \lambda w [\text{time}(t)(w) \& \text{John was in Norway at } t \text{ in } w] ] ]$   
 $\& \lambda w. \text{John was in Norway this year} \not\Rightarrow q \rightarrow \neg q(w) ]$

## 4.2 Again under negation

### 4.2.1 Idea and predictions

Given the different explanations the two theories provide for (1-b), they also differ in their empirical predictions for the example with negation in (6-b.). Whereas *Maximize Presupposition* predicts the sentence in (6-b.) to be as degraded as (1-b), *Obligatory Implicatures* predicts (6-b.) to be acceptable as opposed to (1-b).

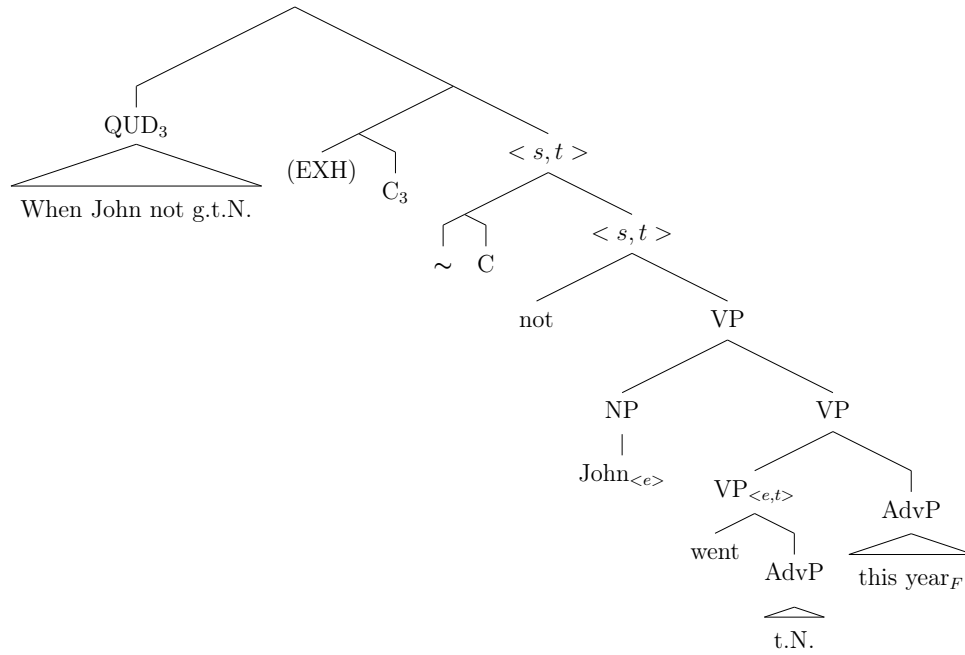
- (6) a. John went to Norway last year.  
 b. He did not go to Norway this year.

For *Maximize Presupposition* the explanation for why (6-b.) should be degraded remains the same as before. The sentence has a presuppositionally stronger competitor with "again" which has not been used, see (7). Thus, the speaker has to believe the presupposition of (6-b.) (given in (7-a.)) to be false, i.e. that John did not go to Norway at a time preceding this year, see (7-b.). This, as in the affirmative case before, should yield a contradiction with (6-a.).

- (7) He did not go to Norway this year, again.  
 a.  $\llbracket \text{not} [ [\text{John did go to Norway again}_{t_1}] \text{ this year} ] \rrbracket = \lambda w$ : John went to Norway in  $w$  last year. Joe did not go to Norway this year in  $w$ .  
 b.  $\neg$  John went to Norway in  $w$  last year.

*Obligatory Implicatures* predicts that the status of (6-b) is different from the one of (1-b). The assumption behind this prediction is that the QUD that is exhausted changes with negation. The implicature resulting from exhausting this QUD does not yield a contradiction anymore. As was discussed for "too" in the last chapter, there are two syntactic positions for the exhaustivity operator in (6-b), below and above negation. The LF where the exhaustivity operator has scope over negation is given in (8).

(8)



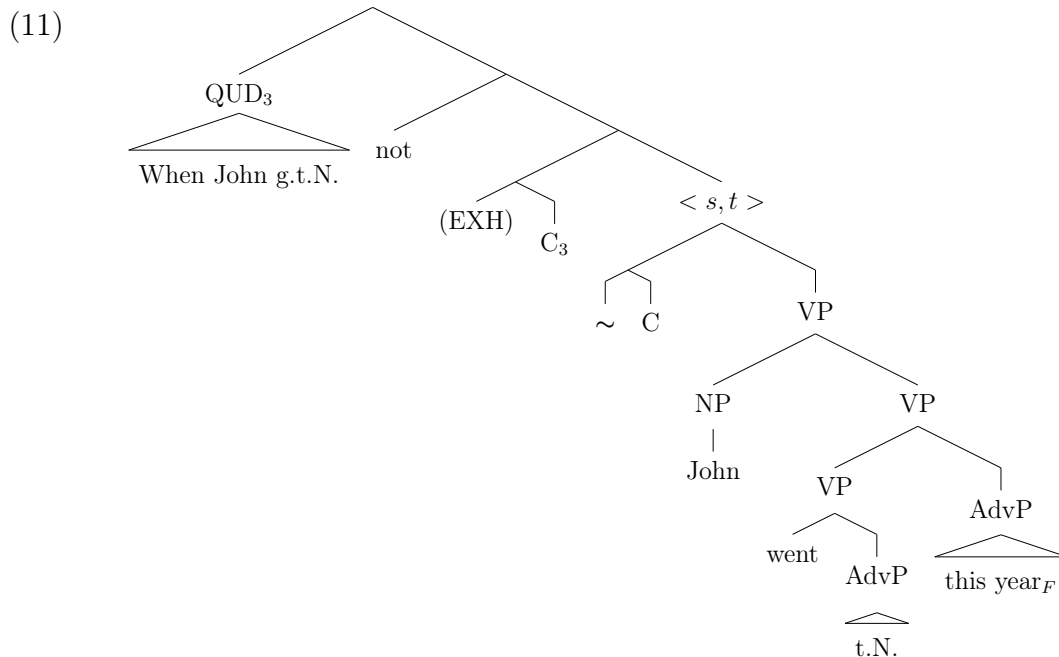
The exhaustification strategy does not result in a contradiction, see the interpretation of (8) in (9).

- (9)  $\llbracket \text{EXH} \rrbracket (\llbracket \text{When was John not in Norway} \rrbracket) (\llbracket \text{John was not in Norway this year} \rrbracket) (w) \Leftrightarrow [\text{John was not in Norway this year}] (w) \ \&$   
 $\forall q [ q \in [\lambda p. \exists t. p = \lambda w [\text{time}(t)(w) \ \& \ \text{John was not in Norway at } t \text{ in } w]] \ \& \ \lambda w. \text{John was not in Norway this year} \not\Rightarrow q ] \rightarrow \neg q(w)$   
 'This year was the only time John did not go to Norway'

If focus instead falls on negation, the QUD becomes a polar question of the form "Did Peter go to Norway this year?". Exhaustifying the sentence with respect to this question, does not result in a contradiction either, see (10).

- (10)  $\llbracket \text{EXH} \rrbracket (\llbracket \text{Did John go to Norway this year} \rrbracket^w) (\llbracket \text{John did not go to Norway this year} \rrbracket) (w) \Leftrightarrow [\text{John did not go to Norway this year}] (w) \ \&$   
 $\forall q [ q \in [\lambda p. p = \lambda w. \text{John was not in Norway this year in } w \vee p = \lambda w. \text{John was in Norway this year in } w] \ \text{and} \ \text{John did not go to Norway this year} \not\Rightarrow q \rightarrow \neg q(w) ]$   
 'John did not go to Norway this year'

The LF where negation has scope over the exhaustivity operator represents an interpretation the sentence does not have, see the tree in (11) and its interpretation in (12).



- (12)  $\llbracket \text{NOT} \rrbracket (\llbracket \text{EXH} \rrbracket (\llbracket \text{When was John in Norway} \rrbracket) (\llbracket \text{John was in Norway this year} \rrbracket) (w)) \Leftrightarrow$   
 $\neg [ [ \text{John was in Norway this year} ] (w) \ \& \ \forall q [ q \in [ \lambda p. \exists t [ p = \lambda w. \text{time}(t)(w) \ \& \ \text{John was in Norway at } t \text{ in } w ] ] ] \ \& \ \lambda w. \text{John was in Norway this year} \not\Rightarrow q \rightarrow \neg q(w) ] ]$   
 # 'It is not the case that only this year John went to Norway'

As for the case with "too" and negation discussed in the last chapter, this LF should be ruled out since it yields an unattested reading. One reason to dismiss it is to assume that a covert intervention effect occurs which disallows association of the exhaustivity operator with a focus across negation. However, under this assumption the exhaustivity operator is not flexible enough to move across negation and directly c-command its focus. Even if the explanation for why this LF is not available is another one, the fact remains that this reading does not exist. The reading there negation has low scope *does* exist. However, it does not result in a contradiction with a context which establishes that John went to Norway before this year. Accordingly, *Obligatory Implicatures* does not predict the trigger to be obligatory. Its insertion depends on an exhaustivity implicature which contradicts the context. Such an exhaustivity implicature does not arise with negation.

To test the different predictions of *Obligatory Implicatures* and *Maximize Presupposition*, an off-line rating study on "again" in affirmative sentence and

under negation was conducted.

There were two main goals of the experiment. First, the study tested whether "again" is obligatory in simple affirmative sentences. Second, it tested whether "again" is obligatory under negation. The two theories introduced in the beginning do not differ with regard to the predictions for simple affirmative sentences. Both predict that "again" is obligatory in affirmatives when its presupposition is given in the context. *Obligatory Implicatures* but not *Maximize Presupposition* predicts that "again" is not obligatory in negated sentences when its presupposition is given in the context. This is because of the assumption of *Obligatory Implicatures* that exhaustification of a negated sentence does not lead to a contradiction in contexts where the presupposition of "again" is verified.

#### 4.2.2 Design and material

For the material, contexts were created that introduced the general setting and two protagonists, one of which about to make an utterance, see (13). The utterance consisted of two sentences which served as the target sentences for the study. The first sentence always satisfied the presupposition of "again", see (14). The second target appeared in four different conditions, see (14-a.-d.).

- (13) Sonja und Nadine sind Kollegen. Sie unterhalten sich über Freizeitaktivitäten, die sie letzte Woche gemeinsam unternommen haben. Sonja sagt:  
'Sonja and Nadine are colleagues. They are talking about activities they did together last week. Sonja says:'
- (14) Wir waren am Dienstag schwimmen.  
'We went swimming on Tuesay.'
- a. Am Freitag waren wir wieder schwimmen.  
'We went swimming on Friday, again.' (-negation,+again)
  - b. Am Freitag waren wir schwimmen.  
'We went swimming on Friday.' (-negation,-again)
  - c. Am Freitag war wir nicht wieder schwimmen.  
'We did not go swimming on Friday, again.' (+negation, +again)
  - d. Am Freitag waren wir nicht schwimmen.  
'We did not go swimming on Friday.' (+negation,-again)

A 2x2 design was used for the study which crossed the two factors AGAIN and NEGATION. The second target sentence thus appeared in one of the following four conditions: it appeared with "wieder" ("again") but without negation (14-a.), without "wieder" and without negation (14-b.), with "wieder" and with negation (14-c.), or with negation and without "wieder" (14-d.). Six items were created for each condition, making for 24 experimental items in total. In addition the study contained 48 filler items.

### 4.2.3 Procedure

The experiment was created using the free software OnExp (*OnExp 1.2 User Manual*). 28 native speakers of German participated in the experiment. They did the experiment online, on their own computer, after receiving a link to the experiment. People were asked to read the context carefully and then read the two target sentences, always uttered by a person appearing in the context. The target sentences were presented separately in a gray box on the computer screen. Participants were then instructed to judge the second target sentence in the given context on an acceptability rating scale ranging from 1 to 5 (5 meaning the sentence is completely acceptable). They were advised that "acceptable" meant that the sentence made sense in the context and could be uttered by a native speaker like that.

### 4.2.4 Results

Analyses were carried out using the R programming language (R Development Core Team) as linear mixed effect models (Baayen, Davidson, and Bates 2008), using the program *lmer* (Bates 2005). The fixed factors were AGAIN (present/absent) and NEGATION (present/absent). Random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, the more complex one was chosen.

A significant interaction was found between the factors AGAIN and NEGATION ( $p < .01$ ). Furthermore, highly significant simple and main effects were found for both factors (all  $p < .01$ ). Whereas without negation the acceptability of the sentence significantly increased with the insertion of "again" ( $M = 1.76$  without "again" and  $M = 3.64$  with "again"), it decreased the acceptability of sentences

with negation (M=3.18 without "again" and M=2,8 with "again"). The results are summarized in figure 4.1 below.

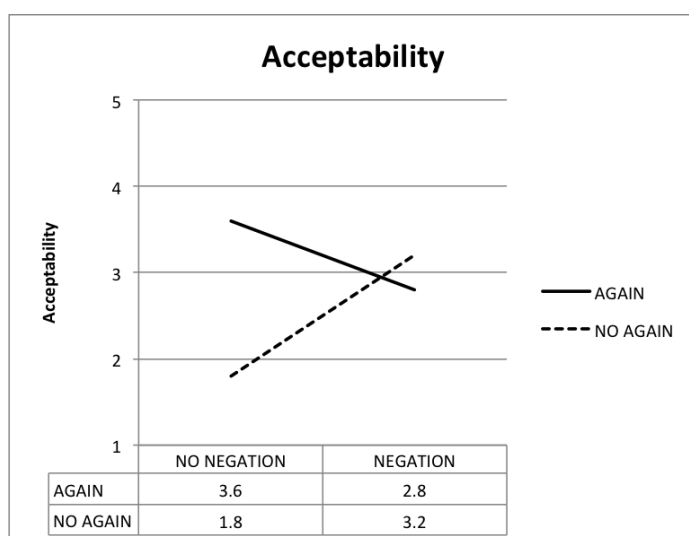


Figure 4.1: Mean acceptability of sentences with "again" and with negation, with "again" and without negation, without "again" and without negation, without "again" and with negation

#### 4.2.5 Discussion

The predictions of both theories are borne out regarding "again" in affirmative sentences. In contexts where its presupposition is fulfilled, leaving out "again" decreases the acceptability of sentences significantly. This result alone is not revealing with regard to the question what kind of inference is responsible for this decrease in acceptability. The most important result in that respect is the interaction that was found between insertion of "again" and insertion of negation. Crucially, the acceptability of sentences decreases with the insertion of "again" when there was negation in the sentence. This is very surprising from the viewpoint of theories exploiting the maxim *Maximize Presupposition*. The findings rather speak in favor of an analysis for the obligatory insertion of "again" that makes use of exhaustivity implicatures. The results meet the prediction of *Obligatory Implicatures* that leaving out the trigger in negated sentences does not lead to the same oddness as leaving out "again" in simple affirmative sentences. Moreover, *Obligatory Implicatures* is able to explain why inserting "again" into the negated sentence even decreases its acceptability. The critical sentences were such that the second target had to have focus on

the temporal phrase (which was an adverbial or prepositional phrase like "on Friday"). Thereby the QUD evoked by the sentences was always of the type "When did we P?" according to *Obligatory Implicatures*, see (15).

$$(15) \quad \llbracket \text{When did we P} \rrbracket = \lambda p. \exists t [p = \lambda w. [\text{time}(t)(w) \ \& \ P(\text{speakers})(t)(w)]]$$

The assumption is that with negation the QUD changes do either a polar question "Did we do Q at t?" or the question "When did we not do Q?". see (16-a.) and (16-b.).

$$(16) \quad \begin{array}{l} \text{a.} \quad \llbracket \text{Did we P or not P} \rrbracket^t = \\ \quad \lambda p. p = \lambda w [P(\text{speakers})(t)(w)] \vee p = \lambda w [ \neg P(\text{speakers})(t)(w) ] \\ \text{b.} \quad \llbracket \text{When did we not P} \rrbracket^t = \\ \quad \lambda p. \exists t [p = \lambda w. \text{time}(t)(w) \ \& \ \neg P(\text{speakers})(t)(w) ] \end{array}$$

Exhaustification of an answer to neither of these question yields a contradiction with a context that entails that we did P at a previous time. The fact that the trigger does not need to be inserted into sentences that answer these questions is thus explained by *Obligatory Implicatures*.

The fact that sentences are even degraded when they contain both negation and "again" is also explained with the assumptions of *Obligatory Implicatures*. "Again" is an anaphoric trigger making reference to a specific time (see Beck 2007, Tiemann 2014). Its insertion is a strong indication that the QUD is of the type "When did we P?". Inserting negation, however, indicates that the QUD is of the form in (16-a.) to (16-b.). Thus, there are two different linguistic cues as to what QUD the second target sentence is supposed to answer (or what is at issue). Inserting both negation and "again" is therefore a pragmatically dispreferred strategy.

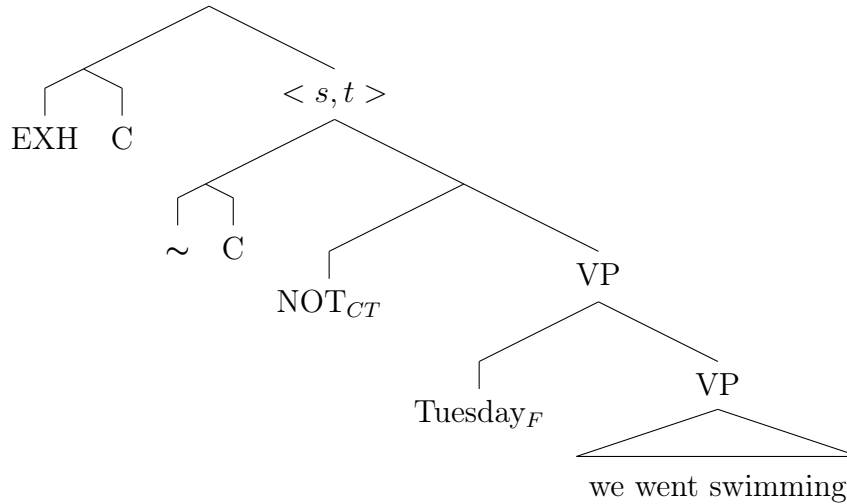
It should be mentioned that the main effect of negation can be explained along the same lines. Only inserting negation was slightly (but still significantly) less acceptable than only inserting "again". There are two possible explanations in line with the *Obligatory Implicatures* theory. First, it is possible that changing the QUD within one utterance is pragmatically dispreferred. Second, it is possible that within this context already the first sentence was (strongly) exhaustified with respect to the question "When did we P?" By hearing and exhaustifying that Sonja and Nadine went swimming on Tuesday the reader knows that they did not go swimming on any other day of the week. This



makes the next utterance with negation simply redundant.

Another possibility to consider is that the temporal phrase carries information focus, whereas negation carries contrastive focus (Büring 2003, Büring 1997), as in the example in (17).

(17)



A set of questions of the form "Did we go swimming at  $t$  or not?" is introduced for a contextually given set of relevant points in time by contrastive focus, see (18-b.). In addition a set of propositions of the form "when did we not go swimming" is introduced by focus, see (18-a.).

- (18) a. F-Alternatives: the set of proposition of the form  $\lambda p. \exists t [p = \lambda w. \text{time}(t)(w) \ \& \ \neg \text{swimming}(\text{speakers})(t)(w)]$   
 { We did not go swimming on Tuesday, we did not go swimming on Friday, ... }
- b. CT-Alternatives: the set of questions of the form  $\lambda p. p = \lambda w. \text{swimming}(\text{speakers})(t)(w) \vee p = \lambda w. \neg \text{swimming}(\text{speakers})(t)(w)$   
 { Did we go swimming on Tuesday, did we go swimming on Wednesday, ... }

Exhaustifying the sentence with respect to the focus alternatives results in the implicature that we only did not go swimming on Tuesday, see (19).

- (19) We did not go swimming on Tuesday ( $w$ ) &  $\forall p [p \text{ in F-Alt} \ \& \ p \neq [\lambda w. \text{We did not go swimming at Tuesday in } w]] \rightarrow \neg p(w)$

At the same time an inference arises through the presence of contrastive focus

that there is one question in the CT-Alternatives which has not been answered and whose answer is distinct from the ordinary value of the sentence. Together with the implicature in (19) this suggest that there is at least one day on which we went swimming. Since this is given in the context, this kind of interpretation only again could be considered redundant but not contradictory. This analysis thus does not speak against the assumption that in the presence of contrastive focus obligatory exhaustification of information focus is triggered. This obligatory exhaustification does not yield a contradiction and insertion of the trigger is not assumed to be obligatory under *Obligatory Implicatures*.

#### 4.2.6 Summary

The study overall supports the view of *Obligatory Implicatures* that the insertion of "again" should follow from the independently needed mechanism of exhaustification. The general pragmatic principle *Maximize Presupposition* is not suited for explaining the phenomenon. It would predict that "again" is obligatory under negation. The facts about "again" under negation also support the claim that "again" and "too" pattern alike and that their behavior should be explained by assuming the same underlying mechanism. To further support this view, additional evidence for the influence of the presence of a question on the insertion "again" has to be found.



## Chapter 5

# Obligatory Factives - Knowledge versus Belief

Another contrast that has received attention in the literature on *Maximize Presupposition* is the one between the embedding verbs "know" and "believe". The following, purely theoretical, chapter is dedicated to this contrast and how it is explained by the two different theories introduced in chapter 2. As opposed to "too" and "again", the trigger "know" has been argued to have a non-presuppositional lexical alternative. The main question addressed is thus whether the insertion of "know" depends on information structural factors, as predicted by *Obligatory Implicatures* or should be subsumed under a principle working with lexical competition on the level of presupposition, as *Maximize Presupposition*. In section 5.1. I will discuss the meaning of "know" and how it is distinct from the meaning of the embedding verb "believe". I will review and adopt an approach to "know" which sees its presuppositions just as an entailment. In section 5.2. I will show how this approach makes the right predictions for the insertion of "know" under negation. In section 5.2. I will furthermore argue, that the inferences from using "believe" are implicatures which become weaker or stronger with the lexical competition introduced in the context. They are thereby not dependent on the ("weak") presupposition of "know".

## 5.1 The meaning of "know"

The factive verb "know" presupposes the truth of its complement, see (2-a.). As a result, the presupposition of (1-b.) is that Peter has a sister. The observation is that "know" is obligatory when its presupposition is entailed by the context. The verb "believe" has the same assertion as "know", see (2-b.), but lacks its presupposition. The sentences with "believe" is unacceptable in a context where its complement is known to be true, see (1-a.).

- (1) Peter has a sister.
- a. John # believes that Peter has a sister.
  - b. John knows that Peter has a sister.
- (2)
- a.  $\llbracket \text{know} \rrbracket^g = \lambda w. \lambda p. \lambda x. p(w). \text{BELIEF}(p)(x)(w)$
  - b.  $\llbracket \text{believe} \rrbracket^g = \lambda w. \lambda p. \lambda x. \text{BELIEF}(p)(x)(w)$
  - c.  $\llbracket \text{BELIEF} \rrbracket^g = \lambda p. \lambda x. \lambda w. \forall w' [w' \text{ is compatible with } x\text{'s beliefs in } w \rightarrow p(w')]$

Accounts working with *Maximize Presupposition* explain this contrast by claiming that "believe" and "know" are on a scale of presuppositional strength, where "know" is the strongest item on the scale. Using (2-a.) in a context like (2), where the presupposition of "know" is fulfilled is degraded since it violates *Maximize Presupposition*.

For *Obligatory Implicatures*, the explanation used for the obligatory occurrence of "too" and "again" can be extended in a straightforward way to the data surrounding "know". The idea is that "know" is inserted obligatorily when the implicature that "believe" triggers contradicts the context. Unlike *Maximize Presupposition* approaches the *Obligatory Implicature* account furthermore assumes that this implicature is the result of exhaustification of the QUD, not a lexical scale. I will show and argue that, even though it is plausible in many contexts that "know" and "believe" are relevant alternatives, they do not have to be.

As for the cases before, the QUD is assumed to be retrieved from focus. For the two sentences in (2-a.) and (2-b.) the most natural place to put focus is on the verbs "believe" and "know", respectively. This is because John's attitude towards the proposition in (2) is the only discourse new information and thus seems to be at issue. More concretely, the QUD with respect to which the

sentence (2-a.) is mandatorily exhaustified is hence "What is the R such that John R that Peter has a sister?", where R is a propositional attitude. The result of this exhaustification is given in (3) below.

- (3)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{What is the R John R Peter has a sister} \rrbracket)(\llbracket \text{John believes Peter has a sister} \rrbracket) \Leftrightarrow$   
 $\text{John believes Peter has a sister}(w) \ \& \ \forall q[ q \in [\lambda p. \exists R. \text{PropAtt}(R)(w)[p = \lambda w. \text{John R Peter has a sister in } w] ] \ \& \ \lambda w. \text{John believes Peter has a sister} \not\Rightarrow q \rightarrow \neg q(w)]$

The R that is asked for, however, is assumed to be restricted to propositional attitudes that are salient (and relevant) alternatives to "believe" in the context. Without further contextual information, the most salient alternative to "believe" is "know" since both express a degree of certainty with regard to the proposition that follows. 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". Approaches to obligatory triggers that make use of *Maximize Presupposition* would assume that these two propositions are identical with respect to their assertion. Exhaustifying the sentence with "believe" should hence not exclude the sentence with "know" since it cannot distinguish between them based on assertive strength. However, there is some evidence that the competition and distinction between "know" and "believe" is not just based on the presupposition of "know".

First, when putting an overt *only* in the sentence with "believe" it can be seen that the inference arises that the sentence with "know" is not true. However, the presupposition of "know" does not project in this case.

- (4) John only believes that Peter has a sister, he does not know it.

(4) does not presuppose that Peter has a sister. What is negated in the second conjunct is not the assertion since this would yield a contradiction with the first conjunct. However, it also not the presupposition that is negated, i.e. as a case of local accommodation. If the presupposition of the second conjunct in (4) was accommodated locally then the result would be the one (5).

- (5)  $\neg (\text{Peter has a sister} \ \& \ \text{believe}(\text{John})(\text{Peter has a sister}))$   
 "It is not the case that Peter has a sister and John believes it."

Negation would have access to both assertion and presupposition with local accommodation. The interpretation one would get for (5) is one where Peter does not have a sister. This is clearly not what (4) states.

These facts suggest that sentences with "know" and "believe" are not equally informative. The sentence in (5) can only be used both in contexts where it is still at-issue whether Peter has a sister or not. What is negated is just that John does not have strong evidence to believe that Peter has a sister.

These data are consistent with recent approaches to the meaning of "know" where it is considered to be a so called "soft" trigger whose presupposition only arises (and projects) in certain contexts (Abusch 2002, Simons et al. 2011, Abrusan 2011, Romoli 2011). Abusch (2002) calls the presuppositions of soft triggers "pragmatic" because of their sensitivity to contextual information, especially the presence of alternatives. She presents similar data as the one in (4) above to argue that the presupposition of "know" is suspendable (as opposed to the semantic presuppositions of hard triggers like "too" and "again") when contrasted with weaker embedding verbs like "suspect", compare (6).

- (6) John suspects Mary is having an affair, he does not know it. (Abusch 2002, p.2)

The same is predicted by Simons et al. (2011) who claim that the presupposition of "know" can only project if its complement is not at issue. It is very clear that it is still at issue whether Mary is having an affair in (6). Thus, the presupposition of "know" does not project. It seems that in competition with "believe" (and other non-presuppositional propositional attitude verbs) - that is when the QUD is about a propositional attitude - the presupposition of "know" is not what defines the contrast between the verbs. Rather it seems that it is about the degree of certainty the attitude verbs express, where using "know" suggest having the highest degree of certainty possible.

The empirical picture that arises poses a problem for *Maximize Presupposition*. If "know" loses its presuppositional status in competition with other propositional attitude verbs, *Maximize Presupposition* is unfit to explain the oddness of "believe"-sentences in contexts where the presupposition of "know" is fulfilled.

The facts rather align with a recent proposal made by Romoli (2011) in combination with *Obligatory Implicatures*. Romoli (2011) assumes that the comple-

ment of "know" in unembedded contexts should be just seen as an entailment, not a presupposition (see also Abrusan 2011)<sup>1</sup>. In addition to  $p$  being an entailment to *know p*, Romoli (2011) argues, {know p, p} form a scale of which *know p* is the strongest element. It entails its alternative ( $p$ ) in unembedded sentences. In embedded contexts it is an implicature. This also explains why the presupposition of "know" sometimes does not project through all types of embedding, for example if-clauses, as in (7) below. Projection is a question of scope of the exhaustivity operator. In this case the implicature is arising locally, below the if-clause, and is subsequently canceled.

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

I will adopt the view that the complement of "know" is an entailment in simple affirmative sentences and assume that  $know\ p = believe\ p \wedge p$ <sup>2</sup>. This still accounts for the fact that the implicature arising from the use of "know" projects through negation. The sentence in (8) would have the alternative set in (8-a.). Moreover, the scale is reversed under negation, making  $\neg p$  the stronger alternative which is negated. The result is in (8-b.).

- (8) John does not know that Peter has a sister.
- a. Alt= {  $\neg(P\ \text{has a sister}(w) \ \& \ \forall w' [w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow P\ \text{has a sister}(w'))$ ,  $\neg P\ \text{has a sister}(w)$  }
  - b. Exh(A)(John does not know that Peter has a sister) =  $\neg(P\ \text{has a sister}(w) \ \& \ \forall w' [w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow P\ \text{has a sister}(w')) \ \& \ \neg\neg P\ \text{has a sister}(w)$
  - c. "It is not the case that Peter has a sister and John believes it and Peter has a sister"  
"Peter has a sister and John does not believe it."

<sup>1</sup>However, in Abrusan's proposal the complement of "know" is an entailment that can turn into a presupposition via a mechanism that makes use of topic situations.

<sup>2</sup>I am aware that this is a serious simplification. A more accurate semantics of "know" would include the evidence the speaker has for believing a certain proposition. However, for the argument put forward here these details are not crucial. What is important is that whatever the semantic component is that makes "know" stronger it seems to be operative at the level of assertion. Furthermore, its negation is what makes the sentence with "believe" odd when a proposition is in fact known to be true

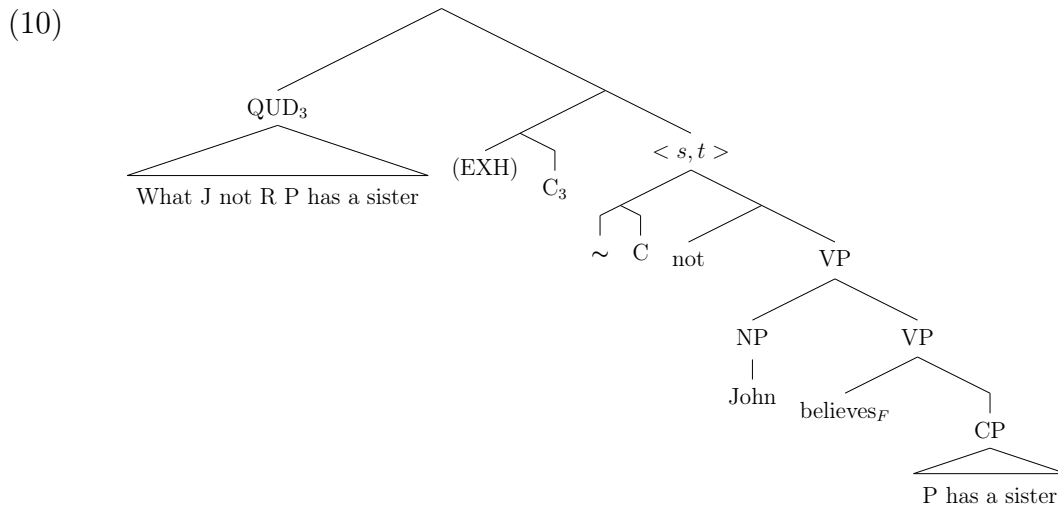


## 5.2 "Know" under negation

It is now possible to offer a more detailed explanation for why "know" is not obligatory under negation, see (9).

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

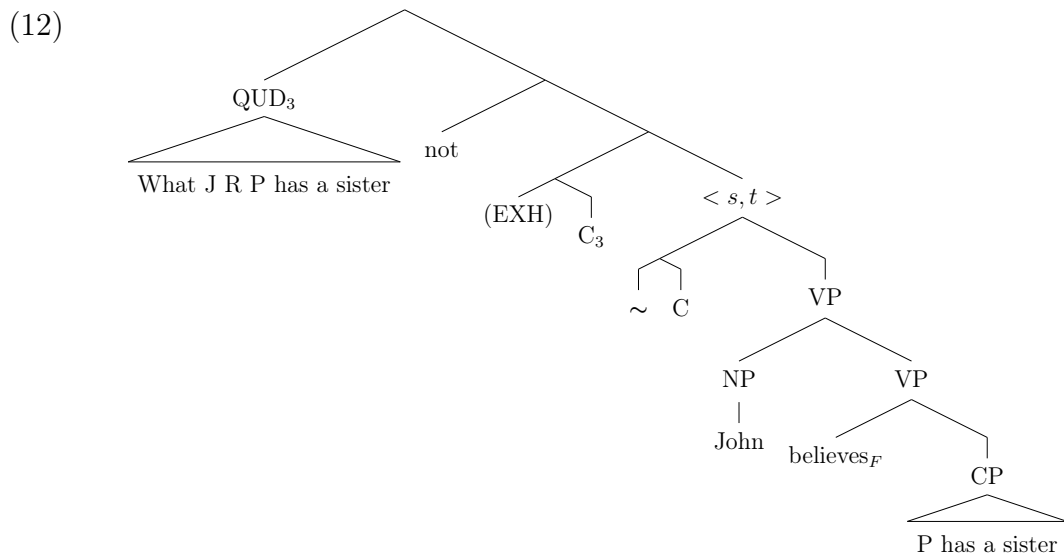
Parallel to the examples with "too" and "again", the exhaustivity operator can take scope over negation and below it. Then the operator is scoping over negation the QUD changes to "What is the R such that John does *not* R Peter has a sister?", see (10).



If, again, the question set is supposed to be restricted to salient alternatives which in this case are "John does not believe that Peter has a sister" and "John does not know that Peter has a sister" then exhaustifying the sentence in (10-b.) with respect to this question set will not generate an implicature at all. "John does not believe p" is the stronger alternative now and entails "John does not know p" ; and the exhaustivity operator can only exclude alternatives that are not entailed. Under the present proposal the sentence with "know" is only obligatory when the sentence with "believe" has an implicature that contradicts the context. It is hence predicted that the sentence containing negation should not be odd and the insertion of "know" not obligatory. The QUD might once more also change to a polar question ("Does John believe Peter has a sister or not?"). Exhaustifying (10-a.) with respect to this question will not lead to a contradiction with the context in (10), either, see (11).

- (11)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{Does John believe or not that Peter has a sister} \rrbracket)(\llbracket \text{John does not believe Peter has a sister} \rrbracket)(w) \leftrightarrow [\text{John does not believe Peter has a sister}](w) \ \&$   
 $\forall q [q \in [\lambda p.p = \lambda w. \text{John believes Peter has a sister in } w \vee p = \lambda w. \text{John does not believe Peter has a sister in } w] \text{ and John does not believe Peter has a sister} \not\Rightarrow q \rightarrow \neg q(w) ]$   
 'John does not believe Peter has a sister'

The second option, once more, is that negation has scope over the exhaustivity operator as in the LF in (12).



This LF has the interpretation in (13). It says that John not only believes that Peter has a sister.

- (13)  $\llbracket \text{NOT} \rrbracket(\llbracket \text{EXH} \rrbracket(\llbracket \text{What R John Peter has a sister} \rrbracket^w)(\llbracket \text{John believes Peter has a sister} \rrbracket)(w)) \Leftrightarrow$   
 $\neg \text{John believes Peter has a sister}(w) \ \& \ \forall q [q \in [\lambda p.\exists R.\text{PropAtt}(R)(w).[p = \lambda w. \text{John R Peter has a sister in } w] ] \ \& \ \lambda w.\text{John believes Peter has a sister} \not\Rightarrow q \rightarrow \neg q(w) ]$   
 # 'It is not the case that John only believes Peter has a sister'

As opposed to the cases with "again" and "too", this reading is not completely out but requires that the implicatures is immediately made explicit, as in (14).

- (14) John does not believe Peter has a sister, he knows it.

As discussed by Chierchia, Fox, and Spector (2011), this reading is a special case which requires strong focus on "believe" and a special form of meta-linguistic negation. It is not easily available without the continuation in (14). Most importantly, the implicature it yields in this case is not contradictory to the fact that Peter has a sister. Thus, the insertion of the trigger is not predicted by *Obligatory Implicatures* in this scenario, either.

*Maximize Presupposition* would predict (9-a) to have the stronger competitor with "know" in (15-a.), which has the interpretation in (15-b.) The sentence in (9-a) should yield the missing trigger inference in (15-c.) and should be contradictory to the context.

- (15) Peter has a sister.
- a. John does not know that Peter has a sister.
  - b.  $\llbracket \text{John not know Peter has a sister} \rrbracket^g = \lambda w: \text{Peter has a sister in } w.$  BELIEF(Peter has a sister)(Peter)(w)
  - c.  $\neg$  Peter has a sister in w

This prediction is not borne out. However, as Chemla 2008 notes the sentence in (15-a.) and (9-a) are actually not equivalent on the level of assertion due to the fact that "believe" is a neg-raising verb whereas "know" is not. That is, (14-a.) translates to the stronger (16-a.), whereas (15-a.) stays the weaker (16-b.) on the level of assertion.

- (16) a. believe(J)( $\neg$ Peter has a sister)  
 b.  $\neg$ believe(J)(Peter has a sister)

Chemla (2008) notes that it would be necessary to have the alternatives in (17-a.) and (17-b.) for *Maximize Presupposition* to make the right prediction that (17-a.) can have the inference in (17-c.).

- (17) a. John does not believe that Peter has a sister.  
 b. John knows that Peter does not have a sister.  
 c. Inference: Peter has a sister.

This requires the stipulation that "alternatives should not be thought of as syntactic objects" (Chemla 2008, p.20). The issue of neg-raising does not arise with the alternative proposal presented. It is fixed by the QUD whether the relevant alternatives are propositional attitudes John has towards Peter having

a sister or Peter not having a sister. What kind of inference arises with the use of "believe" (Peter has a sister or Peter does not have a sister) thus depends on the context. For example, (18-a.) will be fine in the context C in (18) where Peter has a sister and odd in a context C' where Peter does not have one<sup>3</sup>. This is because an inference arises that Peter has a sister by the use of "believe" in (18-a.), see the derivation in (18-a.)to (18-d.). The reverse holds for the sentence "John believes that Peter has a sister" as will be shown below.

- (18) C: Peter has a sister.  
 C': Peter does not have a sister.
- a. p= John believes Peter does not have a sister.
  - b. Q=  $\forall w'[w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow (\neg P \text{ has a sister})(w'), \forall w'[w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow (\neg P \text{ has a sister})(w') \ \& \ (\neg P \text{ has a sister})(w)$
  - c.  $\text{Exh}(Q)(p) = \forall w'[w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow (\neg P \text{ has a sister})(w') \ \& \ \neg (\forall w'[w' \text{ is compatible with what } x \text{ believes in } w] \rightarrow (\neg P \text{ has a sister})(w'))$
  - d. = "John believes Peter does not have a sister and it is not the case that John believes that Peter does not have a sister and Peter does not have a sister"  
 "John believes Peter does not have a sister and Peter has a sister"

If negation has scope over the attitude verb, then the QUD, as mentioned before, changes to a polar question or to a question about what attitudes John does not have towards a proposition. No inference arises that could contradict the context since now the scale is reversed with "not believe" being the strongest alternative. Thus, (19-a.) is acceptable in both contexts in (19).

- (19) C: Peter does not have a sister.  
 C': Peter has a sister.
- a. John does not believe Peter has a sister.

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<sup>3</sup>The sentence becomes better with an additive: "John glaubt auch, dass Peter keine Schwester hat"/"John also believes that Peter does not have a sister". However, in this case it is presupposed that "Peter does not have a sister is true" and the inference cannot arise

### 5.3 Obligatory implicatures of "believe"

The proposition with "know" is more informative than the one with "believe" according to these assumptions. The obligatory insertion of "know" can be explained by exploiting the mechanism described above. The result of exhaustifying the sentence that contains "believe" repeated in (20-a.) below with respect to the restricted question set (for the alternative question "Does John believe or know that Peter has a sister?") given in (20-b.) would be the one in (20-c.).

- (20) Peter has a sister. # John believes Peter has a sister.
- a. John believes that Peter has a sister.
  - b.  $Q = \{ (\forall w' \in \text{BEL}(J)(w) \rightarrow (\text{P has a sister})(w')), (\forall w' \in \text{BEL}(J)(w) \rightarrow (\text{Peter has a sister})(w') \ \& \ \text{Peter has a sister}(w)) \}$
  - c.  $\text{EXH}(Q) = (\forall w' \in \text{BEL}(J)(w) \rightarrow (\text{Peter has a sister})(w'))$  and  $\neg (\forall w' \in \text{BEL}(J)(w) \rightarrow (\text{Peter has a sister})(w') \ \& \ \text{Peter has a sister}(w)) \rightarrow \neg \text{Peter has a sister}(w)$ .

"John knows Peter has a sister" is not entailed by "John believes that Peter has a sister" under the assumptions made. Exhaustifying the latter sentence will result in the implicature that the former sentence is false. When further assuming that "know p" is equal to "believe p  $\wedge$  p" this amounts to saying that p is false since "believe p" is part of the assertion of (20) and cannot be excluded. The oddness of (20) is hence predicted. The implicature of the sentence, which is the result of mandatory exhaustive interpretation, contradicts what is entailed by the context.

Another fact that speaks in favor of analyzing the inferences arising with "believe" sentences as a result from exhaustifying sentences with regard to alternatives generated by the QUD rather than lexical scales is that the inference arising with "believe" crucially changes with the context. It has been show above that, if the complement of "believe" is entailed by the context, a very likely competitor to the "believe"- sentences is a sentence with "know". However, if it is not entailed by the context that the complement is true, then "know" is not necessarily the relevant competitor. The sentences in (21-a.) and (22-a.) have different inferences due to the respective contexts they are embedded in.

- (21) Are you sure you closed the windows?  
 a. I believe so.
- (22) Do you think Paul married Sue?  
 a. I believe so.

In (21), the sentence with "believe" has the inference that the speaker is not sure that s/he closed the windows. The sentence with "believe" has an inference which cannot be the result from competition with "know". Its presupposition is not fulfilled in the context. The inference is predicted to occur if it is an implicature resulting from exhaustifying the QUD. This QUD is about the degree of certainty regarding the truth of "I closed the windows". This degree of certainty can be expressed by different embedding verbs, in the cases above "be sure that" and "believe". The scale evoked, which is also crucial for establishing the QUD, is sketched in (23).

- (23)  $\{\lambda n. x \text{ is } n\% \text{ certain that } p\} = \{x \text{ is } 100\% \text{ certain that } p, x \text{ is } 90\% \text{ certain that } p, x \text{ is } 80\% \text{ certain that } p \dots\}$

The alternatives triggered by using propositional attitude verbs do stand in an entailment relation with one another. This makes the implicatures arising from exhaustification in the cases of attitude verbs scalar implicatures. Accordingly, the question which is evoked by using embedding verbs should be the one in (24).

- (24)  $\llbracket \text{How certain is } x \text{ that } p? \rrbracket = [\lambda p. \exists n [p = p \text{ is } n\text{-certain in } w]]$

The meaning of different attitude verbs are associated with different probabilities on a probability scale. The relevant alternatives can be narrowed down by context, however, as shown by (21) and (22). Since there is only one relevant alternative in these contexts, contrastive focus should be evoked, which, as was argued in chapter 3, makes the implicature obligatory. This seems to be the right prediction since canceling the implicature in this case is odd, see (25).

- (25) Are you sure you closed the windows?  
 a. ??I think so. In fact, I am sure.

## 5.4 Conclusion

The data suggest that *Maximize Presupposition* is not the right principle to account for the obligatory insertion of the factive verb "know". Especially the fact that "know" is not obligatory under negation suggests that the inferences arising when using "believe" instead of "know" are implicatures. This view is supported by the observation that the strength of the inference changes with context, more specifically the attitude verb "believe" is contrasted with. In direct competition with "know", the presupposition of "know" furthermore does not project. This speaks in favor of an analysis which treats the complement of "know" as an entailment which is part of the lexical scale "know" evokes. Rather than the presuppositional status it is the degree of certainty that is expressed on the level of assertion by these attitude verbs which seems to be the crucial and defining factor in their competition. Since the relevant scale contains elements which stand in an entailment relation the implicatures resulting from exhaustification should be considered scalar implicatures. The oddness of "believe" in contexts where its complement is known to be true is thus better explained by assuming it is the result of exhaustification of a - potentially contextually restricted - ordered scale.

# Chapter 6

## Obligatory definites

The original case discussed to motivate the maxim *Maximize Presupposition* (Heim 1991) is the obligatory use of definite determiners. Most of the empirical predictions of the principle have been shown to work for the definite/indefinite distinction. It is a shortcoming of recent approaches to obligatory presupposition triggers that they fail to observe that these data, especially regarding negation, differ significantly from the data observed for other presupposition triggers. The last chapters have shown that the insertion of the triggers "too", "again", and "know" is not obligatory under negation. Moreover, it has been argued that their insertion depends on discourse level concerns, more specifically what kind of focus is introduced, contrastive or information focus. Section 6.1. of this chapter is dedicated to the singular definite. In section 6.1.2. I will report an off-line study on its insertion under negation. The second half of the chapter, 6.2., discusses the plural definite. Section 6.2.1. reports a reading time study which tested the influence of discourse on the insertion of the plural definite. The chapter will show that the empirical picture arising for obligatory definites is significantly different from the picture arising for the obligatory triggers discussed in chapter 3 to 5.

### 6.1 The singular definite

#### 6.1.1 Meaning of the definite determiner

In her original proposal of *Maximize Presupposition*, Heim (1991) observes that the following two sentences in (1) and (2) have the same assertion but differ in what they presuppose. Both assert the existence of a reading boy, see (1-a.)



and (2-a.). However, (1) presupposes that there is a unique boy in the domain of discourse (see (1-b.)) whereas (2) lacks this presupposition.

- (1) The boy is reading.  
 a. Assertion:  $\exists x[\text{boy}(x) \ \& \ \text{reading}(x)]$   
 b. PSP:  $\exists x\forall y[\text{boy}(y) \leftrightarrow y=x]$
- (2) A boy is reading.  
 a. Assertion:  $\exists x[\text{boy}(x) \ \& \ \text{reading}(x)]$

The observation furthermore was that (1) has to be used when the presupposition of the definite is fulfilled, whereas (2) will result in oddness in that context. The example used to show this was (3).

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

The obligatory insertion of the definite determiner is something that follows straightforwardly from *Maximize Presupposition*. The indefinite has the missing trigger inference that the presupposition of the definite does not hold. This special inference has been called the “antiuniqueness” effect of the indefinite. It is responsible for the contrast between (3-a.) and (3-b.).

Trying to extend the explanation of *Obligatory Implicatures* to the above phenomenon is less straightforward. The first problematic point for the theory as it stands now is the unclear role of the QUD in the use of the indefinite and definite determiner. It seems that the sentences in (1) and (2) address are different. Whereas (1) answers a question about an individual like “Who is reading?”, (2) makes a quantitative statement like “how many boys are reading?”. This is expected under a standard analysis which treats definite NPs as individuals of type  $\langle e \rangle$  and indefinites as quantifiers of type  $\langle \langle et \rangle, \langle \langle et \rangle, t \rangle \rangle$  (Heim and Kratzer 1998).

According to *Obligatory Implicatures*, sentences with an indefinite determiner should be odd in contexts that fulfill the presupposition of the definite because they have an unwanted implicature resulting from the exhaustification of a QUD. If we take sentences with indefinites to make a statement about quantity (How many boys are reading?) the implicature of (2) would be that exactly one boy is reading. This implicature is not, however, contradictory to

a context that verifies the presupposition of the definite counterpart "The boy is reading" (that there is exactly one boy), see the derivation in (4).

- (4) a.  $\llbracket \text{How many boys are reading} \rrbracket = \lambda p. \exists n [\exists x [p = \lambda w. [\text{boys}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=n]]]]$
- b.  $\llbracket \text{EXH} \rrbracket (\llbracket \text{How many boys are reading} \rrbracket) (\llbracket \text{A boy is reading} \rrbracket) \Leftrightarrow \exists x [\text{boy}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1]](w) \ \& \ \forall q [q \in [\lambda p. \exists n [\exists x [p = \lambda w. \text{boys}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=n]]]] \ \& \ \lambda w. \exists x [\text{boy}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1]] \not\Rightarrow q \rightarrow \neg q(w)]$   
'Exactly one boy is reading'
- c. (There is exactly one boy and) exactly one boy is reading.

Since a contradiction arising from an unwanted exhaustivity implicature is the reason for inserting the trigger according to *Obligatory Implicatures*, obligatory insertion of the definite would not be predicted based on the implicature of the indefinite in (4-a.). However, the data show very clearly that the definite must be inserted if there is only one unique boy in the discourse. Moreover, the definite is the only trigger that seems to be obligatory in embeddings, i.e. under negation, in questions and if-clauses, see (5-a.) to (5-c.).

- (5) a. If # a / the father of the victim did not arrive then we have to call the mother.
- b. Did # a / the father of the victim arrive?
- c. #A / The father of the victim did not arrive.

This is unsurprising given what was just said. The definite does not scopally interact with negation or other operators. No matter what QUD is triggered with negation and what exhaustification strategy might be chosen to evaluate it, the definite is not affected. To show that the definite in fact differs from other triggers in this crucial aspect, a rating study was conducted that tested the obligatory insertion of the German definite determiner in simple affirmative sentences and under negation. Before I move on to a possible extension of *Obligatory Implicatures* to the singular definite this study will be reported in the next section.

## 6.1.2 The singular definite under negation

### Design and Material

To substantiate the hypothesis that the definite determiner is obligatory under negation empirically, an offline study was conducted which was constructed parallel to the one for "again" reported in chapter 4. Contexts were created which satisfied the presupposition of the definite determiner. An example is given in (6) below.

- (6) Tina hat sich am Wochenende eine Wohnung angeschaut.  
'Tina was looking at an apartment last weekend.'

Two factors were manipulated for the target items which were presented in this context. First, to see whether the definite is really obligatory in this context, the target either contained a definite or indefinite determiner (+/-DEF). Second, to see whether negation had an influence on the obligatoriness of the trigger the targets either contained negation or not (+/-NEG). The study thus had a two by two design crossing the factors NEGATION and DEFINITENESS. A sample item in all four conditions for the context in (6) above is given in (7).

- (7) a. Die Wohnung war sehr teuer. (+DEF, -NEG)  
'The apartment was expensive.'  
b. Eine Wohnung war sehr teuer. (-DEF, -NEG)  
'An apartment was expensive.'  
c. Die Wohnung war nicht sehr teuer. (+DEF,+NEG)  
'The apartment was not expensive.'  
d. Eine Wohnung war nicht sehr teuer. (-DEF,+NEG)  
'An apartment was not expensive.'

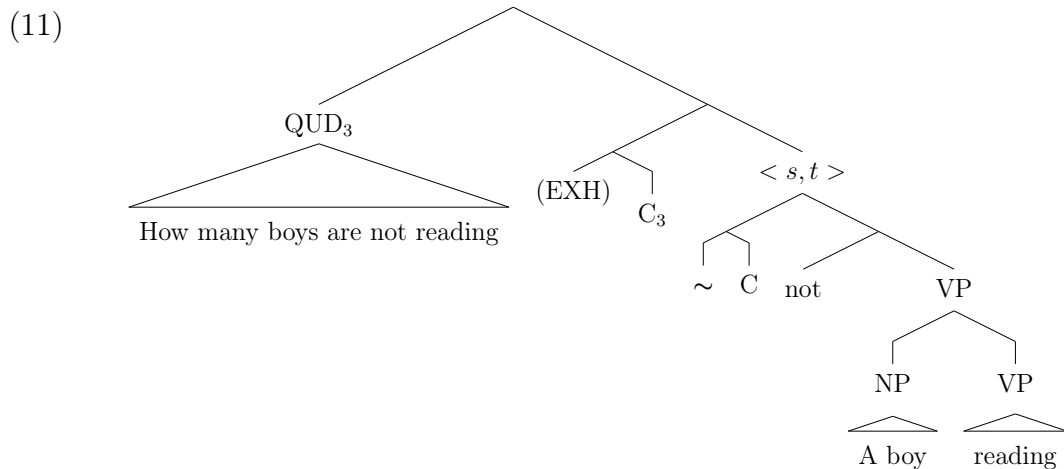
Six items were created for each condition resulting in a total of 24 experimental items. 24 German native speakers did the experiment online by following a link. The experiment was programmed using the free software OnExp (*OnExp 1.2 User Manual*). The study had 48 filler items. Participants were first presented with the context sentences and then with the target sentence in one of the four conditions. They were asked to judge the acceptability of the last sentence they saw on a scale from 1 to 7, where 7 was completely acceptable.

## Predictions

*Maximize Presupposition* straightforwardly predicts the definite determiner to be obligatory both in affirmative and negated sentences when its presupposition is met in the context. Using the indefinite should result in oddness in these contexts, again for both negated and unnegated sentences, since missing trigger inferences project. That is using the weaker (9) when the presupposition of the stronger (8) is fulfilled will lead to the inference in (10), that the presupposition of (8) in (8-b.) is false.

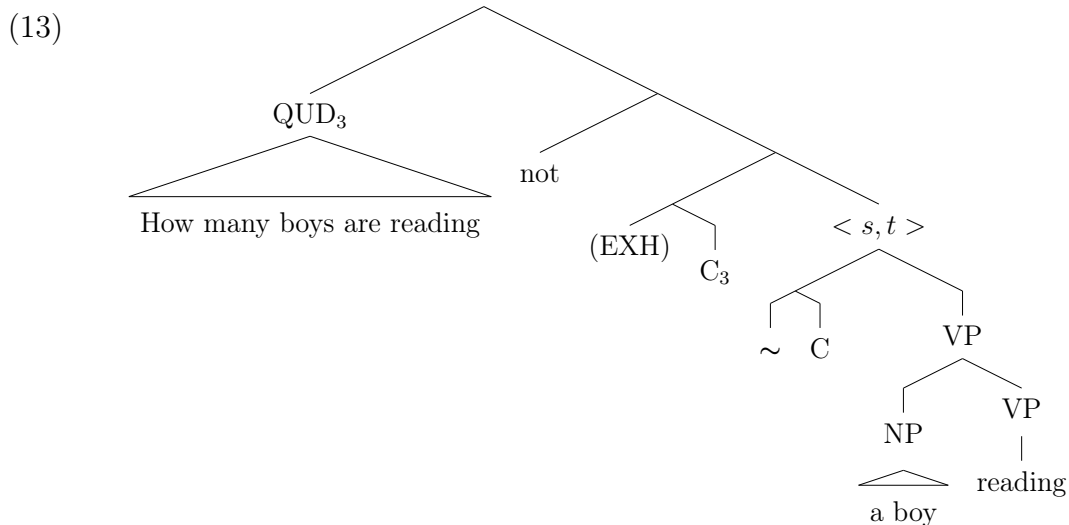
- (8) The boy is not reading.  
 a.  $\lambda w. \neg \text{reading}(w)(\iota x[\text{boy}(w)(x)])$   
 b.  $\exists x \forall y [\text{boy}(w)(y) \leftrightarrow y=x]$
- (9) A boy is not reading.  
 a.  $\lambda w. \exists x [\text{boy}(w)(x) \ \& \ \neg \text{reading}(w)(x)]$
- (10)  $\neg \exists x \forall y [\text{boy}(w)(y) \leftrightarrow y=x]$

*Obligatory Implicatures*, as it stands now, does not predict the definite determiner to be obligatory at all. This is because the insertion of an exhaustivity operator into a structure with an indefinite does not result in a contradiction with a context which entails the presupposition of the definite. Accordingly, the scope interaction of exhaust and negation does not play a role. Neither configuration will yield a contradiction. The first option is that negation changes the QUD to "How many boys did not read", see (11). The resulting implicature is not contradictory to the fact that there is one unique boy, see (12).



- (12)  $\llbracket \text{EXH} \rrbracket(\llbracket \text{How many boys are not reading} \rrbracket)(\llbracket \text{A boy is not reading} \rrbracket)$   
 $\Leftrightarrow \exists x [\text{boy}(x)(w) \ \& \ \neg \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1] \ \&$   
 $\forall q [q \in [\lambda p. \exists n [\exists x [p = \lambda w. \text{boys}(x)(w) \ \& \ \neg \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=n]]] \ \&$   
 $\lambda w. \exists x [\text{boy}(x)(w) \ \& \ \neg \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1] \not\Rightarrow q \rightarrow \neg q(w)]$   
 'Exactly one boy is not reading'

As before, the LF where negation has scope over the exhaustivity operator represents an interpretation the sentence does not have, see the tree in (13) and its interpretation in (14).



- (14)  $\llbracket \text{NOT} \rrbracket(\llbracket \text{EXH} \rrbracket(\llbracket \text{How many boys are reading} \rrbracket)(\llbracket \text{A boy is reading} \rrbracket))$   
 $\Leftrightarrow \neg [\exists x. [\text{boy}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1] \ \&$   
 $\forall q [q \in [\lambda p. \exists n [\exists x [p = \lambda w. \text{boy}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=n]]] \ \&$   
 $\lambda w. \exists x [\text{boy}(x)(w) \ \& \ \text{reading}(x)(w) \ \& \ \text{card}(x)(w)=1] \not\Rightarrow q \rightarrow \neg q(w)]]$   
 # 'It is not the case that exactly one boy is reading'

Neither of the structures above produce an implicature which is contradictory to the presupposition of the definite. Accordingly, *Obligatory Implicatures* does not predict its obligatory insertion under negation.

I should note at this point that there is of course a reading of the sentence "A boy is not reading", which I am neglecting here, because it was not a contextually salient one in the experimental items.<sup>1</sup> In this reading, negation also has scope over the indefinite but no exhaustivity operator is present below negation. This yields the interpretation that no boy is reading, see (15).

<sup>1</sup>Also the preferred way to express this reading would be using "kein Junge" ("no boy"), where the negation of the indefinite is more transparent.

$$(15) \quad \lambda w. \neg \exists x [\text{boy}(w)(x) \ \& \ \text{reading}(w)(x)]$$

The sentence is truth-conditionally equivalent to "No boy is reading" which is also infelicitous in a discourse which established that there is a unique individual boy. However, this infelicity is not due to an implicature since the scale involved (numbers of boys) is reversed under negation, making (15) the strongest alternative.

## Results

Analyses were carried out using the R programming language (R Development Core Team) as linear mixed effect models (Baayen, Davidson, and Bates 2008), using the program *lmer* (Bates 2005). The fixed factors were DEFINITENESS (definite/indefinite) and NEGATION (present/absent). Random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, the more complex one was chosen.

There was no significant interaction between the factors DEFINITENESS and NEGATION ( $p > .25$ ). There were significant simple and main effects for both factors. The acceptability of sentences decreased significantly when the indefinite instead of the definite was used ( $M=2.56$  versus  $M=6.325$ ,  $p < .01$ ). This effect was significant with negation,  $M=6.08$  for the condition +DEF/+NEG versus  $M=2.42$  for the condition -DEF/+NEG ( $p < .01$ ). It was also significant without negation,  $M=6.57$  for the condition +DEF/-NEG and  $M=2.7$  for -DEF/-NEG ( $p < .01$ ). There was also a main effect of NEGATION. Negation decreased the acceptability of sentences significantly ( $M=4.62$  versus  $M=4.25$ ). This effect of negation showed up for the indefinite determiner ( $M=2.42$  versus  $M=2.7$ ,  $p < .01$ ) as well as for the definite determiner ( $M=6.08$  versus  $M=6.57$ ,  $p > .01$ ). The results are summarized in 6.1 below.

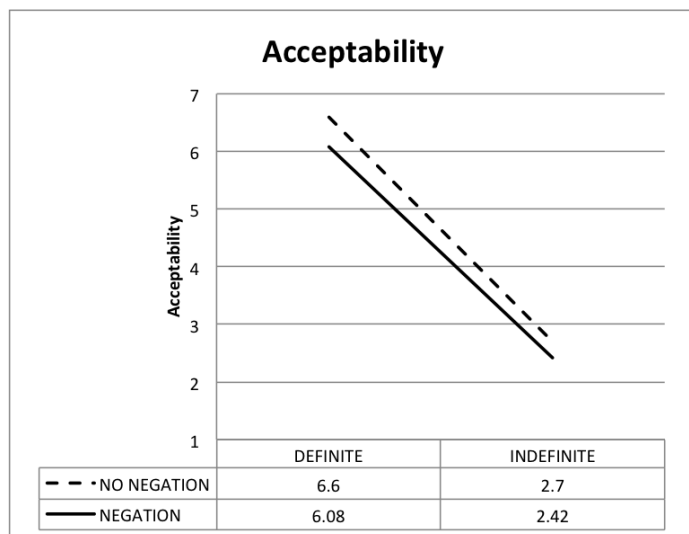


Figure 6.1: Mean acceptability of negated and unnegated sentences with a definite determiner or an indefinite determiner

## Discussion

The predictions of *Maximize Presupposition* are borne out. The definite is obligatory both in negated and unnegated sentences. So far, *Obligatory Implicatures* fails to make this prediction.

A slightly modified version of *Obligatory Implicatures*, however, could potentially capture the distinction between definites and indefinites, at least in simple affirmative sentences. The claim remains that the definite is obligatory when the sentence with the indefinite yields an unwanted exhaustivity implicature. However, the scales operated with can no longer be coming from information structure or the QUD but must be lexical. Taking the standard assumption that existential quantifiers are on the same Horn-scale with universal quantifiers, the implicature in (16-b.) is yielded by the existential claim in (16).

- (16) A boy is reading.
- a. Assertion:  $\exists x [\text{boy}(x)(w) \ \& \ \text{reading}(x)(w)]$
  - b. Implicature:  $\neg \forall y [\text{boy}(y)(w) \rightarrow \text{reading}(y)(w)]$
  - c.  $\rightarrow \exists y [y \neq x \ \& \ \text{boy}(y)(w) \rightarrow \neg \text{reading}(y)(w)]$

The implicature in (16-b.) requires there to be at least one boy who is not reading to not result in empty quantification, see (16-c.). The antiuniqueness

effect of the indefinite alone can thus be explained by assuming that it triggers a scalar implicature that requires there to be more than one item in the domain the indefinite quantifies over: "If 'some shoe' is to implicate 'not all of the shoes' then 'some shoe' should come with the the presupposition that there is more than one shoe" (Kratzer 2003). Unlike before, this inference does not hinge on whether a sentence is exhausted with respect to the QUD. The implicature in (16-b.) is a scalar implicature based on well-defined lexical alternatives (those that stand in an entailment relation).

However, this view is problematic for two reasons. First of all, "antiuniqueness" can be a much weaker inference than a presupposition or mandatory implicature. The sentence in (17) does not say that there is more than 6 ft long catfish. It only says that it is not known that there is *exactly* one (Heim 1991).

(17) Robert caught a 6 ft long catfish.

This is not predicted by theories that assume that antiuniqueness is a presupposition of the indefinite. Theories that work with *Maximize Presupposition* and assume competition with the definite in this case do make the right predictions, though. Pragmatic reasoning would only yield that it is not part of the common ground that there is exactly one 6 ft long catfish.

Second, it is hard to explain from the viewpoint of *Obligatory Implicatures* why all sentences in which quantifiers quantify over domains that are known to contain only one item result in infelicity, see (18).

- (18) a. #All fathers of the victim arrived.  
 b. #No father of the victim arrived.

The same holds for domains that are known to only have two individuals in them. Using the quantifiers "no", or "every" is infelicitous (see (19)) whereas the presuppositional counterpart is fine (see (20)).

- (19) a. #All arms of John are broken.  
 b. #No arm of John is broken.

(20) Both arms of John are not broken.

The oddness of these examples is not predicted under *Obligatory Implicatures*



since none of these sentences have implicatures that contradict the context. In fact, they do not have any implicatures at all. *Maximize Presupposition* provides an explanation for the facts since it operates under the assumption that each of these quantifiers are in competition with "the" and "both", respectively.

Another way of dealing with presuppositional versus non-presuppositional determiners is to assume that they are an exception to the cases discussed so far in that they *do* involve scales that operate on the presuppositional domain. The alternatives that are defined via these scales seem to be obligatorily active, independently from what the focus and QUD is. Moreover, these scales can be exhausted in the same way like the scales involved in implicatures. This is the core of a proposal by Magri (2009). He argues that an implicature account works when one adopts a grammatical theory of implicatures and further assumes that implicatures can be mandatory. The data in (20-a) and (20-b) actually speak in favor of such a grammatical approach to implicatures he claims. The heart of his proposal is that he adds another notion of entailment to the grammar besides ordinary logic entailment. This kind of entailment is entailment given common knowledge and includes propositions of the form "People have one father" and "People have two arms".

His proposal is based on two basic assumptions that makes use of this notion of entailment, the *Blindness Hypothesis* (BH) and the *Mismatch Hypothesis* (MH) given in (21) and (22) below.

- (21) The notion of entailment relevant for the definition of the exhaustivity operator EXH is that of logical entailment rather than that of entailment given common knowledge ( $W_{ck}$ ) (Blindness Hypothesis)
- (22) If the blind strengthened meaning of a sentence  $\varphi$  is a contradiction given common knowledge ( $EXH_{psp}(\varphi) \cap W_{ck} = \emptyset$ ), then sentence sounds  $\varphi$  odd (Mismatch Hypothesis)

The BH says that implicatures are blind to common knowledge, the MH says that they can be obligatory and hence obligatorily contradict common knowledge. Magri notes that this accounts for cases as the following.

- (23) Mary is conducting a survey on the first and last names of Italian children. She knows all Italian children inherit the last name of their father. All children of a given couple share the last name. This week she has interviewed five children of five couples in order to record their names.
- a.  $\varphi = \#$  Some children of couple C have a long last name.
  - b.  $\psi =$  The children of couple C have a long last name.

Magri assumes that  $\langle \text{some, the} \rangle$  is a Horn-scale, hence  $\varphi$  is a scalar alternative of  $\psi$  and  $\psi$  logically entails  $\varphi$  (the opposite doesn't hold, since there is a world, not compatible with common knowledge  $W_{ck}$ , where only some of the children of couple C have a long last name). Hence, the strengthened meaning of  $\varphi$  boils down to  $\varphi \wedge \neg\psi$  namely "Some but not all of the children of couple C have a long last name". This strengthened meaning is a contradiction given the piece of common knowledge that all the children inherit the last name of their father and thus have the same last name. Since this implicature is mandatory and blind to common knowledge the oddness of (23-a) is predicted.

Crucially Magri (2009) modifies the *Mismatch Hypothesis* and *Blindness Hypothesis* to work for presuppositions. He postulates a similar mechanism is at play for presuppositional versus non-presuppositional sentences with the same assertion. He assumes sentence  $\varphi$  containing a presuppositional item denote a partial function from possible worlds into truth values.  $\varphi_{psp}$  is the domain of such a function, namely the presupposition carried by  $\varphi$ . Strengthening is performed for the presupposition  $\varphi_{psp}$  of a sentence  $\varphi$  just as for the assertion. This is captured by the BH and MH modified for presuppositions, given in (24) and (25) below.

- (24) The notion of entailment relevant for the computation of the strengthened presupposition  $EXH_{psp}(\varphi)$  of a sentence  $\varphi$  is that of logical entailment rather than that of entailment relative to common knowledge.
- (25) If the blind strengthened presupposition of a sentence  $\varphi$  contradicts common knowledge  $W_{ck}$ , then  $\varphi$  sounds odd.

He shows how this works for the contrast between (26-a) and (26-b) below.

- (26) a.  $\varphi = \#$ Every child of couple C has a long last name.  
 b.  $\psi =$  The children of couple C have a long last name.

He assumes that distributive predication with definite subjects requires the predicate to be operated by the distributivity operator *Dist*. The distributivity operator *Dist* does something more according to him: It also introduces the so-called homogeneity presupposition, namely the presupposition that the property  $\llbracket \text{VP} \rrbracket^w$  either holds of all the atomic parts  $y$  of  $x$  or else does not hold of any of them. This is spelled out in (27) below.

$$(27) \quad \mathbf{Dist} \llbracket \text{VP} \rrbracket^w = \lambda x. \forall y [ y \leq_{AT} x \rightarrow \llbracket \text{VP} \rrbracket^w(y) ] \vee \forall y [ y \leq_{AT} x \rightarrow \neg \llbracket \text{VP} \rrbracket^w(y) ]$$

Now the domain restrictions of the sentences  $\varphi$  and  $\psi$  in (26) are given in (28) below.  $\varphi$  has all possible worlds in its domain whereas  $\psi$  is only defined in worlds where every child or no child of couple  $C$  have a long last name due to its presupposition.

$$(28) \quad \begin{array}{l} \text{a. } \varphi_{psp} = W \\ \text{b. } \psi_{psp} = YES \cup NO \\ \text{c. } YES = \{w : \text{every child of couple } C \text{ has a long last name in } w\} \\ \text{d. } NO = \{w : \text{no child of couple } C \text{ has a long last name in } w\} \end{array}$$

$\psi_{psp}$  logically asymmetrically entails  $\varphi_{psp}$ . Hence, the set of alternatives that are excludable with respect to  $\varphi$  is the following:  $Excl_{psp}(\varphi) = \{\psi\}$ . Following, the blind strengthened presupposition of  $\varphi$  boils down to (29) which says that the presupposition of  $\psi$  is false.

$$(29) \quad EXH_{psp}(\varphi) = \varphi_{psp} \wedge \neg \psi_{psp} = \neg \psi_{psp}$$

This strengthened presupposition of  $\varphi$  is hence that it is not the case that all or no children of couple  $C$  have the same last name. This is a contradiction given the piece of common knowledge that all the children of a given couple share the same last name. The oddness of the sentence  $\varphi$  in (26-a) is therefore predicted by the MH and BH for presuppositions.

Under Magri's theory all sentences with quantified NPs are in competition with sentences that are containing definite NPs. The sentences with *the* are the stronger alternatives since they are restricted to worlds where there is only one item in the domain of the subject DP whereas the domain of its competitors is not restricted. Hence, exhaustifying these competitors with respect to the presuppositional domain would lead to the mandatory inference that

there is not exactly one item in the set of fathers of the victim. This clearly contradicts what we know and hence the competitor has to be used.

Another possible view on the facts that is consistent with *Obligatory Implicatures* is to claim that the oddness of the sentences in (18) and (19) are not directly related to the fact that there is a competing item with a presupposition. Another hypothesis would be that these data show that there are restrictions on what suitable domains for different quantifiers are. Use of non-presuppositional determiners only becomes infelicitous if it is part of the common ground that the domain they quantify over contains only one or two individuals, that is when the number of items in the domain of the quantifier is no longer at issue. That is, even though *Maximize Presupposition* makes the right empirical predictions for the insertion of the definite it does not really provide an explanation for why we have this mechanism in our grammar. The key to understanding the facts might lie in the issue of what are appropriate questions to ask and what kind of questions are triggered with which quantifiers. Looking at the domains of quantifiers and their relation to the QUD triggered by the definite and other quantifiers might be revealing with regard to this question. To gain some further insight into this issue, the competition between the universal quantifier and the plural definite will be investigated in the next section. Based on the data, I will argue that there is a principled way of explaining under which circumstances using a quantifier leads to oddness. This explanation does not hinge on competition with the definite, even though the two issues are connected.

## 6.2 The plural definite

Even when assuming that for the cases of quantified determiners lexical scales are involved in the generation of an implicature, *Obligatory Implicatures* faces as problem when it comes to the competition between the definite (and "both") with the universal quantifier. Using the universal quantifier where the presupposition of "both" or "the" are fulfilled will give rise to a missing trigger inference. That is, *Maximize Presupposition* accounts straightforwardly for the oddness of (30-a.) (adopted from Magri (2009)) and (31-a.).

- (30) a. #All children of family B have a long last name.  
 b. The children of family B have a long last name

- (31) a. #All hand are broken.  
 b. Both hands are broken.

The universal quantifier is the strongest item on a Horn scale. No implicature is yielded by (31-b.) and (30-b.). Thus, *Obligatory Implicatures* has problems to account for the same data. The insertion of the trigger in these cases seems to be unrelated to the implicatures the sentences otherwise would have.

The purpose of this section is to show that *Obligatory Implicatures* can contribute something to the debate what the distinction between plural definite and universal quantifier is based on. In the following subsection, I will provide the theoretical background on what people have claimed the semantics of the plural definite to be. Then I will present some experimental background on the distinction between the definite and universal quantifier. In the last subsection I will present a reading time study that compared the plural definite with the universal quantifier. It will be shown that *Maximize Presupposition* does not make the right predictions for when the one has to be used over the other but that the picture is more complicated. It will be argued that the decision for using the plural definite and the universal quantifier does not hinge on the presuppositional status of these items alone; however, is connected to it. The difference will be argued to lie in the different QUDs they evoke. What is at-issue for quantificational sentences is presupposed for definites. This is mirrored in the questions they answer. The study provides insights into the question why all quantificational determiners are infelicitous with domains which are known to contain only one item. It is related to the fact what are felicitous questions to ask in a context.

### 6.2.1 The plural definite and the QUD

There are two basic types of theories that try to account for the distribution and meaning of the plural definite and how it contrasts with the meaning and distribution of the universal quantifier.

*Strong* theories assume that both the plural definite and the universal quantifier involve universal quantification over a set (Löbner 1985, Brisson 1996, Heim 2012, Büring and Križ 2013). For the definite, this universal quantification is usually assumed to be part of the presupposition; for the quantifier, it is part of the assertion. *Weak* theories assume that the plural definite introduces existential quantification and only receives a universal reading through

a strengthening mechanism. (Malamud 2012, Magri to appear).

If strong theories are correct then *Maximize Presupposition* would predict that the definite should always be preferred over the universal if a suitable plural referent is provided by the context. Since the universal quantifier is the strongest item on a Horn-scale and thus does not yield an implicature, no such preference for the plural definite in the same context would be predicted by *Obligatory Implicatures*.

An experimental study on the difference between the usage of the two items will be discussed in this section. It will be preceded by some theoretical discussion of the distinction between these determiners. Moreover, I will shortly review two previous studies which investigated the meaning of the plural definite, especially the issue of the availability of non-maximal/maximal readings. The study presented will add to this debate. Furthermore, it will give insights into the predictions of *Maximize Presupposition* and *Obligatory Implicatures* regarding the obligatory insertion of the plural definite. It seems that this insertion is driven by factors that go beyond the presuppositional status of the definite. Especially the status of the QUD in using the definite over the universal will be addressed. The findings suggest that the infelicity of using quantificational determiners in contexts where a specific domain is given might have a principled explanation that is only reflected in the principle *Maximize Presupposition*.

## 6.2.2 Theoretical background

A standard assumption is that plural definites, just like their singular counterparts, denote individuals of type  $\langle e \rangle$  (Heim 2012). They furthermore introduce a maximality presupposition saying that this individual is maximal in the context with respect to the property it combines with, see the lexical entry of "the" in (32-a.) and the relevant definition of maximality in (32-b.) (Heim 2012).

- (32) a.  $\llbracket \text{the} \rrbracket = \lambda P: \exists x \forall y [\text{MAX}(P)(y) \leftrightarrow x=y]. \iota x [\text{MAX}(P)(x)]$   
 b.  $\text{MAX}(P) = \lambda x. P(x) \ \& \ \neg \exists y [P(y) \ \& \ x < y]$

This definition of maximality extends to singular definites as well since the extension of a singular noun like "boy" can only contain atoms. When there are three individual boys in the scenario there is no unique maximal element

in the extension of "boy" and the presupposition would be false. However, for the plural "boys" there is a unique maximal element, the unique sum of all boys. Heim (2012) also notes that thus the presupposition of plural definites is merely existential because every non-empty set has a unique maximum. The difference to the universal quantifier is straightforward. For universal quantifiers maximality is asserted and not presupposed, see the lexical entry in (33).

$$(33) \quad \llbracket \text{all} \rrbracket = \lambda P. \lambda Q. \forall y [ P(y) \rightarrow Q(y) ]$$

The distinction based on a standard theory of definites and universal quantifiers is the level of interpretation at which maximality comes in.

There is another type of presupposition that plural definites have been associated with in the literature. It is referred to as the uniformity or homogeneity presupposition (Löbner 1985, Büring and Križ 2013, Križ 2015). Introducing this presupposition captures the observation that a plural predicate has to either hold of all the individuals that are part of the definite argument or none of them: "[...] if the referent is not homogeneous with respect to the predicate [...] the predicate will not yield a truth-value." (Löbner 1985). It has been argued to be the result of plural predication in combination with definite plural subjects (Beck 2001).<sup>2</sup>

Since homogeneity is presupposed in sentences with a plural definite it projects under negation. The sentence in (34-a.) is odd in the scenario described in (34) since there is one boy that did not go swimming. However, the sentence in [b.] is just as odd because it can only mean that all the boys did not go swimming which is also not true. As opposed to that, maximality and homogeneity can be negated in sentences with a universal quantifier as in (34-c.) (Büring and Križ 2013).

- (34) C: John, Bill and Mike went to the beach. John and Bill went swimming, whereas Mike stayed at the shore.
- a. A: # The boys went swimming.
  - b. B: # No, the boys didn't go swimming. Mike stayed at the shore.
  - c. B: No, all boys didn't go swimming. Mike stayed at the shore.

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<sup>2</sup>See Büring and Križ (2013) and Križ (2015) for a different view where the definite itself carries this presupposition

There is, however, a fact about plural definites that requires the above accounts to be adjusted. Definites *can* refer to a subset in the discourse if it is made salient, as in (35-b.) (adopted from Schlenker 2004).

- (35) 10 girls are in this class.
- a. 3 girls raise their hand.
  - b. The girls have a question.
  - c. All girls have a question.

Heim (2012) claims that in the case of (35) it is even the preferred option to refer to the smaller set - the three girls who raise their hand - with the definite. She argues that sub-pluralities are always more salient and that the definite is more sensitive to salience than the universal quantifier is. At first glance, there seems to be a straightforward solution to this problem for strong accounts given that the presupposition of the definite is quantificational in nature and thus should be sensitive to domain restriction. This is usually captured by inserting a covert domain restriction variable (von Stechow 1994, Heim 2003) into the semantic representation, see a modified lexical entry of "the" and the maximality operator in (36) below.

- (36) a.  $\llbracket \text{the} \rrbracket = \lambda P: \exists x \forall y [\text{MAX}_C(P)(y) \leftrightarrow x=y]. \iota x [\text{MAX}_C(P)(x)]$   
 b.  $\text{MAX}_C(P) = \lambda x. P(x) \ \& \ C(x) \ \& \ \neg \exists y [P(y) \ \& \ C(y) \ \& \ x < y]$

However, there are certain questions that arise with the assumption that the observed fact has to do with domain restriction and salience, the main one being: why is the universal quantifier not sensitive to salience in the same way?

There is a second, related, question regarding non-maximal readings of plural definites which is why using the definite is possible even when no salient sub-domain can be identified. A commonly discussed example in the literature is the one in (37) below (Yoon 1996, Brisson 1996, Schwarzschild 1996, Malamud 2012, Križ 2015).

- (37) I left the windows open.

The claim is that this sentence can be felicitously uttered even if the speaker did not leave all the windows open. Moreover, there does not need to be a salient sub-plurality in the discourse to which "the windows" could refer.



There have been different approaches to incorporating this observation into theories of the plural definite (Yoon 1996, Brisson 1996, Malamud 2012).

Brisson (1996) assumes that non-maximality is equivalent to what has been called "weak distributivity" (Beck 2001, Schwarzschild 1996). She proposes that a distributivity operator that comes with a contextually given Cover (Schwarzschild 1996) is operative in these cases. This Cover picks out salient subgroups, see the definition in (38). The analysis of a sentence like (39) with a distributivity operator that is sensitive to a Cover is given in (39-a.).

- (38) X covers Y iff
- a. X is a set of nonempty subsets of Y
  - b.  $\forall y [y \in Y] \exists x [x \in X] \rightarrow [y \in x]$
- (39) The girls <sup>*Distr*</sup> jumped in the lake.
- a.  $\forall x [x \in [ [Cov_i] ] \& x \subseteq [ [The\ windows] ] \rightarrow x \in [ [are\ open] ] ]$

Brisson (1996) argues that a cover can be ill-fitting with respect to the subject DP if there is no set of cells whose union is equivalent to the set of individuals in the DP. This fact allows for non-maximal reading like the one in (37). Brisson (1996) thereby "locates the source of non-maximality in the VP - more specifically, in the D operator, with its context-sensitive domain variable". She claims that adding the floating quantifier "all" will force the cover to be a good fit, i.e. no exceptions will be allowed, as in (40).

- (40) All the girls jumped in the lake.

This account of non-maximal readings also makes use of the fact that the Distributivity Operator is in its core a quantifier and involves a type of domain restriction, a so called Cover. The difference to the domain restriction account discussed before is that this cover can be "ill-fitting", it only needs to be a sub-plurality of the set quantified over. It does not have to be defined by a certain property within the context, i.e. it does not have to be a salient subgroup. This has the advantage that it can capture the exception cases mentioned above as well as all other non-maximal cases. As the term "ill-fitting" already suggests, non-maximal readings should always be the dispreferred option of using the plural definite. The account does not capture that the availability of non-maximal readings is dependent on specific factors. It seems to depend

on the number of exceptions as well as the number of individuals talked about in total in the context. When talking about only three boys who went to the shore as in (34-a), for example, the reading seems to be unavailable. Also its availability is dependent on whether the exceptions are relevant to the current issue or not, as is shown by antonym examples like in (41) (c. Križ 2015). Whereas (41-a.) could mean that a subset of glasses is dirty, (41-b.) means that all glasses are clean.

- (41) a. The glasses are dirty.  
b. The glasses are clean.

Based on these observations, a recent paper of Križ (2015) argues that the exception cases should be treated separately from cases as (35). The latter case, he claims, is in fact a maximal reading for a smaller domain. However, real non-maximality comes in through a quality implicature. In his account a maximal-reading is accepted when a sentence is "true enough" in the context. More precisely, the exceptions need to be irrelevant for the sentence to count as true.

A remaining problem for strong accounts like the ones reviewed so far is the contrast with the universal quantifier: why is only the maximal reading available for universal quantifiers? Brisson (1996) argues that "all" forces the cover to be a good fit, without explaining why this should be so. Križ (2015) claims that for the universal quantifier every exception is relevant. This is because even one exception makes the universal statement false whereas for the definite there is something like a gray zone where the sentence is "true enough" even though there is an exception. However, no formal account of this is provided. It is, moreover, a stipulation that there exists a notion of "true enough" for the definite but not the quantifier.

A very different approach to non-maximal readings is taken by Malamud (2012) and Magri (2014). They claim that the plural definite has a very weak semantics which is pragmatically strengthened in certain cases. In their view, the plural definite only presupposes existence of a group. In fact, Heim already noted that existence of a group is enough to satisfy the maximality presupposition of the definite since every set has a unique maximum. However, when assuming a weak semantics of the definite, the property described does not have to hold for all individuals in this group but can hold only for some of

them. Deriving an "all" semantics for "the" happens via some mechanism of pragmatic strengthening. These accounts do not face a problem when explaining non-maximal readings since this is just the core semantics of the plural definite. The question that arises for them is what the conditions are under which pragmatic strengthening happens or is disallowed.

Malamud (2012) calls her approach the "Decision Theory Approach", since it makes reference to decisions speakers and hearers make in a conversation to achieve certain goals. The basis of her approach is a combination of "Schwarzschild's proposal with a principled way of how and when the various interpretations arise." (Malamud 2012: 128) She notes that domain narrowing accounts, like the ones discussed above, face the problem that salience and relevance are not notions that are always relevant in account for the meaning of the plural definite. For example, to know the exact composition of the cover is not necessary for uttering (42-a.) felicitously. The semantics she introduces for a sentence like (42-a.) below are underspecified, they just state that a certain subpart of the plurality of windows is the agent for the possibly plural state of being open (see (42-b.)).

- (42) a. The windows are open.  
 b.  $\lambda w. \exists e. {}^{Distr}open(e, w) \ \& \ {}^{Distr}Ag(e) = \sigma x. {}^{Distr}window(x, w)$ <sup>3</sup>  
 c. Paraphrase: there is an event *e* which is an opening event and the agent of the event is the maximum of the plurality *x* such that *x* opens a window in *w*

Malamud (2012) attempts to spell out explicitly the contextual factors involved for when pragmatic strengthening happens. To explain under which circumstances a maximal reading of the definite is licensed, Malamud (2012) first introduces a relevance ordering for propositions, see the definition in (43).

- (43) Proposition *p* is more relevant (better to learn) for resolving DeP<sup>4</sup> than *q* ( $p > DePq$ ) iff

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<sup>3</sup> $\sigma$  is a sum operator and is defined as the supremum of the objects that are in extension of the plural predicate  ${}^{Distr}P$  (Link 1983). It is thus equivalent to Heim's MAX operator, defined above.

<sup>4</sup>DeP are decision problems agents in a conversation try to resolve. "A DeP is a triple  $\langle P, U, A \rangle$ , where the probability function *P* represents agent's beliefs, utility function *U* reflects the agent's preferences, and a set of (mutually exclusive) actions *A* the agent chooses from." (Malamud 2012: 129)

- a.  $p$  eliminates more actions as non-optimal than  $q$  does or
- b.  $p$  eliminates the same number of actions as  $q$  does, and  $q$  entails  $p$  (i.e.  $q$  is over-informative)

Furthermore, she introduces a deictic variable. the relevance operator REL, which encodes information about covers only when necessary and relevant to the hearer's goals (see Malamud (2012) for technical details).

Now the circumstances for strengthening are defined as follows: "the only way to force a maximal interpretation is for REL to produce a single most-relevant proposition, so that the existential quantification over propositions is over a singleton set."(Malamud:2012:131) In all cases where the relevance operator fails to identify a unique most-relevant proposition in the set, existential quantification over propositions is activated, which results in the weaker claim that one of the propositions in the set holds. For example, in the case of (42-a) above, if it is not relevant which windows are open because it is not essential for the hearer's goals, all propositions which state that some windows are open are equally most helpful. The non-maximal reading is thus accounted for<sup>5</sup>

A more recent theory by Magri (2014) shares the same spirit: "the plain meaning of a plural definite such as *the boys* is always just existential, whereby it is equivalent to the corresponding indefinite *some boys*. The universal meaning of the definite arises through a mechanism of *double strengthening*" (Magri (2014): 2) . Double strengthening through stacked exhaustivity operators is allowed, he claims, since both competitors, the definite and the indefinite, have an implicatures. "Some boys" triggers the first order scalar implicature "only some boys", whereas the definite triggers the second order implicature "not only some boys" which contradicts the implicature of the indefinite. His proposal is an extension of an analysis of plural morphology proposed by Spector (2007). Here the fact that the plural can mean "at least two" is also explained by double exhaustification. It is activated due to the fact that the singular is in competition with both the plural and "two", whereas the plural is only in competition with the singular. The inference of the plural disappears in downward-entailing contexts. Magri's proposal works similarly for the definite. Its maximal reading is yielded by double exhaustification, see (44).

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<sup>5</sup>Interestingly, she compares this mechanism with giving partial or full answers to a QUD. Whether these weak semantics for the definite arises with the same quantity as the mention-some reading of answers to questions is up for debate. It seems that both cases are indeed rather limited in their availability.

- (44)  $\llbracket \text{The} \rrbracket = \text{EXH}(\text{EXH}(\text{The}))$   
 $= \text{EXH}(\text{The}) \ \& \ \neg \text{EXH}(\text{Some})$   
 $= \text{THE} \ \& \ \neg (\text{Some} \ \& \ \neg \text{All})$   
 $= \text{All}$

In simple affirmative sentences this strengthening is the default and mandatory according to Magri (2014). In downward entailing environments this strengthening disappears. The definite under negation in (45-a.) patterns with the existential quantifier in (45-c.) not with universal in (45-b.).

- (45) a. Mary didn't see the boys.  
 b. Mary didn't see each of the boys.  
 c. Mary didn't see any of the boys.

The same holds for the definite embedded under "at most". In the context in (46-a.) using the definite is infelicitous, so is using the indefinite in (46-c.). However, the universal in (46-b.) is fine.

- (46) I know that there are three boys: Adam, Bill, and Carl. Furthermore,  
 I know that both Adam and Bill only saw some of the pictures. Thus.  
 . .  
 a. #At most one boy has seen the pictures.  
 b. At most one boy has seen all of the pictures.  
 c. #At most one boy has seen some of the pictures.

The non-maximal reading of the definite Magri (2014) assumes to be a case of a "sloppy reading" of the definite.

In sum, one can identify two main approaches to the semantics of the plural definite. There are strong accounts of plural definites that say that plural definites presuppose homogeneity (Löbner 1985, Magri 2014, Büring and Križ 2013) and maximality (Heim 2011). Under this view the definite universally quantifies over a set and is thus in direct competition with the universal quantifier. The only difference is that for the universal the maximality component is part of the assertion, whereas it is part of the presupposition for definites. These approaches assume that the pragmatically weaker, non-maximal readings occur due to salience constraints of the plural definite (Heim 2011, Brisson 1996). To formalize this the maximality operator in the presupposition of the

definite can be made sensitive to a domain restriction. An alternative is to assume a cover variable for the distributivity operator that is always active in plural predication with definite subjects (Brisson 1996, Schwarzschild 1996). A question that arises is why weakening is disallowed for the universal quantifier. Whereas some proposals point in the direction that the relevance of exceptions plays a role, this is not spelled out formally. There are also weak accounts of the plural definite which say that non-maximality is the core meaning of plural definites. They existentially quantify over a sub-plurality. Maximality comes in through pragmatic strengthening which is either default (Magri 2014) or relevance driven (Malamud 2012). Under this view, the definite plural should have a weaker meaning than the universal quantifier.

In how far these theories make the right empirical predictions has not been subject to much investigation. In the next section, two experiments will be reported that have tested some of the assumptions outlined in the previous section. After that a study on the distinction between the universal quantifier and the plural definite will be reported that sheds further light on the issue. I will argue that strong theories do make the right predictions and that the issue of domain narrowing is, in fact, related to whether quantification over a set is part of the assertion or presupposition. It will be shown that *Maximize Presupposition* is not fully equipped to account for the competition but that the distinction requires incorporation of the notion of a QUD.

### 6.2.3 Previous experimental work

In this section I will report two recent studies directly contrasting weak and strong theories of plural definites. Both use the universal quantifier as a control item in their experiments and are therefore also revealing with regard to the differences between the two.

Schwarz (2013) uses a reaction-time study with a picture verification task to test the predictions of strong and weak theories. He summarizes those predictions as follows: Under the strong account, the literal meaning of a definite is a maximal one, whereas non-maximal interpretations are derived pragmatically. Thus the non-maximal readings should be slower than the maximal one since they require additional pragmatic reasoning. On the weak account, the literal meaning of statements with plural definites either involve (the equivalent of) existential quantification or are underspecified with respect to maximality. In

this case non-maximal interpretations are based on the literal meaning alone, whereas maximal ones require pragmatic strengthening. Accordingly, maximal interpretations should be slower than non-maximal ones.

In the experiment, participants were presented with a picture with nine dots. Depending on the condition some or all of the dots were black. The design tested when and how fast non-maximal readings were derived depending on several factors. First, it was tested whether the clustering of the shapes of the relevant color plays a role in how readily available these non-maximal readings are. Then, it was looked at in how far the number and proportion affects non-maximal interpretations. Moreover, the influence of whether something like a standard set by other shapes present in the display might affect the willingness to give a non-maximal judgment was tested.

First, Schwarz (2013) looked at the proportion of maximal readings for the plural definite depending on these factors. He found that there was a majority (70%) of maximal response choices, and 30% non-maximal response choices in average over all conditions (meaning 30% of the time people said the sentence with the plural definite is true in contexts where not all of the dots were black). A fully contiguous distribution of black circles yielded a significant increase in non-maximal responses. Looking at the reading times next, they found that non-maximal responses took significantly longer than maximal ones. Schwarz (2013) argues that the results show, first, that maximal readings are preferred over non-maximal readings and, second, that maximal readings most likely do not involve additional pragmatic reasoning processes.

Schwarz (2013) claims that the findings are not consistent with the view that statements with definite plurals and distributive predicates generally involve a homogeneity presupposition due to the limited availability of non-maximal interpretations. He furthermore notes that the variation observed between the conditions cannot be explained in terms of Malamud's (2012) analysis. The goals of the speaker or hearer did not vary between the tasks and the trials and thus did not influence the choice for a maximal/non-maximal interpretation. Schwarz (2013) thus concludes that non-maximal answers are really based on a maximal semantics, but that maximality only has to hold within a restricted domain. He mentions that more needs to be said on such an analysis to account for the differences between definite plurals and other quantifiers. He points out that no comparable weakening is possible with the universal quantifier.

Schwarz's findings are thus consistent with strong approaches to plural definites, that assume pragmatic weakening through domain restriction or covers, such as Heim's (2011) or Brisson's (1996) analyses. His results also suggest that the exceptions do play a role in the decision whether a maximal reading is available. Color and shape of the circles that did not fit the description influenced the availability of maximal readings.

The goal of Kriz and Chemla's (2014) experiment was to find truth-value gaps for the cases where the plural definite did not refer to the maximum. That is, they tried to prove that the presupposition of the plural definite was not satisfied when the definite referred to a subset of individuals in the discourse. For that purpose, they also used picture verification tasks with colored dots. They tested plural definites with two groups of participants, one had the choice between the judgments *completely true* and *not completely true*, the other had the choice between *completely false* and *not completely false*.

They found that in a "gap"-situation - when a definite referred to a subset of dots in the picture and the presupposition was not satisfied - the completely false and completely true judgments do not add up to 100, as in a regular false situation.

They show that there is a statistical interaction between sentences ("the" vs "all") and true-corresponding responses in the two tasks (comparing *completely true* vs *not completely false*). There are more *not completely false* responses than *completely true* responses in the gap condition, but only for the *the* sentences.

Križ and Chemla (2014) argue on the basis of these data that they found evidence for a truth-value gap for the "the" condition. Participants are reluctant to make absolute judgments for the non-maximal cases whereas they are very clear on judging the sentences with universal quantifiers true or false. A question that arises with the design of the experiment is: What does it mean for something to not be completely false? The authors note themselves that in the absence of "completely" no clear gap was found and the results could not be reproduced.

Both studies thus found evidence suggesting that the plural definite is based on a maximal semantics. However, two issues remain unresolved. The first one is the question of relevance and salience. It is hard to judge based on a set of dots what is relevant and irrelevant or even more or less salient information. The results from Schwarz (2014) point in the direction of certain factors



influencing the decision. However, they are not revealing with respect to the linguistic contexts that furnish maximality. A related issue is the question of contrast with the universal quantifier. It does not allow for the same restrictions and does not produce a truth-value gap. However, no explanation so far is given for why this should be so. The next section will present a study on the difference between the two lexical items using linguistic material. An analysis will be provided that uses the QUD to account for their respective distribution and use.

## 6.2.4 Reading time study

### Idea and material

The general idea behind the experiment was to test the predictions of the weak and strong theories outlined above. Instead of presenting pictures with dots, linguistic material was used for the contexts in which the universal quantifier or plural definite were presented. Contexts were created that introduced a set of individuals with a numeral (first context sentence, (47-a.)) and then established a subset of this set of individuals with a partitive construction (second context sentence, (47-b.)).

- (47) a. In die Sprechstunde von Hannes kommen acht Studenten.  
'Eight students are coming to Hannes' office hours.'
- b. Fünf der Studenten kommen aus Tübingen.  
'Five students are from Tübingen.'

In addition to the context, two target sentences were created. The first target sentence either had a plural definite, (48-a.), or a universal quantifier in it (48-b.).

- (48) a. Die Studenten brauchen eine Unterschrift von Hannes.  
'The students need a signature.'
- b. Alle Studenten brauchen eine Unterschrift von Hannes.  
'All students need a signature.'

The assumption was that, by that time, participants had to decide whether the NP containing the definite or universal quantifier referred to the bigger or smaller set in the context. Importantly, a bias towards one or the other

option was tried to be avoided. As opposed to the example in (35) there was no obvious connection between the property of the sub-plurality introduced and the property the definite/universal combined with in the target (for the example case in (47) and (48) being from Tübingen and needing a signature). The second target sentence was meant to disambiguate. It referred back to the set mentioned in the previous test sentence with a numeral, either the smaller or bigger one used in the context. Moreover, a discourse connective "deshalb" ("this is why") was used to make clear that the two targets were related by content (referred to the same set).<sup>6</sup> This way it became clear with the second target whether the set referred to with the definite or universal quantifier was the bigger or smaller set introduced in the context. An example is given in (49).

- (49) Deswegen gibt Hannes acht/fünf Studenten seine Unterschrift.  
'This is why Hannes is giving his signature to eight/five students.'

Two independent factors were manipulated for the study. First, the quantifier used in the first target was manipulated. The sentence either contained a definite determiner (DEF) or universal quantifier (QUA). Second, it was manipulated whether the numeral in the second target picked up the smaller (SMALL) or bigger (BIG) set in the context. The two conditions QUANTIFIER and SIZE OF DOMAIN were crossed. Accordingly, there were four conditions in total in the study: QUABIG, QUASMALL, DEFBIG, DEFSMALL. Six items were created per condition which made a total of 24 items.

## Procedure

32 participants (German native speakers) first saw and read the context as a whole on a computer screen. The experiment was programmed with the software E-Prime. A moving window technique was used for the target sentences so that the reading times could be measured on-line. The sentences were presented to the participants word by word. The exception to this were the critical NPs in the target sentences ("All /The students" and "eight/five students" in the example above) which were presented as a unit, respectively.

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<sup>6</sup>That was necessary since using the numeral after already having introduced the set violated the novelty-condition (Heim 1982). Since this violation appeared in all conditions, it is expected to influence the results evenly across conditions and was not considered a factor for the analysis.

After reading the context and target sentences people were asked how coherent they thought the whole discourse was on a scale from 1 to 5 (5 being totally coherent). For the analysis, the reading times on the critical NPs targets were considered. Especially interesting was the NP ("eight/five students") in the second target. At this point it turned out whether the decision made regarding the domain of quantification for the universal/plural definite in the previous sentence was correct.

## Predictions

First, I want to summarize once more the empirical predictions of the theories discussed for the reading times and coherency of these sentences, especially their predictions in interaction with *Maximize Presupposition*. Strong accounts of the plural definite assume that it presupposes uniformity and maximality. They predict that the definite should preferably refer to the bigger set mentioned in the context. This is because the presupposition of the definite would otherwise be violated<sup>7</sup>. Reading times should be lower in the DEFBIG condition than in the DEFSMALL condition on the second target sentence. The discourse should be judged more coherent in the DEFBIG condition. In combination with *Maximize Presupposition*, this theory would predict that the definite should be judged more coherent with the bigger set than the quantifier (DEFBIG over QUABIG) since the definite presupposes what the quantifier merely asserts.

If weakening through domain restriction is possible for the definite in the same way as it is for other quantifiers, a similar behavior of the universal and the definite in reading times and coherency is expected. Two possible restrictions are available in the discourse. Accordingly, a real ambiguity should be observed. In combination with *Maximize Presupposition*, the definite should always be better than the quantifier since the domain restriction is part of the presupposition.

If, however, the definite is somehow more reactive to salience as claimed by Heim (2012) then it should also be better than the universal in referring to the smaller set. This is because the sub-plurality that is mentioned last should be more salient in the context. The reading times would then expected to be higher for DEFBIG than for DEFSMALL. However, no such difference would

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<sup>7</sup>Assuming that restricting the domain is not allowed

| Theory          | Predictions Coherence | Prediction RT     |
|-----------------|-----------------------|-------------------|
| Strong / MaxPSP | DEFBIG>QUABIG         | DEFSMALL>QUASMALL |
| Strong+DomRestr | DEFBIG>QUABIG         | DEFBIG<QUABIG     |
|                 | DEFSMALL>QUASMALL     | DEFSMALL<QUASMALL |
| Weak            | DEFSMALL>DEFBIG       | DEFBIG>DEFSMALL   |

Table 6.1: Theoretical predictions for reading times and coherency judgments for sentences with the plural definite and universal quantifier

be expected for the quantifier (if anything, the reading times should display the opposite behavior).

According to the weak accounts, a non-maximal reading corresponds to the literal interpretation of the definite. There is no need for strengthening for reasons of relevance in the sense of Malamud (2012). Weak accounts would thus predict the definite being to be judged more coherent when referring to the smaller set than when referring to the bigger set. Reading times should be higher with the bigger set than with the smaller set. If "blind" doubled strengthening is performed in the sense of Magri (2014), the definite should be better with the bigger set. However, in the DEFSMALL condition this obligatory implicature has to be canceled. Accordingly, increased reading times on the second target and a lower coherency for the DEFSMALL condition than for DEFBIG would be expected.

The predictions for coherency judgments and reading times on the critical NP ("five/eight students") in the second target are summarized in table 6.1.: the symbol ">" means "faster than" for reading times, it means "more acceptable" for the coherency judgments.

## Results

The results of the experiment are summarized next. First, the coherency judgments will be reported, then the results for reading times will be discussed. Analyses were carried out using the R programming language (R Development Core Team) as linear mixed effect models (Baayen, Davidson, and Bates 2008), using the program *lmer* (Bates 2005). The fixed factors were SIZE OF SET (big/small) and QUANTIFIER (the/all). Random factors were subjects and items. Additionally, models with random slopes for both subjects and items

were calculated. When an ANOVA revealed a significant difference between the models, the more complex one was chosen.

For the acceptability ratings, there was a highly significant interaction between the two conditions SIZE OF DOMAIN (BIG/SMALL) and type of QUANTIFIER (DEF/QUA) for coherency ( $p < .01$ ). There was no main effect of QUANTIFIER. However, there was a significant main effect of SIZE ( $p < .01$ ): the definite and the universal quantifier were judged more coherent when referring to the bigger set than to the smaller set ( $M = 3.7$  versus  $M = 2.5$ ).

There were also significant simple effects of SIZE for both the quantifier and definite ( $p < .01$ ). Both simple effects were in the same direction. The universal quantifier was judged more coherent with the bigger set ( $M = 3.9$  versus  $M = 2.2$ ). Also, the plural definite was judged more coherent with the bigger set ( $M = 3.5$  versus  $M = 2.7$ ).

Interestingly, there was another simple effect of quantifier for the two conditions SMALL and BIG set ( $p < .01$ ). Referring to the smaller set was more coherent with the definite than with the universal ( $M = 2.7$  versus  $M = 2.2$ ). When the bigger set was meant, the universal quantifier was judged more coherent than the definite ( $M = 3.9$  versus  $M = 3.5$ ). Results are summarized in figure 6.2 below.

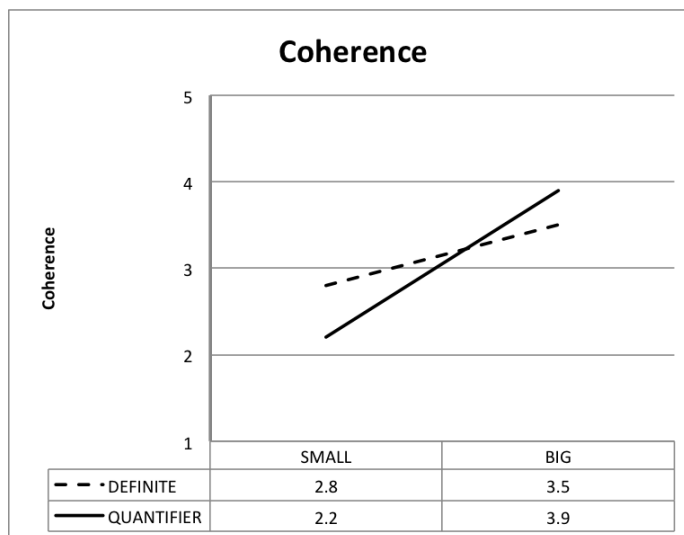


Figure 6.2: Average coherency judgments for sentences with a definite determiner or universal quantifier when referring to the bigger or smaller set mentioned in the context

For the reading times, there was a marginally significant interaction on the critical word between size of domain and type of quantifier in reading times ( $p < .09$ ). In the DEF condition the critical NP ("five/eight students") in the second target was read slower when the bigger set was referred to; it was read faster with the quantifier when the bigger set was meant. There were no main or simple effects for reading times on the critical word. There were no other reading time effects on the first word, critical word+1, or final word. The interaction on the critical word is shown in 6.3 below.

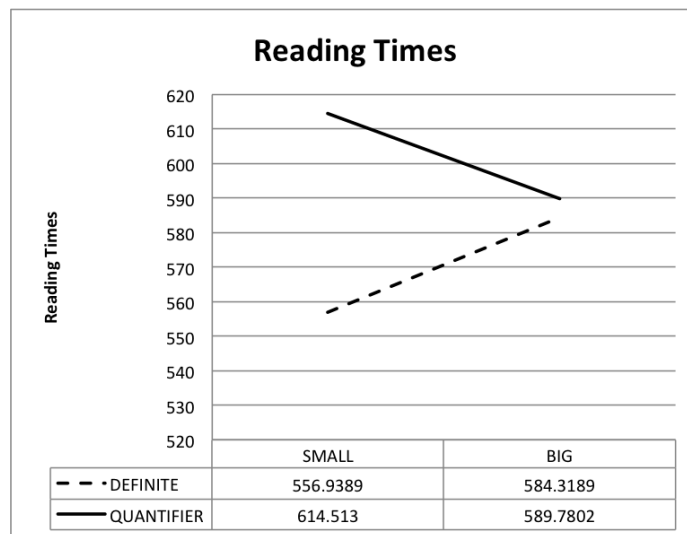


Figure 6.3: Average reading times of the critical region referring back to the smaller or bigger set mentioned in the context ("5/8 students") in the second target depending on the quantifier used in the first target

## Discussion

In sum, the results show that a maximal interpretation is the default and preferred interpretation for definites. Discourses where the definite refers to the more salient sub-plurality are perceived as less coherent than in the cases where it refers to the bigger set. The definite is not better in referring to the bigger set than the universal quantifier, however. This speaks against a strict version of the strong theory (disallowing domain restriction) in combination with *Maximize Presupposition*. The definite is better at referring to the smaller set than the universal quantifier. The results can thus also not be explained by a theory which assume that both quantifier and determiner always allow for domain restriction in combination with *Maximize Presupposition*. This theory

predicts that the definite is always preferred due to its presupposition.

Which one of the quantifiers is preferred, crucially changes with the size of domain referred to. That is, whereas restricting the domain is possible for the definite (albeit it not being the first interpretation), domain narrowing is strongly dispreferred for the universal quantifier. This is also reflected in the difference in reading times on the critical word depending on quantifier and size of the set. The universal is read faster when referring to the bigger set, the definite faster when referring to the smaller set.

In accordance with the results from Schwarz (2013), a strong theory that allows for pragmatic weakening seems to make the right predictions for the use of the plural definite. This kind of theory has to still specify (a) under which circumstances domain narrowing is allowed for the definite and (b) why it is not allowed for the universal.

I want to argue that the key to answering both these questions is the level of meaning where domain restriction plays a role. Whereas the domain restriction is part of the assertion and thus at-issue content for the universal it is part of the presupposition for the definite. The approach is in line with the observation of Križ (2015) that for the universal exceptions are relevant. I assume that this is because quantity and maximality are directly at issue for the universal, creating a QUD of the form "How many P are/did Q?".

For definites it seems that the issue which domain we are talking about (including the issue what the size of the domain is) needs to be resolved since the existence of such a domain is presupposed. Definites do not answer a question of quantity but of reference. What is at issue for the sentences with plural definites is whether the property described by the VP holds of the individuals in that given domain or not. There were two possible sets of individuals/domain restrictions that could verify the presupposition in the experiment. In the case with the definite, the QUD changes and people are confronted with a genuine ambiguity. It depends on what kind of question they accommodate: What did the x in the bigger/smaller set do?

As opposed to the cases with the universal, using the definite with the smaller or bigger set is not a question of informativity but about failed reference. When asking about the bigger set it would be strange to answer what the smaller set did (even when an entailment relation holds), compare the example in (50).

- (50) A: There are ten students in my class, 4 boys and 6 girls.
- a. B: Did the girls submit their homework?
  - b. A: # The students did.
  - c. A: All students did.

To make the analysis of the two quantifiers which is in line with the experimental results more explicit, let me return to the most commonly discussed example discussed in the literature, repeated in (51), again to illustrate this point.

- (51) There are ten girls in this class.
- a. 3 girls raise their hand.
  - b. All girls have a question.
  - c. The girls have a question.

It seems very clear that the "girls in this class" mentioned in (51) function as the domain restriction for the existential statement in (51-a.). That is, the existential quantifier behaves as predicted and is sensitive to domain narrowing. The semantic representation of the two context sentences in (51) and (51-a.) are provided in (52-a.) and (53-b.).

- (52) [ [ 10 girls ] are in this class ]
- a.  $\exists x[\text{girls}(x) \ \& \ \text{in this class}(x) \ \& \ \text{card}(x)=10]$
- (53) [ [ 3 girls C ] raise their hand ]
- a.  $g(C) = \lambda x. x \text{ is in this class}$
  - b.  $\exists x[\text{girls}(x) \ \& \ g(C)(x) \ \& \ \text{raise their hand}(x) \ \& \ \text{card}(x)=3]$   
 $\exists x[\text{girls}(x) \ \& \ \text{in this class}(x) \ \& \ \text{raise their hand}(x) \ \& \ \text{card}(x)=3]$

The QUD that is answered with the quantificational statement in (53) is supposed to be the one in (54).

- (54) [ [ How many girls raise their hand ]<sup>g</sup> =  
 $\lambda p. p = \lambda w. \exists n \exists x[\text{girls}(x)(w) \ \& \ \text{raise their hand}(x)(w) \ \& \ \text{card}(x)(w)=n]$

This question is already quantificational in nature. To make it relevant to the context, it is probably about the only set of girls available in the context up to this point, which are the "ten girls in the class". That is, the domain



restriction that is operative in (54) is supposed to be already encoded in the semantics of the question, see (55).

- (55)  $\llbracket \text{How many}_C \text{ girls raise their hand} \rrbracket^g =$   
 $\lambda p.p = \lambda w.\exists n\exists x[\text{girls}(x)(w) \ \& \ \text{in this class}(x)(w) \ \& \ \text{raise their hand}(x)(w)$   
 $\ \& \ \text{card}(x)(w)=n]$   
 'How many girls in this class raise their hand?'

Since restricting quantification is assumed to already be involved in the question, the decision for C depends on the accommodated QUD. I assume that, without further contextual pressure, this C has to remain stable as long as the QUD stays quantificational in nature. (51-b) clearly also answers a quantificational question. In this case, the question set is assumed to be restricted to the lexical alternatives "some" and "all". Moreover, the C it used remains the same as before. That is, (51-b) is supposed to answer the following QUD in (56).

- (56)  $\llbracket \text{Did some}_C \text{ or all}_C \text{ girls have a question} \rrbracket^g =$   
 $\lambda p.p = \lambda w.\exists x[\text{girls}(x)(w) \ \& \ \text{in this class}(x)(w) \ \& \ \text{have a question}(x)(w)]$   
 $\vee p = \lambda w.\forall x[\text{girls}(x)(w) \ \& \ \text{in this class}(x)(w)] \rightarrow \text{have a question}(x)(w)$

This analysis captures the observation that even the smallest exceptions make a difference for making a truthful statement (answer the QUD truthfully) with the quantifier (c. Križ 2015). The question is not about a property that a certain group possesses or not but about the quantity of individuals who have this property. Making "some girls have a question" true and not "all girls have a question" requires there to be at least one girl who does not have a question. That is one exception is enough to make the stronger meaning false and the weaker automatically true.

The analysis works with the stipulation that it is a pragmatic default to maintain the same domain restriction for quantificational questions within one context. However, this seems to fit the empirical picture. Without further indication that the domain changed, C will remain stable, compare the example in (57).

- (57) I have ten students in my class.  
 a. Five students are from Berlin.

- b. Three/ Some students are blond.

It seems that the statements in (57-a.) and (57-b.) make claims about different sets of students in my class. With enough contextual pressure this default can be overruled. Several factors, like how big the sub-plurality considered is, and what relations are expressed by the statements, overrule this constraint, compare (58).

- (58) I had 60 students in my Introduction to Semantics class.
- a. 20 students received a grade better than "good".
- b. All students attended the tutorial regularly.

The example shows that if there is an explicitly relation and a big enough set, "all" can refer to sub-pluralities. Note that the data on "all" could be explained without assuming that C is predefined by the question. Rather, universal statements with different domain restrictions could be considered to be in competition ("Did all 3 or did all 10 girls ask a question?"). The biggest domain restriction is chosen because the universal statement is thus the strongest according to the "Strongest Meaning Hypothesis" (Dalrymple et al. 1998). The preference to refer to the bigger set with "all" would be predicted. This is because "all girls in this class have a question" entails "all girls in this class who raise their hand" have a question. However, this would make the wrong predictions for "some". For sentences with an existential, the entailment patterns for (51) are reversed since "some" is upward monotonic. "Some students in this class are blond" does not entail that "some students from Berlin in this class are blond" but vice versa. A preference for using "some" with the smaller set should thus be observed which does not fit the empirical picture. By saying that domain restrictions are specified in the question and preferably remain stable through using different quantificational statements the data are more accurately explained.

The definite plural is assumed to pattern differently from the universal because it evokes a different QUD. The lexical entry of the definite is repeated in (59).

- (59) a.  $[[\text{The}]] = \lambda P: \exists x \forall y [MAX_C(P)(y) \leftrightarrow x=y]. \iota x. MAX_C(P)(x)$
- b.  $MAX_C(P) = \lambda x. P(x) \& C(x) \& \neg \exists y [P(y) \& C(y) \& x < y]$

"The girls" in (51-c) has two possible referents, the ten girls in the class and

the three girls that raise their hand (and are in this class). This corresponds to two different domain restrictions the maximality operator can take, see the two different referents that are possible in (60) and (61) below.

- (60) a.  $\llbracket \text{The girls} \rrbracket = \iota x. \text{girls}(x) \ \& \ \text{in this class}(x) \ \& \ \neg \exists y [\text{girls}(y) \ \& \ \text{in this class}(y) \ \& \ x < y]$   
 $= \iota x. (\text{girl}_1 + \dots + \text{girl}_{10})(x)$   
 $= \text{GIRLS}_{10}$
- (61) a.  $\llbracket \text{The girls} \rrbracket = \iota x. \text{girls}(x) \ \& \ \text{raise hand}(x) \ \& \ \text{in this class}(x) \ \& \ \neg \exists y [\text{girls}(y) \ \& \ \text{raise hand}(y) \ \& \ \text{in this class}(y) \ \& \ x < y]$   
 $= \iota x. (\text{girl}_1 + \text{girl}_2 + \text{girl}_3)(x)$   
 $= \text{GIRLS}_3$

There are thus two different meanings for (62-a.), depending on which of the plural individual in (60) and (61) is taken, see (62-b.) and (62-c.).

- (62) a.  $\llbracket \llbracket \text{The girls} \rrbracket \llbracket *[\text{have a question}] \rrbracket \rrbracket$   
 b.  $\forall y [\text{AT}(y) \ \& \ y \leq G_{10} \rightarrow y \text{ has a question}]$   
 c.  $\forall y [\text{AT}(y) \ \& \ y \leq G_3 \rightarrow y \text{ has a question}]$

The question that is answered by (51-c) is one about individuals who have a question. Given that the contexts only contains two (plural) individuals the restricted question set for this question is presented in (63).

- (63)  $\llbracket \text{Who has a question} \rrbracket = \lambda p. \exists x. [p = \lambda w. \text{person}(x)(w) \ \& \ \text{has-a-question}(x)(w)]$   
 $= \lambda p. p = \lambda w [ \text{GIRLS}_{10} \text{ has a question in } w ] \vee p = \lambda w [ \text{GIRLS}_3 \text{ has a question in } w ]$

Without further contextual input, it is just ambiguous what set of girls is meant by "the girls", i.e. which of the two answers in the question set is given by (35-b). In this case, however, the "Strongest Meaning Hypothesis" could explain the preference for referring to the bigger set. Since "the girls in this class have a question" entails "the girls who raise their hand in this class" have a question, the former is the stronger statement and thus has to be used. However, the option to refer to the smaller set remains genuinely available. If there is contextual pressure to resolve the ambiguity in a way that will make the definite refer to the smaller set, then this will be the preferred option (over

using the strongest claim as the default). This is what is supposed to happen for the standard example in (51).

It seems that *Maximize Presupposition* would predict a general preference of using the plural definite over the universal quantifier when there is a plural set in the context that it can refer to. This is not the case. The choice of quantifier is dependent on other discourse factors, especially what the QUD is. Based on the data it is doubtful that these items should be considered to be truth-conditionally equivalent in one and the same context. Whether they make the same assertion depends on the choice of domain. This again depends on several factors, and different ones for the quantifier and definite. For the quantifier number of items in a domain is at issue, exceptions are thus not allowed. Moreover, there is a preference for keeping the domain stable for all quantificational questions in one and the same context. For the definite, the number of items and the composition of the domain is not at-issue. There is a real ambiguity of reference with more than one set in the context. There is a preference for using the stronger claim within set of answers if the ambiguity cannot be resolved based on context. It is important to note that the system still requires there to be a principle *Maximize Presupposition*. It is operative in the question set of the QUD. The alternatives evoked have to be defined in the context.

This analysis offers a new perspective on why quantifiers cannot combine with domains known to contain only one individual. The question a sentence with a quantifier evokes is "Do some or all  $x$  in  $C$  do  $P$ ?". This is an infelicitous question to ask given that neither of the answers in the question set can ever be false in a world where it is presupposed that there is only one  $x$  in  $C$ . Apart from applying a principle like *Maximize Presupposition* the data can thus be explained by assuming that there is a ban on introducing questions whose possible answers are truth-conditionally equivalent. Since universal quantifiers evoke QUD with only two alternative propositions in their question set, it is infelicitous to use them when there is no world where one of them could be false. However, given the facts about embedding, this would require the assumption that these questions arise below the level of the clause.

### 6.3 Summary and outlook

The data presented in section 6.1. speak in favor of an analysis of obligatory definites that makes use of the principle *Maximize Presupposition*. It seems that the obligatory insertion of definites is not related to an implicature yielded by exhaustifying a QUD. Rather it looks as if lexical competition between the indefinite and definite does play the crucial role in inserting the definite obligatorily. This is supported by the finding of the study conducted on the insertion of the definite under negation. The results suggest that the definite is obligatory under negation. This is expected under *Maximize Presupposition*. *Obligatory Implicatures* does not predict the definite to be obligatory in affirmative sentences or under negation since exhaustification of a sentence with an indefinite with regard to the QUD is not contradictory to a context which entails the presupposition of the definite.

In section 6.2. the question was pursued whether there is a principled explanation for why all quantifiers, not only the indefinite, cannot be used with domains known to only contain one individual besides assuming a competition with the definite. A study was reported on the use of the definite plural and universal quantifier. It was shown that the presuppositionality of the definite is not the defining factor in the competition with the universal quantifier. When one is preferred over the other is dependent on the different types of contexts, especially the size of domain talked about. I propose that the questions that are generated by the quantifier and the definite are different. Moreover, I assume that there are restrictions on what these questions have to look like. An appropriate question set must contain alternatives which are truth-conditionally distinct. This explains why universal quantifiers in general do not work with singleton domains. For the definite, there is a restriction on the question set, too: The alternatives therein must be individuals and thereby must all observe the principle *Maximize Presupposition*. However, more research is needed on the topic, especially regarding these questions being active in embedding structures.

The data together suggest that competition between presuppositional determiners and their non-presuppositional counterparts is activated obligatorily and below the level of the clause. Rather than assuming that *Maximize Presupposition* is a purely pragmatic principle one could entertain the idea that the principle is operative on the level of morpho-syntax. Based on the empir-

ical data I would like to suggest that *Maximize Presupposition* is applied for definiteness and other features. One background assumption is that whether definiteness is expressed morphologically is a question of the grammar of a specific language. Features license the overt realization or not in a language. In English, having an article is obligatory, with the exception of the bare plural (Heim 2012).

(64) Books arrived.

Based on this observation, Heim (2012) argues that definiteness should be considered a feature, see the lexical entries for the features +/- DEF in (65) below.

- (65) a.  $\llbracket [-\text{DEF}] \rrbracket = \lambda P. \lambda Q. \exists x [P(x) \ \& \ Q(x)]$   
 b.  $\llbracket [+DEF] \rrbracket = \lambda P: \exists x. \forall y. [\text{MAX}(P)(y) \leftrightarrow x=y]. \iota x [\text{MAX}(P)(x)]$

There is cross-linguistic evidence for this view as well. In languages like Danish, the definiteness feature is not only visible on the determiner, but also on the adjective (Katzir 2011):

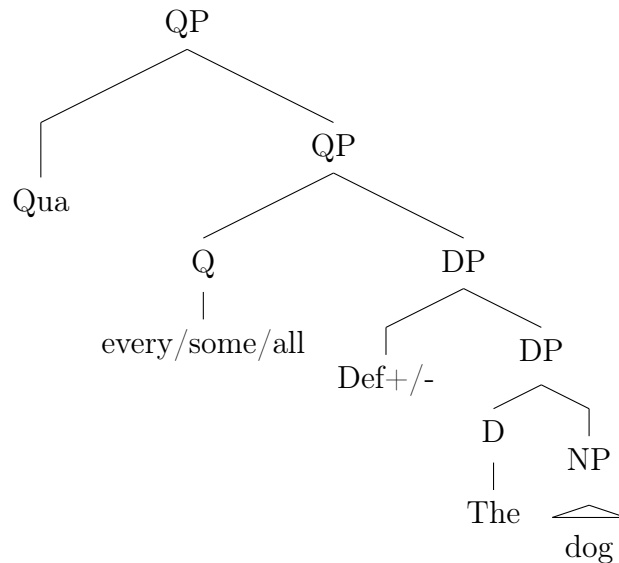
- (66) den stor-e gaml-e hest  
 DEF big old horse  
 'the big old horse'

Depending on the syntactic configuration, it can also be expressed on the noun itself:

- (67) hest-en  
 DEF horse  
 'the horse'

According to Katzir (2011), grammar dictates the morphological realizations of features like definiteness, while the economy principle restricts their distribution. Adopting this view, I assume the following structure for an English Determiner Phrase:

(68)



Every DP is c-commanded by a QP which is headed by a quantifier. A quantificational interpretation of the NP is blocked when the D head is filled, the existential/universal feature the quantifier carries cannot associate with the Noun across the D head. The D head is obligatorily filled with "the" in English when the DP is definite. This is obligatorily the case when the presupposition of the feature +DEF is fulfilled. It is thus an example of the principle *Maximize Presupposition* at work. The meaning of universal and existential quantification remain the same. However, as for determiners it is the quantificational feature associated with quantifiers that carries meaning, not the quantifier itself, see (69).

- (69) a.  $\llbracket \forall \rrbracket = \lambda P. \lambda Q. \forall x [P(x) \rightarrow Q(x)]$   
 b.  $\llbracket \exists \rrbracket = \lambda P. \lambda Q. \exists x [P(x) \ \& \ Q(x)]$

Since features carry the meaning, the morphological realization of (quantificational) determiners is semantically vacuous, see (70-a.). The quantifier "all" is special in that it can take a plural individual and quantify over its atomic parts, see (70-b.)

- (70) a.  $\llbracket \text{the/a/every/some} \rrbracket = \emptyset$   
 b.  $\llbracket \text{all} \rrbracket = \lambda y_{\langle e \rangle}. \lambda P_{\langle e, t \rangle}. \forall x [x \leq y \ \& \ \text{At}(x) \rightarrow f(x)]$

For the compositional interpretation of examples containing quantifiers or definites this view does not change anything for the analysis, see the examples in (71) and (72).

- (71) [ [  $\forall$  [ Every dog ] ] [ snores ] ]  
 a. [  $\forall$  ]( [ dog ])( [ snores ] )  
 b.  $\forall x$  [dog(x)  $\rightarrow$  snores(x)]  
 c. 'Every dog snores'
- (72) [ [ DEF [ the dog ] ] [snores] ]  
 a. [ snores ] ([ +DEF ]([ dog ]))  
 b. snores( $\iota x$ . MAX(dog)(x))  
 c. The unique dog snores.

The view presented is better equipped to explain cross-linguistic variation. Definiteness can be expressed in languages that choose not to morphologically mark it, like for example Russian. With enough contextual pressure an NP is obligatorily definite in Russian as well. This should also be considered a case of *Maximize Presupposition*. Since the non-presuppositional indefinite is not overtly expressed in Russian (and similar languages) either a missing trigger inference cannot arise in these languages.

Another advantage of this proposal is that it accounts for the obligatory occurrence of other feature markings. According to Sauerland (2002) masculine gender (MASC), singular (SG) and present (PRES) are featurally less marked than feminine gender, plural and past, respectively. He argues that when the latter are inserted instead of their competitors, the resulting sentences are presuppositionality stronger and should thus have to be used as a consequence of the principle *Maximize Presupposition*. Accordingly, MASC, SG and PRES should give rise to an inference that presupposition of their competitor is not true.

*Obligatory Implicatures* cannot account for obligatory insertion of presuppositional features. This is because features can neither carry focus nor be subject to the QUD. The insertion of presuppositional features can thus not follow from an exhaustivity implicature which ends up contradicting the context.

Moreover, there is some evidence that the inferences arising from using the presuppositionally weaker item really are connected to the presupposition of the competitor. According to Percus (2006), the sentence in (73-a.) does not presuppose that all professors are male. However, (73-b.) presupposes that all professors are female.



- (73) a. Every professor decorated his office.  
 b. Every professor decorated her office.

The same can be observed for French plural pronouns. Sentences with pronouns carrying the neutral masculine gender feature have the inference that not all referents are female, whereas sentences where the pronoun has female gender has the presupposition that the referents are all female. These inferences project under negation, just like the inference resulting from the indefinite, see (74).

- (74) a. Ils ne vivent pas à Paris.  
 They [MASC] do not live in Paris.  
 ⇒ "They" are not all female.  
 b. Elles ne vivent pas à Paris.  
 They [FEM] do not live in Paris.  
 ⇒ "They" are all female.

Another example discussed in the literature is the competition between present and past tense. Sauerland (2002) argues that the PRES operator does not introduce a presupposition on its own, but rather should be interpreted as a non-past due to competition with the PAST operator. He observes that the sentence in (75) is true even when some of the Tuesdays where the speaker fasts are in the past. It is only false when all of them are in the past.

- (75) Every Tuesday this month I fast.

In sum, the observation is that the choice for a specific feature or tense seems to be driven by their presuppositions. The inferences the so called unmarked forms (MASC, PL, PRES) trigger an inference that the presupposition of the competitor is false.

Parallely to the definite/indefinite distinction, this is subject to cross-linguistic variation. This is due to the fact that morphologically marking gender, number or tense is a question of the grammar of a given language, as well. In sum, *Maximize Presupposition* is better equipped to account for obligatory phenomena which do evoke lexical scales of the form {+FEATURE, -FEATURE}, where one feature is marked by a presupposition. For German (and English), these scales seem to exist for the features +DEF, +FEM, +PAST, and +SG.

# Chapter 7

## Summary of the results

In this dissertation, I have looked at the most commonly discussed examples of obligatory presupposition triggers. I presented two proposals for how to analyze obligatory presupposition triggers in discourse. The first theory exploits a principle *Maximize Presupposition*. The second theory is based on *Obligatory Implicatures*. I tested the empirical predictions of these theories for different presupposition triggers using experimental methods.

The theories differ with respect to two main points. The first point regards the inferences arising from not using the trigger. The second point regards the type of alternatives they assume to be involved in the insertion of the trigger. *Maximize Presupposition* predicts presupposition triggers to have lexical alternatives. Using an alternative results in a special inference which projects. *Obligatory Implicatures* assumes the relevant alternatives to be focus alternatives representing possible answers to a QUD. The inferences arising from not using the trigger are assumed to be implicatures resulting from exhaustification of a proposition with respect to the question set of the QUD.

Based on these different assumptions, the theories make different empirical predictions for the obligatory insertion of a presupposition trigger, first, under negation and other holes for presuppositions, and, second, for the influence of the QUD on the insertion of the trigger. *Maximize Presupposition* predicts triggers to be obligatory under negation and the QUD to not have an influence. *Obligatory Implicatures* predicts triggers to not be obligatory under negation and the QUD to have an influence.

These two main predictions were tested for a number of individual triggers in chapters 3 to 6. Whereas the German equivalents of triggers "too", "again"

and "know" are not obligatory under negation, as shown by sections 3.1., 4.1. and 5.1, the definite determiner is obligatory under negation, as was shown by section 6.1. As regards the influence of the QUD, it could be seen for "too" and "know" in sections 3.2. and 5.2. that it depends on contextual alternatives and the QUD whether an inference arises when they are not used. This suggests that in these cases the inferences arising from not using the trigger are exhaustivity implicatures. It was argued in section 6.2. that for the insertion of the plural definite the QUD plays a role as well. When using a plural definite the question set can only contain presuppositional alternatives. An overview over which findings reported supported which of the theories *Maximize Presupposition* and *Obligatory Implicatures* is given in the table in 7.1 below.

| Prediction    | "too"   | "again"                 | "know"                  | singular definite                                 | plural definite             |
|---------------|---|-------------------------|-------------------------|---|-----------------------------|
| Negation      | Obligatory Implicatures                           | Obligatory Implicatures | Obligatory Implicatures | Maximize Presupposition                           |                             |
| QUD/Discourse | Obligatory Implicatures                           |                         | Obligatory Implicatures |   | Maximize Presupposition + ? |
|               | Empirical scope of <i>Obligatory Implicatures</i> |                         |                         | Empirical Scope of <i>Maximize Presupposition</i> |                             |

Figure 7.1: Overview over the empirical findings supporting *Maximize Presupposition* and *Obligatory Implicatures*

The most important finding of the thesis is thus that not all presupposition triggers should be treated alike when it comes to their obligatory insertion. One class of trigger is better accounted for by using *Obligatory Implicatures*, another set of triggers should be explained using *Maximize Presupposition*. I will provide a more detailed characterization of the source of this differential treatment in the following two sections.

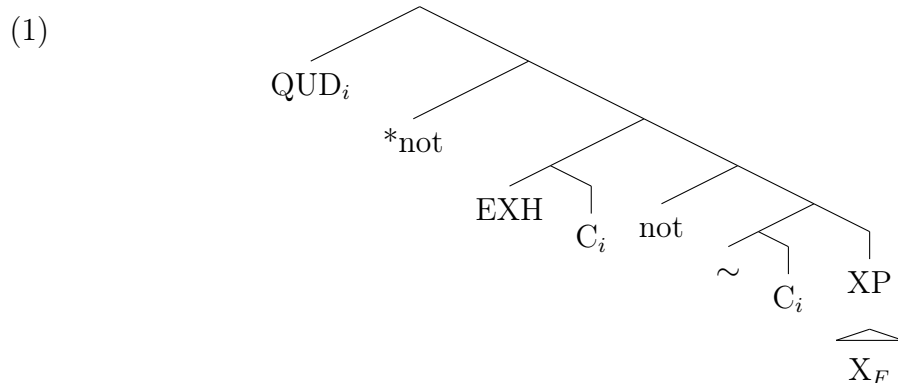
## 7.1 Why Obligatory Implicatures?

The empirical evidence presented in chapters 3 to 5 have shown that *Maximize Presupposition* is not the right principle to account for the obligatory insertion of the presupposition triggers "again", "too", and "know". Competition for these items is not operative on the lexical but propositional level and is dependent on information structure, i.e focus tells us what the alternatives to consider are. I will refer to this first class of triggers as "discourse-managing

triggers" since it is their discourse function, avoiding or canceling an implicature by introducing a presupposition, which drives their obligatory insertion. I will summarize the arguments I put forward for the claim that the insertion of the triggers "too", "again" and "know" follows from *Obligatory Implicatures* in the following two subsections. Section 7.1.1. summarizes the arguments coming from the embedding of triggers under negation, section 7.1.2. iterates the arguments based on sensitivity of this class of triggers to discourse. In section 7.1.3. I will present some further evidence for the view that the triggers "too", "again" and "know" should be put in one class, the class of discourse-managing triggers, when it comes to obligatory insertion.

### 7.1.1 Evidence from negation

First evidence for assuming that the above triggers fall into the same class comes from the observation that all of them are not obligatory under negation. This is predicted by *Obligatory Implicatures* since it is in these contexts where the QUD changes to a negative or polar one. Exhaustifying the sentence without the trigger with respect to a negative question does not yield a contradiction. The general pattern is the one in (1).



Whether the trigger is obligatory under negation depends on the interaction of negation with the exhaustivity operator according to *Obligatory Implicatures*. When negation is below the operator, the focus alternatives also have to contain negation due to Question-Answer-Congruence. Exhaustification of these alternatives does not yield a contradiction with a positive context. The version where negation is below the operator is to be ruled independently, since the according exhaustivity implicature is not attested. This makes the right empirical prediction that the triggers "again", "too", and "know" do not have

to be inserted under negation.

It makes further predictions for the (local) contexts under which these triggers are obligatory. It should be fine to leave out the triggers in embedding structures if the exhaustivity operator is not attested in these embeddings. It was, for example, also shown in section 3.2.1. that the additive is not obligatory in the second conjunct of a conjunction. Exhaustifying the individual conjuncts is ruled out on independent grounds, therefore this finding can be explained by *Obligatory Implicatures*. The obligatory insertion of discourse-managing triggers is dependent on the interaction of different embedding operators with the exhaustivity operator. One would have to test this hypothesis further by looking at additional embedding operators, especially downward-entailing operators, like antecedents of conditionals, questions and the first argument of universal quantifiers. If the empirical generalization outlined is correct, then how obligatory a discourse-managing trigger is in these context is a measure of how obligatory exhaustification is in embedded environments. This is an important finding beyond the issue of obligatory triggers since it adds to the current debate whether the exhaustivity operator is a syntactically flexible operator generating local implicatures and part of the grammar (Chierchia, Fox, and Spector 2011).

### 7.1.2 Evidence from discourse sensitivity

The dependency of the obligatory insertion of the triggers "again", "too" and "know" on different discourse factors has especially been shown for the insertion of the additive particle in section 3.2. Its insertion depends on how relevant alternatives are in the context. However, it was argued that the pure presence of alternatives (as represented by a question) did not pose enough pressure to exhaustify. This could be due to the fact that, as opposed to scalar implicatures, the relevant alternatives are not lexical and do not stand in an entailment relation with one another. The data suggest that contrast is the crucial factor for exhaustification. In the case of scalar items, this contrast is part of the lexical meaning since it always has just one relevant scalar alternative. For particularized conversational implicatures like the ones discussed in the thesis it is important that it is known what the alternatives to consider are, but also how many relevant alternatives there are. If only one relevant alternative was made prominent in the context exhaustification was

mandatory. In contexts where there are more alternatives to consider, or the nature of these alternatives was underspecified, exhaustification was optional. As a result, exhaustification should not be considered mandatory in all matrix clauses, but should be considered mandatory with contrastive focus. Most importantly, there was a correlation between mandatory exhaustification and the necessity of inserting the additive particle. If there was mandatory exhaustification, leaving out the trigger is more dispreferred. This supports the view of *Obligatory Implicatures*.

A special case is "believe" versus "know" since lexical competition seems to be conventionalized in this case. It was shown that with other relevant alternatives, the inference from using "believe" gets weaker. This also speaks in favor of treating the insertion of "know" as following from exhaustification strategies.

### 7.1.3 Further evidence

There is evidence beyond the one presented in this dissertation that the triggers at issue fall into the same category with regard to the mechanism behind their obligatory insertion. For all of them, a certain amount of cross-linguistic stability can be observed. Additives, factives and iteratives exist in many languages with identical meanings and presuppositions<sup>1</sup>, for example Hungarian, French, German, English, Guarani (Simons et al. 2011) and Salish (Matthewson 2006).

*Obligatory Implicatures* predicts the obligatoriness of these items to be cross-linguistically stable. It is expected that the obligatory insertion follows from the same general mechanism of exhaustification in these languages. The insertion of triggers like "again", "too", and "know" is related to discourse management. Inserting them marks that a QUD has already been answered, whereas not inserting them will force a focus and thereby yield an unwanted exhaustivity implicature. Presuppositions are one type of non-at-issue content. It is predicted that triggers that have this kind of discourse function in any given language also share the presuppositional status of the triggers discussed here. It is important to note, however, that not only presuppositional items have the power to cancel an implicature or keep it from arising. As has been shown in chapter 3, the discourse connective "and" is another lexical item that marks

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<sup>1</sup>If we take projection to be the crucial characteristic.

non-exhaustivity but does so on the level of assertion. It is expected under *Obligatory Implicatures* that the syntactic environments where exhaustivity implicatures do not arise and the trigger is not obligatory should also be the same across languages. The mechanism working with *Obligatory implicatures* is operative in cases where an optional lexical element is added into the structure for discourse reasons. It is unproblematic from a conceptual point of view to explain the insertion of this subset of triggers with the mechanism of exhaustification of the QUD. It is independently needed, i.e. for (embedded) questions and other (embedded) implicatures.

## 7.2 Why Maximize Presupposition?

In section 6 of the dissertation I presented arguments for why *Maximize Presupposition* is the right principle to account for the obligatory insertion of definite determiners. I will summarize these arguments in the next section 7.2.1.. I will discuss some further evidence from acquisition and cross-linguistic research in 7.2.2..

### 7.2.1 Evidence from negation and discourse-sensitivity

Under *Obligatory Implicatures* the insertion of presupposition triggers is motivated by an implicature which ends up contradicting the context. This is why the trigger should be less obligatory in contexts where this implicature does not arise. Under *Maximize Presupposition*, the insertion of the trigger is less dependent on contextual factors since it is due to automatically activated lexical competition. The evidence suggests that the obligatory insertion of the definite follows from *Maximize Presupposition*. It was shown that the insertion of the definite is not dependent on discourse factors, specifically it is obligatory irrespective of what the QUD is. Furthermore, *Maximize Presupposition* accounts for the fact that all quantifiers, even those lacking implicatures, are infelicitous when the presupposition of the definite is fulfilled, see (2).

- (2)
- a. #Every father arrived.
  - b. #Did every father of the victim arrive?
  - c. If # every father of the victim arrived...
  - d. I saw # every father of the victim on the street.

Assuming that the examples in (1) and (2) are blocked because of the local competition with the stronger definite determiner explains the data. Moreover, it was demonstrated that the obligatory occurrence of the definite is independent of the operators it is embedded under. Specifically, it was shown in 6.1. that the singular definite is obligatory under negation. The data suggest that lexical competition is involved in the insertion of definites. Since exhaustification below negation is blocked it cannot be the relevant factor for the insertion of the definite. Also what kind of QUD is exhaustified is not relevant. It was argued in section 6.2. that it is possible to account for the data in (2) by assuming that quantifiers in general evoke infelicitous questions in this case. The question set of "Did all or some fathers arrive?" cannot contain false answers with singleton domains. The question asked must be about individuals. That is, all the alternatives in the question set must be presuppositional. As a result, *Maximize Presupposition* is still needed to work for the alternatives in the question set of the QUD.

Based on these data and the observation that presuppositional features display similar behavior, I argued that *Maximize Presupposition* is operative on the level of morphology, not discourse, and is needed to maximize the presupposition of a given feature, if a language marks this feature overtly (Sauerland 2008b, Sauerland 2008a). The obligatory insertion of a second class of triggers, those carrying presuppositional features, thus follows from *Maximize Presupposition* which says that the presuppositionally stronger feature has to be chosen when possible. For German and English, the obligatory marking of the definiteness feature by using the definite determiner over the indefinite and other quantifiers when possible is one case of *Maximize Presupposition*.

### 7.2.2 Further evidence

Further evidence that *Maximize Presupposition* is the right principle to account for the insertion of definites comes from acquisition. Children very early understand when and how to use the definite determiner correctly, especially when they have strong evidence (Rozendaal and Baker 2008). Rozendaal and Baker (2008) compare French, English and Dutch speaking children with regard to how accurately they associate the indefinite and definite with givenness/novelty and specific/non-specific uses. They observe that French children are the first to use the definite correctly and base this on the fact that a deter-



miner is always required in French. Children in general soon associate definites with givenness. They use the definite for given material 60-80% of the time (depending on language) by the age of 3 years and 3 months. They rarely use the indefinite incorrectly for given material (around 5% of the time). In contrast, they do not associate the indefinite with novelty at that age. For discourse new material they use the indefinite, definite and bare nouns almost equally. This suggests that children know how to use the definite before they know what the indefinite means. This is not surprising given the wide range of meanings the indefinite can receive. However, it also means that it is probably not the implicature resulting from the indefinite that motivates children to use the definite with given material. The data are more in line with the assumption that children acquire the presupposition of the definite and the general pragmatic principle that they should maximize presuppositions that are fulfilled by the context with their utterance.<sup>2</sup>

Furthermore, as opposed to what was observed for other triggers above, a wide range of cross linguistic variation in the domain of determiners can be observed (Chierchia 1998). There is already a fair degree of variation with respect to the syntactic and morphological representation of determiners within language families, i.e. southeast Asian languages (Simpson 2005). Cantonese and Mandarin, for example, lack articles and number morphology altogether. It is an open issue whether the *classifier + noun* combination or bare nouns they use instead (covertly) express definiteness or indefiniteness and should be considered determiner-like (Cheng and Sybesma 1999, Cheng and Sybesma 2005, Wu and Bodomo 2009). The same questions have been investigated for bare nouns in Russian and other Slavic languages (Pereltsvaig 2006, Kagan and Pereltsvaig 2011). Already based on the fact that plural nouns in English do not require a determiner, it has been argued that there is not necessarily a relation between morphologically marking of a determiner and a noun being interpreted as a definite or indefinite description (Heim 2012). Definiteness should thus be considered a feature which a language chooses to morphologically express or not. As a consequence, it should also be a question of the grammar of an individual language whether this feature is obligatorily expressed, as predicted by *Maximize Presupposition*.

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<sup>2</sup>If assuming that all presuppositional phenomena are subsumed under a principle *Maximize Presupposition*, this would lead to the expectation that children know when the uses of "know", "too", and "again" are obligatory at the same time when they acquire the obligatory use of the definite, which is doubtful (Sigrid Beck, p.c.).

### 7.3 Summary

Based on the empirical data, I propose a view on obligatory presupposition triggers which puts them into two classes. These two classes are to be distinguished based on the mechanism behind their obligatory insertion, *Obligatory Implicatures* or *Maximize Presupposition*. As a result, I argue that both mechanisms are active and needed in natural language.

The first class of triggers are discourse-managing items which are inserted obligatorily to cancel or avoid an exhaustivity implicature in certain contexts. Additive, iteratives and factives fall into this first class of triggers. A direct correlation between the local and global factors for exhaustification and obligatory insertion of these triggers can be established. The insertion of this first class of obligatory triggers thus follow from the independently needed mechanism of exhaustification and can give us further insights into the nature of this mechanism.

The second class of triggers includes presuppositionally marked features which are obligatorily inserted due to *Maximize Presupposition*. The principle should be reformulated as a grammatical constraint which is operative on a level smaller than the lexicon and automatically activated. Rather than eliminating the option that some items are ordered on a scale of presuppositional strength, it is important to define what these items and scales are for a given language. Taking into consideration the evidence so far, the domain where we expect these scales is limited to morphological features which have a presuppositional marked and unmarked form, not lexical items. For German it was shown that definiteness should be considered one of these features, which makes the obligatory insertion of definite determiners a case of the principle *Maximize Presupposition*.



# Appendix A

## Material experiment 1

- (1)
  - a. A: Peter hat gestern in seiner WG eine Party geschmissen.
  - b. B: Wer ist zu der Party gekommen? / Ja, hab ich schon gehört.
  - c. A: Maria ist zu der Party gekommen.
  - d. C: Julia ist zu der Party gekommen.  
C: Julia ist auch zu der Party gekommen.  
C: Und Julia ist zu der Party gekommen.
- (2)
  - a. A: Anni hat gestern im Garten gearbeitet.
  - b. B: Was hat sie gepflanzt? / Habe ich schon gesehen.
  - c. A: Anni hat Bohnen gepflanzt.
  - d. C: Anni hat Kürbisse gepflanzt.  
C: Anni hat auch Kürbiss gepflanzt.  
C: Und Anni hat Kürbisse gepflanzt.
- (3)
  - a. A: Micha ist gestern im Freibad gewesen.
  - b. B: Wer war mit ihm dort? / Schön.
  - c. A: Janina war mit ihm dort.
  - d. C: Hannah war mit ihm dort.  
C: Hannah war auch mit ihm dort.  
C: Und Hannah war mit ihm dort.
- (4)
  - a. A: Gestern haben die Schulferien angefangen.
  - b. B: Wer hat seit gestern Urlaub? / Das muss ja viele freuen.
  - c. A: Herbert hat seit gestern Urlaub.
  - d. C: Gerd hat seit gestern Urlaub.  
C: Gerd hat auch seit gestern Urlaub.  
C: Und Gerd hat seit gestern Urlaub.

- (5) a. A: Maria ist gestern umgezogen.  
b. B: Wer hat beim Umzug geholfen?/ Das hab ich schon gehört.  
c. A: Karo hat beim Umzug geholfen.  
d. C: Sebastian hat beim Umzug geholfen.  
C: Sebastian hat auch beim Umzug geholfen.  
C: Und Sebastian hat beim Umzug geholfen.
- (6) a. A: Peter war gestern bei Ikea.  
b. B: Was hat er gekauft?/ Das hat er mir schon erzählt.  
c. A: Er hat einen Kleiderschrank gekauft.  
d. C: Er hat ein Bett gekauft.  
C: Er hat auch ein Bett gekauft.  
C: Und er hat ein Bett gekauft.
- (7) a. A: Susi war am Wochenende in Paris.  
b. B: Was hat sie angeschaut?/ Das ist aber schön.  
c. A: Sie hat den Eiffelturm angeschaut.  
d. C: Sie hat den Arc de Triomphe angeschaut.  
C: Sie hat auch den Arc de Triomphe angeschaut.  
C: Und sie hat den Arc de Triomphe angeschaut.
- (8) a. A: Lisa hatte gestern Geburtstag.  
b. B: Was hat sie bekommen? /Das wusste ich gar nicht.  
c. A: Sie hat einen Messerblock bekommen.  
d. C: Sie hat eine CD bekommen.  
C: Sie hat auch eine CD bekommen.  
C: Und sie hat eine CD bekommen.
- (9) a. A: Hans studiert an der Uni Würzburg.  
b. B: Was studiert er? /Ach so.  
c. A: Er studiert Politik.  
d. C: Er studiert Geschichte.  
C: Er studiert auch Geschichte.  
C: Und er studiert Geschichte.
- (10) a. A: Am Freitag war in Reutlingen Stadtfest.  
b. B: Wer ist hingegangen?/ Das ist immer spaßig  
c. A: David ist auf dem Stadtfest gewesen.  
d. C: David ist auf dem Stadtfest gewesen.

- C: David ist auch auf dem Stadtfest gewesen.  
C: Und David ist auf dem Stadtfest gewesen.
- (11) a. A: Helga war nach dem Arbeiten noch in der Stadtbibliothek.  
b. B: Was hat sie ausgeliehen. / Ach was.  
c. A: Sie hat einen Roman ausgeliehen.  
d. C: Sie hat ein Spiel ausgeliehen.  
C: Sie hat auch ein Spiel ausgeliehen.  
C: Und sie hat ein Spiel ausgeliehen.
- (12) a. A: Karin hat sich gestern mit Ingo getroffen.  
b. B: Was haben sie unternommen? / Das ist ja eine Überraschung.  
c. A: Sie waren Abendessen.  
d. C: Sie waren im Kino.  
C: Sie waren auch im Kino.  
C: Und sie waren im Kino.
- (13) a. A: Frank war auf dem Wochenmarkt.  
b. B: Was hat er gekauft? / Wie immer  
c. A: Er hat Äpfel gekauft.  
d. C: Er hat Suppengrün gekauft.  
C: Er hat auch Suppengrün gekauft.  
C: Und er hat Suppengrün gekauft.
- (14) a. A: Theo hatte am Wochenende Putzdienst.  
b. B: Was hat er geputzt? / Ach ja richtig.  
c. A: Er hat das Bad geputzt.  
d. C: Er hat die Küche geputzt.  
C: Er hat auch die Küche geputzt.  
C: Und er hat die Küche geputzt.
- (15) a. A: Simone war mit ihrem Sohn im Zoo.  
b. B: Was haben sie sich angesehen? / Das ist schön.  
c. A: Sie haben Eisbären angeschaut.  
d. C: Sie haben Schlangen angeschaut.  
C: Sie haben auch Schlangen angeschaut.  
C: Und sie haben Schlangen angeschaut.
- (16) a. A: Peter hat gestern für die WG gekocht.  
b. B: Was hat er gekocht? / Das ist sehr nett von ihm

- c. A: Er hat Gemüselasagne gemacht.  
d. C: Er hat eine Suppe gemacht.  
C: Er hat auch eine Suppe gemacht.  
C: Und er hat eine Suppe gemacht.
- (17) a. A: Simon ist gerade von einer Kreuzfahrt zurückgekommen.  
b. B: Wo ist er gewesen?/ Das war bestimmt cool.  
c. A: Er war auf den Bahamas.  
d. C: Er war auf Kuba.  
C: Er war auch auf Kuba.  
C: Und er war auf Kuba.
- (18) a. A: Rita hat bei einer Verlosung gewonnen.  
b. B: Was hat sie gewonnen?/ Das ist ja cool  
c. A: Sie hat zwei Karten fürs Musical gewonnen.  
d. C: Sie hat einen Getränkegutschein gewonnen.  
C: Sie hat auch einen Getränkegutschein gewonnen.  
C: Und sie hat einen Getränkegutschein gewonnen.
- (19) a. A: Paulas Sohn Tim geht jetzt jeden Dienstag zum Schwimmen.  
b. B: Wer geht mit ihm?/ Das ist erstaunlich.  
c. A: Jan geht mit ihm schwimmen.  
d. C: Daniel geht mit ihm schwimmen.  
C: Daniel geht auch mit ihm schwimmen.  
C: Und Daniel geht mit ihm schwimmen.
- (20) a. A: Christian liegt seit gestern mit einer Lungenentzündung im Krankenhaus.  
b. B: Wer hat ihn besucht?/ Das habe ich schon gehört.  
c. A: Sibylle hat ihn besucht.  
d. C: Kerstin hat ihn besucht.  
C: Kerstin hat ihn auch besucht.  
C: Und Kerstin hat ihn besucht.
- (21) a. A: Tills Band hatte gestern einen Auftritt.  
b. B: Was haben sie gespielt?/ War bestimmt ein Erfolg.  
c. A: Sie haben Pink Floyd gespielt.  
d. C: Sie haben die Rolling Stones gespielt.  
C: Sie haben auch die Rolling Stones gespielt.

- C: Und sie haben die Rolling Stones gespielt.
- (22) a. A: Anja arbeitet jetzt gelegentlich in einer Kneipe.  
 b. B: Wann muss sie arbeiten?/ Das hat bestimmt Spaß gemacht.  
 c. A: Sie muss am Montag arbeiten.  
 d. C: Sie muss am Mittwoch arbeiten.  
 C: Sie muss auch am Mittwoch arbeiten.  
 C: Und sie muss am Mittwoch arbeiten.
- (23) a. A: Verena hat gestern Abend den Lieferservice bestellt.  
 b. B: Was hat sie bestellt?/ Das ist aber ungewöhnlich.  
 c. A: Sie hat Pizza bestellt.  
 d. C: Sie hat Salat bestellt.  
 C: Sie hat auch Salat bestellt.  
 C: Und sie hat Salat bestellt.
- (24) a. A: Jonas war gestern auf einer Signierstunde des FC Bayern München.  
 b. B: Von wem hat er ein Autogramm bekommen?/ Das ist ja cool  
 c. A: Er hat von Mario Gomez ein Autogramm bekommen.  
 d. C: Er hat von Philipp Lahm ein Autogramm bekommen.  
 C: Er hat auch von Philipp Lahm ein Autogramm bekommen.  
 C: Und er hat von Philipp Lahm ein Autogramm bekommen.
- (25) a. A: Inge ist gestern auf dem Weg nach Hause bestohlen worden.  
 b. B: Was wurde ihr geklaut?/ Das ist ja furchtbar.  
 c. A: Ihr wurde der Geldbeutel geklaut.  
 d. C: Ihr wurde das Handy geklaut.  
 C: Ihr wurde auch das Handy geklaut.  
 C: Und ihr wurde das Handy geklaut.
- (26) a. A: Oliver hat gestern sein Auto zur Repartur gebracht.  
 b. B: Was ist kaputt?/ Na endlich  
 c. A: Der Kühler ist kaputt.  
 d. C: Die Bremsen sind kaputt.  
 C: Die Bremsen sind auch kaputt.  
 C: Und die Bremsen sind kaputt.
- (27) a. A: Birgit hat angefangen ehrenamtlich zu arbeiten.  
 b. B: Wo arbeitet sie?/ Das passt zu ihr.  
 c. A: Sie arbeitet in einer Suppenküche.



- d. C: Sie arbeitet in einem Altenheim.  
C: Sie arbeitet auch in einem Altenheim.  
C: Und sie arbeitet in einem Altenheim.
- (28) a. A: Susi war am Wochenende auf einem Festival.  
b. B: Wer hat gespielt?/ Das ist typisch.  
c. A: Die Ärzte haben gespielt.  
d. C: Die Toten Hosen haben gespielt.  
C: Die Toten Hosen haben auch gespielt.  
C: Und die Toten Hosen haben gespielt.
- (29) a. A: Frauke hat angefangen als Lehrerin zu arbeiten.  
b. B: Was unterrichtet sie?/ Das hätte ich nicht gedacht.  
c. A: Sie unterrichtet Deutsch.  
d. C: Sie unterrichtet Sport.  
C: Sie unterrichtet auch Sport.  
C: Und sie unterrichtet Sport.
- (30) a. A: Bei Sonja wurde eine Allergie festgestellt.  
b. B: Wogegen ist sie allergisch? / Das überrascht mich nicht.  
c. A: Sie ist gegen Birke allergisch.  
d. C: Sie ist gegen Pappel allergisch.  
C: Sie ist auch gegen Pappel allergisch.  
C: Und sie ist gegen Pappel allergisch.
- (31) a. A: Karin hat wieder angefangen, Sport zu machen.  
b. B: Was macht sie? / Das sieht man.  
c. A: Sie spielt Tennis.  
d. C: Sie geht Joggen.  
C: Sie geht auch Joggen.  
C: Und sie geht Joggen.
- (32) a. A: Robert war am Wochenende bei einer Hochzeit.  
b. B: Was gab es zu essen? / Das war bestimmt nett.  
c. A: Es gab Kalbsfilet zu essen. C: Es gab Wolfsbarsch zu essen.  
C: Es gab auch Wolfsbarsch zu essen.  
C: Und es gab Wolfsbarsch zu essen.
- (33) a. A: Ina hatte gestern Hochzeitstag.  
b. B: Was hat sie bekommen? / Wie schön!

- c. A: Sie hat Rosen bekommen.
  - d. C: Sie hat eine Halskette bekommen.  
C: Sie hat auch eine Halskette bekommen.  
C: Und sie hat eine Halskette bekommen.
- (34)
- a. A: Hans hat gestern ein interessante Debatte im Fernsehen gesehen.
  - b. B: Wer hat an der Debatte teilgenommen?/ So so.
  - c. A: Angela Merkel hat an der Debatte teilgenommen.
  - d. C: Gregor Gysi hat an der Debatte teilgenommen.  
C: Gregor Gysi hat auch an der Debatte teilgenommen.  
C: Und Gregor Gysi hat an der Debatte teilgenommen.
- (35)
- a. A: Wanda war gestern auf der Sperrmüll-Deponie.
  - b. B: Was hat sie abgegeben?/ Das ist eine gute Idee.
  - c. A: Sie hat einen Tisch abgegeben.
  - d. C: Sie hat einen Küchenstuhl abgegeben.  
C: Sie hat auch einen Küchenstuhl abgegeben.  
C: Und sie hat einen Küchenstuhl abgegeben.
- (36)
- a. A: Gestern hat ein Sturm bei Tom Schäden angerichtet.
  - b. B: Was ist beschädigt worden? /Das ist ja ärgerlich.
  - c. A: Ein Fenster ist beschädigt worden.
  - d. C: Ein Beet ist beschädigt worden.  
C: Ein Beet ist auch beschädigt worden.  
C: Und ein Beet ist beschädigt worden.



# Appendix B

## Material experiment 2

- (1) Tom kommt gerade vom Einkaufen wieder. Er hat für seine Mitbewohner [Lena, Daniel und Arne] Schokolade gekauft.
  - a. [Nur] /Toms /Mitbewohner /Arne /mag /gern /Schokolade.
  - b. Toms /Mitbewohner /Lena /und /Daniel /mögen /auch /gern /Schokolade.
- (2) Petra bestellt zu ihrem Geburtstag Pizza. Sie hat ihre Nachbarn [Jonas, Hannes und Tom] eingeladen.
  - a. [Nur] /Petras /Nachbar /Jonas /kommt /zum /Pizza /essen.
  - b. Petras /Nachbarn /Hannes /und /Tom /kommen /auch /zum /Pizza /Essen.
- (3) Julian spielt Gitarre in einer Band. Er mag seine Bandkollegen [Rafael, Matti und Benni].
  - a. [Nur] /Julians /Bandkollege /Rafael /hat /vorher /in /einer /anderen /Band /mitgespielt.
  - b. Julians /Bandkollegen /Benni /und /Matti /haben /auch /vorher /in /einer /anderen /Band /gespielt.
- (4) Carla ist gerade bei einer Hochzeitsfeier. An ihrem Tisch sitzen ihre Schulfreunde [Pascal, Finn und Karo].
  - a. [Nur] /Carlas /Schulfreund /Pascal /hat /eine /Begleitung /mitgebracht.
  - b. Carlas /Schulfreunde /Finn /und /Karo /haben /auch /eine /Begleitung /mitgebracht.

- (5) Lena bringt ihre drei Kinder [Lotte, Maxi und Nathanael] vor der Arbeit zur Schule.
- [Nur] /Lenas /Sohn /Nathanael /bringt /sehr /gute /Noten /nach /Hause.
  - Lenas /Kinder /Lotte /und /Maxi /bringen /auch /sehr /gute /Noten /nach /Hause.
- (6) Claudia genießt gerade die Sonne auf der Dachterrasse, die sie mit ihren Mitbewohnern [Paul, Jule und Saskia] teilt.
- [Nur] /Claudias /Mitbewohnerin /Jule /hat /Pflanzen /auf /der /Terrasse.
  - Claudias /Mitbewohner /Paul /und /Saskia /haben /auch /Pflanzen /auf /der /Terrasse.
- (7) Christine ist Oberschwester in der Kinderklinik. Sie verbringt gerade ihre Mittagspause mit ihren Kolleginnen [Martina, Sigrid und Jana].
- [Nur] /Christines /Kollegin /Jana /hat /am /nächsten /Tag /Nachtschicht.
  - Christines /Kolleginnen /Martina /und /Sigrid /haben /auch /am /nächsten /Tag /Nachtschicht.
- (8) Jonas hat am Wochenende Geburtstag. Er fragt seine Kumpels [Gregor, Basti und Roman], ob sie ihm beim Einkaufen helfen.
- [Nur] /Jonas' /Kumpel /Roman /kommt /zum /Einkaufen /mit.
  - Jonas' /Kumpels /Basti /und /Gregor /kommen /auch /mit /zum /Einkaufen.
- (9) Thomas informiert sich vor seiner Promotion mit seinen Kommilitonen [Alex, Stefan und Sara] über Stipendien.
- [Nur] /Thomas' /Kommilitonin /Sara /hat /sich /auf /Stipendien /beworben.
  - Thomas' /Kommilitonen /Alex /und /Stefan /haben /sich /auch /auf /Stipendien /beworben.
- (10) Gregor fährt nach Österreich in den Urlaub. Er besucht die größeren Städte [Salzburg, Linz und Wien].
- [Nur] /Wien /hat /Gregor /sehr /gut /gefallen.
  - Salzburg /und /Linz /haben /Gregor /auch /sehr /gut /gefallen.
- (11) Hannes sitzt gerade in seiner Stammkneipe. Er diskutiert mit seinen

Kollegen [Jan, Frederik und Lars] über Fußball.

- a. [Nur] /Hannes' /Kollege /Lars /spielt /selber /in /einem /Verein /Fußball.
  - b. Hannes' /Kollegen /Frederik /und /Jan /spielen /auch /Fußball /in /einem /Verein.
- (12) Karolin möchte ihre Kommode verkaufen. Sie ruft ihre Schwestern [Carla, Dana und Franziska] an und fragt sie, ob sie Interesse haben.
- a. [Nur] /Karolins /Schwester /Carla /will /die /Kommode /kaufen.
  - b. Karolins /Schwestern /Dana /und /Franziska /wollen /auch /die /Kommode /kaufen.
- (13) Simon macht im Sommer mit seinen Freunden einen Europaurlaub mit dem VW Bus. Sie fahren durch die südlichen Länder [Italien, Kroatien und Österreich].
- a. [Nur] /Kroatien /hat /günstiges /Benzin.
  - b. Italien /und /Österreich /haben /auch /günstiges /Benzin.
- (14) Helga sucht nach einem geeigneten Studienplatz. Sie schaut sich Universitäten mit ihrer Mutter [in Leipzig, Berlin und München] an.
- a. [Nur] /Berlin /ist /Helga /groß /genug /zum /Studieren.
  - b. Leipzig /und /München /findet /Helga /auch /groß /genug /zum /Studieren.
- (15) Marie macht eine hochalpine Bergtour. Ihre Wanderfreunde [Klaus, Jan und Sandra] begleiten sie.
- a. [Nur] /Maries /Begleiter /Klaus /hat /Wanderstöcke /dabei.
  - b. Maries /Begleiter /Jan /und /Sandra /haben /auch /Wanderstöcke /dabei.
- (16) Sabine war gerade beim Bäcker. Sie kauft Brezeln für ihre Söhne [Elias, Matthias und David].
- a. [Nur] /Sabines /Sohn /David /will /seine /Brezel /sofort /essen.
  - b. Sabines /Söhne /Matthias /und /Elias /wollen /auch /ihre /Brezeln /sofort /essen.
- (17) Clara ist im Park spazieren. Sie führt ihre Hunde [Dora, Cesar und Rex] Gassi.

- a. [Nur] /Claras /Hund /Rex /jagt /einer /Hundedame /hinterher.  
 b. Ihre /Hunde/ Dora /und /Cesar /jagen /auch /einer /Hundedame /hinterher.
- (18) Simone braucht für Silvester ein neues Kleid. Sie geht mit ihren Mitbewohnerinnen [Janina, Frida und Hannah] einkaufen.
- a. [Nur] /Simones /Mitbewohnerin /Janina /findet /ein /schönes /Kleid.  
 b. Simones /Mitbewohnerinnen /Hannah /und /Frida /finden /auch /ein /schönes /Kleid.
- (19) In Christinas WG ist gerade ein Zimmer frei geworden. Sie lädt die potenziellen Untermieter [Thomas, Gregor und Matthias] zu einem Besichtigungstermin am Abend ein.
- a. [Nur] /Der /Bewerber /Thomas /ist /Student.  
 b. Die /Bewerber /Gregor /und /Matthias /sind /auch /Studenten.
- (20) Sarah ist im Alpenverein. Sie geht mit ihren Wanderfreunden [Frida, Sarah und Hannes] am Wochenende klettern.
- a. [Nur] /Sarahs /Freundin /Frida /klettert /erst /seit /einem /Jahr.  
 b. Ihre /Freunde /Hannes /und /Suse /klettern /auch /erst /seit /einem /Jahr.
- (21) Sabine ist Deutschlehrerin und diskutiert mit ihren Zwölfklässlern [Prag, Rom und Wien als] mögliche Ziele für eine Kursfahrt.
- a. [Nur] /Prag /findet /bei /den /Schülern /große /Zustimmung.  
 b. Rom /und /Wien /finden /auch /große /Zustimmung /bei /den /Schülern.
- (22) Anna wünscht sich für ihren Geburtstag etwas Besonderes. Sie geht mit ihren Schwestern [Lisa, Janine und Kathrin] in die Oper.
- a. [Nur] /Annas /Schwester /Lisa /gefällt /die /Aufführung /sehr /gut.  
 b. Annas /Schwestern /Kathrin /und /Janine /gefällt /die /Aufführung /auch /sehr /gut.
- (23) Bernd kommt gerade vom Arbeiten nach Hause. Er füttert sofort seine Katzen [Paula, Suse und Carlotta].
- a. [Nur] /Bernds /Katze /Paula /schleicht /ihm /liebevoll /um /die

/Beine.

- b. Seine /Katzen /Carlotta /und /Suse /schleichen/ ihm /auch /liebevoll  
/um /die /Beine.

(24) Johanna braucht für einen Kuchen noch Zutaten. Sie fragt ihre Nachbarn [Holger, Maxim und Luise] nach Zucker.

- a. [Nur] /Johannas /Nachbar /Holger /hat /Zucker /im /Haus.  
b. Johannas Nachbarn Maxim /und /Luise /haben /auch /Zucker  
/im /Haus.





# Appendix C

## Material experiment 3

- (1) Jan ist nach Hause gekommen, hat seine Jacke abgelegt, einen Apfel und eine Scheibe Toast gegessen und sich vor den Fernseher gesetzt.
  - a. Er hat auch eine Birne gegessen.
  - b. Er hat eine Birne gegessen.
  - c. Er hat keine Birne gegessen.
  - d. Er hat einen Apfel gegessn.
  
- (2) Karla ist zur Party gekommen, hat alle begruesst, Petra und Simon umarmt und hat sich in die Kueche gesetzt.
  - a. Sie hat auch Lisa umarmt.
  - b. Sie hat Lisa umarmt.
  - c. Sie hat Lisa nicht umarmt.
  - d. Sie hat Petra umarmt.
  
- (3) Rita ist nach Italien gefahren, hat sich ein Auto gemietet, hat Rom und Florenz besucht und ist nach Hause gefahren.
  - a. Sie hat auch Venedig besucht.
  - b. Sie hat Venedig besucht.
  - c. Sie hat Venedig nicht besucht.
  - d. Sie hat Rom besucht.
  
- (4) Saskia ist ins Buro gekommen, hat einen Kaffee gekocht, Frida und Hannah begruesst und sich an ihren Schreibtisch gesetzt.
  - a. Sie hat auch Sonja begruesst.
  - b. Sie hat Sonja begruesst.
  - c. Sie hat Sonja nicht begruesst.

- d. Sie hat Frida begrüsst.
- (5) Florian ist zur Bank gegangen, hat Geld abgehoben, Stefan und Sabine getroffen und ist zum Arbeiten gegangen.
- a. Er hat auch Kai getroffen.
  - b. Er hat Kai getroffen.
  - c. Er hat Kai nicht getroffen.
  - d. Er hat Stefan getroffen.
- (6) Lars ist zur Uni gefahren, in die Bibliothek gegangen, hat ein Buch und eine Zeitschrift ausgeliehen und ist nach Hause gefahren.
- a. Er hat auch ein Hoerbuch ausgeliehen.
  - b. Er hat ein Hoerbuch ausgeliehen.
  - c. Er hat kein Hoerbuch ausgeliehen.
  - d. Er hat ein Buch ausgeliehen.
- (7) Petra ist zum Einkaufen gefahren, war im Alnatura, hat ein Brot und eine Flasche Rotwein gekauft und ist nach Hause gefahren.
- a. Sie hat auch Butter gekauft.
  - b. Sie hat Butter gekauft.
  - c. Sie hat keine Butter gekauft.
  - d. Sie hat Brot gekauft.
- (8) Georg ist ins Freibad gegangen, ist ein paar Bahnen geschwommen, hat ein Eis und Pommes gegessen und ist nach Hause gefahren.
- a. Er hat auch eine Cola getrunken.
  - b. Er hat eine Cola getrunken.
  - c. Er hat keine Cola getrunken.
  - d. Er hat ein Eis gegessen.
- (9) Susi ist zum Geburtstag gekommen, hat das Geschenk ueberreicht, ein Bier und einen Gin Tonic getrunken und ist nach Hause gegangen.
- a. Sie hat auch ein Glas Wein getrunken.
  - b. Sie hat ein Glas Wein getrunken.
  - c. Sie hat kein Glas Wein getrunken.
  - d. Sie hat ein Bier getrunken.
- (10) Maxim ist zu seinen Eltern gefahren, hat seine Schwester getroffen, den Boiler und das Flurlicht repariert und ist heim gefahren.

- a. Er hat auch den Geschirrspüler repariert.
  - b. Er hat den Geschirrspüler repariert.
  - c. Er hat den Geschirrspüler nicht repariert.
  - d. Er hat den Boiler repariert.
- (11) Frida ist in die Kantine gekommen, hat sich zu Kollegen gesetzt, eine Suppe und einen Salat gegessen und ist wieder zum Arbeiten gegangen.
- a. Sie hat auch ein Steak gegessen.
  - b. Sie hat ein Steak gegessen.
  - c. Sie hat kein Steak gegessen.
  - d. Sie hat eine Suppe gegessen.
- (12) David ist in die Kueche gekommen, hat Kaffee gekocht, ein Marmeladenbrot und eine Banane gegessen und ist zur Arbeit gefahren.
- a. Er hat auch Cornflakes gegessen.
  - b. Er hat Cornflakes gegessen.
  - c. Er hat keine Cornflakes gegessen.
  - d. Er hat eine Banane gegessen.
- (13) Hannes ist auf das Volksfest gegangen, hat zwei Bier getrunken, eine Waffel und ein Lebkuchenherz gekauft und ist nach Hause gelaufen.
- a. Er hat auch eine Zuckerstange gekauft.
  - b. Er hat eine Zuckerstange gekauft.
  - c. Er hat keine Zuckerstange gekauft.
  - d. Er hat auch eine Waffel gekauft.
- (14) Sabine ist auf das Grillfest gekommen, hat ein Steak gegessen, mit Gregor und Frank getanzt und ist nach Hause spaziert.
- a. Sie hat auch mit Lukas getanzt.
  - b. Sie hat mit Lukas getanzt.
  - c. Sie hat nicht mit Lukas getanzt.
  - d. Sie hat mit Gregor getanzt.
- (15) Robert ist zur Weihnachtsfeier gegangen, hat Gluehwein getrunken, Erika und Lisa ein Geschenk ueberreicht und ist nach Hause gefahren.
- a. Er hat auch Dana ein Geschenk ueberreicht.
  - b. Er hat Dana ein Geschenk ueberreicht.
  - c. Er hat Dana kein Geschenk ueberreicht.

- d. Er hat Erika Geschenk ueberreicht.
- (16) Benni ist zur Post gegangen, hat ewig angestanden, hat ein Paket und ein Einschreiben abgeholt und ist zur Arbeit gefahren.
- a. Er hat auch einen Brief abgeholt.
  - b. Er hat einen Brief abgeholt.
  - c. Er hat keinen Brief abgeholt.
  - d. Er hat ein Paket abgeholt.
- (17) Kira ist ins Tierheim gefahren, hat etwas Geld gespendet, eine Katze und ein Kaninchen adoptiert und ist zurueck in ihre WG gefahren.
- a. Sie hat auch einen Hasen adoptiert.
  - b. Sie hat einen Hasen adoptiert.
  - c. Sie hat keinen Hasen adoptiert.
  - d. Sie hat auch eine Katze adoptiert.
- (18) Theo ist nach Paris gefahren, hat einen Kaffee getrunken, den Eiffelturm und den Triumphbogen besucht und ist nach London weitergefahren.
- a. Er hat auch Notre Dame angeschaut.
  - b. Er hat Notre Dame angeschaut.
  - c. Er hat Notre Dame nicht angeschaut.
  - d. Er hat den Eiffelturm angeschaut.
- (19) Jana ist ins Krankenhaus gefahren, hat ihren Vater besucht, Blumen und Schokolade mitgebracht und mit den Aerzten gesprochen.
- a. Sie hat auch eine Zeitschriften mitgebracht.
  - b. Sie hat eine Zeitschriften mitgebracht.
  - c. Sie hat keine Zeitschriften mitgebracht.
  - d. Sie hat Blumen mitgebracht.
- (20) Paul ist in sein Zimmer gegangen, hat den Fernseher angestellt, seine Freundin und seine Mutter angerufen und ist ins Bett gegangen.
- a. Er hat auch seinen Kumpel angerufen.
  - b. Er hat seinen Kumpel angerufen.
  - c. Er hat seinen Kumpel nicht angerufen.
  - d. Er hat seine Mutter angerufen.
- (21) Cordula ist nach Hause gekommen, hat Spaghetti gekocht, ihre Nach-

barn Finn und Lars eingeladen und einen Film angeschaut.

- a. Sie hat auch ihren Nachbarn Sam eingeladen.
- b. Sie hat ihren Nachbarn Sam eingeladen.
- c. Sie hat nicht ihren Nachbarn Sam eingeladen.
- d. Sie hat ihren Nachbarn Finn eingeladen.

(22) Timo ist zum Wochenmarkt gegangen, hat Dana getroffen, einen Rettich und einen Blumenkohl gekauft und ist nach Hause gegangen.

- a. Er hat auch Kaese gekauft.
- b. Er hat Kaese gekauft.
- c. Er hat keinen Kaese gekauft.
- d. Er hat einen Rettich gekauft.

(23) Kim ist zu ihrem Klassentreffen gegangen, hat viele Leute wieder getroffen, hat Hackbaellchen und Bowle mitgebracht und sich koestlich amuesiert.

- a. Sie hat auch eine Lachsschnitten mitgebracht.
- b. Sie hat eine Lachsschnitten mitgebracht.
- c. Sie hat keine Lachsschnitten mitgebracht.
- d. Sie hat Hackbaellchen mitgebracht.

(24) Tobi ist zu einem Klavierkonzert gegangen, hat einige Bekannte getroffen, hat mit Susi und Paula Sekt getrunken und das Konzert sehr genossen.

- a. Er hat auch mit Stefanie Sekt getrunken.
- b. Er hat mit Stefanie Sekt getrunken.
- c. Er hat nicht mit Stefanie Sekt getrunken.
- d. Er hat mit Susi Sekt getrunken.



# Appendix D

## Material experiment 4

- (1) Sonja und Nadine sind Kolleginnen. Sie unterhalten sich ueber Freizeitaktivitaeten, die sie in der letzten Woche unternommen haben. Sonja sagt:
  - a. Wir waren am Dienstag schwimmen. Am Freitag waren wir [nicht] [wieder] schwimmen.
- (2) Saskia und Jana sind Mitbewohnerinnen. Sie fuellen ein Formular fuer die Stadtwerke aus, in dem sie die Wartung ihrer Heizung seit dem Jahr 2001 festhalten muessen. Saskia sagt:
  - a. Der Heizungstechniker hat 2008 unsere Heizung entlueftet. 2012 hat er sie [nicht] [wieder] entlueftet.
- (3) Hannah und Tobias sind ein junges Ehepaar. Sie unterhalten sich ueber die Reinigung des Schornsteins in ihrem gemeinsamen Haus. Hannah sagt:
  - a. Der Schornsteinfeger hat im Januar den Schornstein gereinigt. Im November hat er ihn [nicht] [wieder] gereinigt.
- (4) Tina und Lars sind Nachbarn. Sie unterhalten sich ueber Verabredungen zum Mittagessen in der letzten Woche. Tina sagt:
  - a. Wir waren am Montag zusammen Mittag essen. Am Mittwoch waren wir [nicht] [wieder] zusammen Mittag essen.
- (5) David und Paul sind beste Freunde. Sie unterhalten sich ueber gemeinsame Reisen nach Amerika. David sagt:
  - a. Wir waren im Maerz in den USA. Im November waren wir [nicht]



[wieder] in den USA.

- (6) Jan und Arne sind alte Schulfreunde. Sie unterhalten sich ueber ihre letzten Sommerurlaube. Jan sagt:
- a. Wir waren vor 3 Jahren gemeinsam im Sommerurlaub. Letztes Jahr waren wir [nicht] [wieder] gemeinsam im Sommerurlaub.
- (7) Janina und Albert sind Geschwister. Sie unterhalten sich ueber Besuche ihrer Eltern. Janina sagt:
- a. Unsere Eltern waren im Januar zu Besuch. Im Maerz waren sie [nicht] [wieder] zu Besuch.
- (8) Gregor und Stefan sind Bandkollegen. Sie unterhalten sich ueber Auftritte ihrer Band. Gregor sagt:
- a. Unsere Band ist im Mai aufgetreten. Im Juli sind wir [nicht] [wieder] aufgetreten.
- (9) Julia und Karin sind Mitbewohnerinnen. Sie unterhalten sich ueber ihre Vermieterin. Julia sagt:
- a. Unsere Vermieterin war am Sonntag da. Am Dienstag war sie [nicht] [wieder] da.
- (10) Simon und Frauke sind Mitbewohner. Sie unterhalten sich ueber ihren gemeinsamen Mitbewohner Matthias. Simon sagt:
- a. Matthias war am Mittwoch bei seiner Freundin. Am Donnerstag war er [nicht] [wieder] bei seiner Freundin.
- (11) Laura und Severin sind Komilitonen. Sie unterhalten sich ueber den Chor, in dem sie gemeinsam singen. Laura sagt:
- a. Unser Chor ist im August aufgetreten. Im Dezember ist er [nicht] [wieder] aufgetreten.
- (12) Gabi und Timo sind ein junges Paar. Sie unterhalten sich ueber ihre Nachbarn. Gabi sagt:
- a. Die Nachbarn haben am Freitag die Polizei gerufen. Am Samstag haben sie [nicht] [wieder] die Polizei gerufen.
- (13) Sarah und David sind ein Ehepaar. Sie unterhalten sich ueber Reparaturen an ihrem Auto. Sarah sagt:
- a. Unser Auto war im Februar in der Werkstatt. Im Dezember war

es [nicht] [wieder] in der Werkstatt.

- (14) Frank und Claudia sind schon lange verheiratet. Sie unterhalten sich ueber den Gitarrenunterricht ihres Sohnes. Frank sagt:
- a. Unser Sohn hatte am Montag Gitarrenunterricht. Am Donnerstag hatte er [nicht] [wieder] Gitarrenunterricht.
- (15) Rita und Sabine sind Geschwister. Sie unterhalten sich ueber die Krankenhausbesuche ihres Vaters. Rita sagt:
- a. Unser Vater war im Maerz im Krankenhaus. Im Mai war er [nicht] [wieder] im Krankenhaus.
- (16) Hannes und Jule sind langjaehrige Mitbewohner. Sie unterhalten sich ueber ihre Umzuege. Hannes sagt:
- a. Wir sind 2008 umgezogen. 2010 sind wir [nicht] [wieder] umgezogen.
- (17) Sebastian und Katharina besitzen zusammen eine Tischlerei. Sie unterhalten sich ueber Steuerpruefungen. Sebastian sagt:
- a. Der Wirtschaftspruefer war 2012 in der Firma. 2014 war der Wirtschaftspruefer [nicht] [wieder] in der Firma.
- (18) Georg und Anne sind gute Freunde. Sie unterhalten sich ueber ihre gemeinsamen Kinobesuche in letzter Zeit. Georg sagt:
- a. Wir waren am Sonntag vor zwei Wochen im Kino. Letzten Freitag waren wir [nicht] [wieder] im Kino.
- (19) Felix und Dana sind beste Freunde. Sie unterhalten sich ueber ihre letzten Silvester. Felix sagt:
- a. Wir haben 2010 gemeinsam Silvester gefeiert. 2011 haben wir [nicht] [wieder] gemeinsam Silvester gefeiert.
- (20) Sascha und Maria sind ein junges Paar. Sie unterhalten sich ueber ihren Labrador. Sascha sagt:
- a. Wir haben unseren Hund im Januar impfen lassen. Im Dezember haben wir unseren Hund [nicht] [wieder] impfen lassen.
- (21) Klara und Bernhard sind ein altes Paar. Sie unterhalten sich ueber ihren Schrebergarten. Klara sagt:
- a. Wir sind am Mittwoch in den Garten gefahren. Am Freitag sind

wir [nicht] [wieder] in den Garten gefahren.

- (22) Andreas und Karolin sind sehr gute Freunde. Sie unterhalten sich ueber Besuche in Frankreich. Andreas sagt:
- a. Wir sind 2009 nach Frankreich gefahren. 2012 sind wir [nicht] [wieder] nach Frankreich gefahren.
- (23) Susi und Daniel sind Mitbewohner. Sie unterhalten sich ueber Renovierungen in ihrer Wohnung. Daniel sagt:
- a. Wir haben 2008 unsere Kueche renoviert. 2011 haben wir die Kueche [nicht] [wieder] renoviert.
- (24) Paul und Katja sind Freunde. Sie unterhalten sich ueber Hochzeiten, zu denen sie im letzten Jahr eingeladen waren. Paul sagt:
- a. Wir waren im Juli auf einer Hochzeit. Im August waren wir [nicht] [wieder] auf einer Hochzeit.

# Appendix E

## Material experiment 5

- (1) Jan und Karolin haben bei Saturn einen Fernseher gekauft.
  - a. Der/ Ein Fernseher ist [nicht] von Panasonic.
- (2) Rita und Timo haben fuer ein Grillfest einen Lachs gekauft.
  - a. Der/ Ein Lachs kommt [nicht] von einer Fischfarm.
- (3) Sara hat zu ihrem Geburtstag ein Auto geschenkt bekommen.
  - a. Das/ Ein Auto ist [nicht] blau.
- (4) Janine hat fuer ihren Nachbarn ein Paket entgegen genommen.
  - a. Das/ Ein Paket ist [nicht] sehr schwer.
- (5) Lisa hat fuer den Besuch ihrer Mutter einen Kuchen gebacken.
  - a. Der/ Ein Kuchen ist [nicht] mit Schokolade.
- (6) Paul hat fuer seinen Sohn Jonas ein Schaukelpferd gekauft.
  - a. Das/ Ein Schaukelpferd ist [nicht] sehr stabil.
- (7) Sigrid hat fuer ihren Garten eine Rose bestellt.
  - a. Die/ Eine Rose ist [nicht] zweifarbig.
- (8) Simon hat sich ein Surfboard angeschafft.
  - a. Das/ Ein Surfboard ist [nicht] gruen.
- (9) Tina hat sich am Wochenende eine Wohnung angeschaut.
  - a. Die/ Eine Wohnung war [nicht] sehr teuer.
- (10) Lara hat eine Katze aus dem Tierheim adoptiert.
  - a. Die/ Eine Katze ist [nicht] schwarz.

- (11) Sophie hat fuer ihre Tochter ein Klavier gekauft.  
a. Das/ Ein Klavier ist [nicht] aus Buchenholz.
- (12) Jennifer hat bei einem Preisausschreiben eine Kreuzfahrt gewonnen.  
a. Die/ Eine Kreuzfahrt findet [nicht] im Mittelmeer statt.
- (13) Hanna hat von ihrem Bruder eine Postkarte bekommen.  
a. Die/ Eine Postkarte ist [nicht] aus Rom.
- (14) Ronja hat fuer eine Hochzeit ein Kleid gekauft.  
a. Das/ Ein Kleid ist [nicht] aus Seide.
- (15) David hat fuer eine Geschaeftsreise nach Paris einen Flug gebucht.  
a. Der/ Ein Flug wird [nicht] von British Airways durchgefuehrt.
- (16) Ronald hat sich fuer eine Bergwanderung eine Daunenjacke gekauft.  
a. Die/ Eine Daunenjacke ist [nicht] blau.
- (17) Susanne und Fred haben sich im Kino einen Film angeschaut.  
a. Der/ Ein Film spielt [nicht] in Peru.
- (18) Katharina hat beim Schreiner einen Schrank reparieren lassen.  
a. Der/ Ein Schrank ist [nicht] aus Kirschbaumholz.
- (19) Luis hat fuer seinen Malkurs einen Pinsel gekauft.  
a. Der/ Ein Pinsel ist [nicht] aus Schweinsborsten.
- (20) Gregor hat seiner Tochter fuer die Schule eine Apfel eingepackt.  
a. Der/ Ein Apfel ist [nicht] sehr gross.
- (21) Susi hat zum Abitur eine Reise geschenkt bekommen.  
a. Die/ Eine Reise ist [nicht] fuer zwei Personen.
- (22) Bruno hat fuer seine Freundin einen Verlobungsring bestellt.  
a. Der/ Ein Verlobungsring ist [nicht] aus Weissgold.
- (23) Robert hat beim Optiker eine Brille bestellt.  
a. Die/ Eine Brille ist [nicht] von Gucci.
- (24) Desiree hat fuer eine Radtour im Urlaub ein Fahrrad geliehen.  
a. Das/ Ein Fahrrad ist [nicht] sehr alt.

# Appendix F

## Material experiment 6

- (1) In der Klasse von Sam sind zehn Mädchen. Vier Mädchen singen im Schulchor.
  - a. Alle Mädchen /haben /eine Fleißaufgabe /gemacht. /Deswegen/ gibt /Sam /zehn Mädchen /einen Bonus-Stern.
  - b. Alle Mädchen /haben /eine Fleißaufgabe /gemacht. /Deswegen /gibt /Sam /vier Mädchen /einen Bonus-Stern.
  - c. Die Mädchen /haben /eine Fleißaufgabe /gemacht. Deswegen /gibt /Sam /zehn Mädchen /einen Bonus-Stern.
  - d. Die Mädchen /haben /eine Fleißaufgabe /gemacht. /Deswegen /gibt /Sam /vier Mädchen /einen Bonus-Stern.
- (2) In der Brigade von Paul sind acht Zimmermänner. Fünf Zimmermänner haben ihre Ausbildung in Tübingen gemacht.
  - a. Alle Zimmermänner /singen /Tenor. /Deswegen /rekrutiert /Paul /acht Zimmermänner /für /seinen Chor.
  - b. Alle Zimmermänner /singen /Tenor. /Deswegen /rekrutiert /Paul /fünf Zimmermänner /für /seinen Chor.
  - c. Die Zimmermänner /singen /Tenor. /Deswegen /rekrutiert /Paul /acht Zimmermänner /für /seinen Chor.
  - d. Die Zimmermänner /singen /Tenor. /Deswegen /rekrutiert /Paul /fünf Zimmermänner /für /seinen Chor.
- (3) Im Wohnheim von Marie wohnen zwölf Männer. Fünf der Männer fahren jedes Wochenende nach Hause.
  - a. Alle Männer /mögen /Filme. /Deswegen /lädt /Marie /zwölf Män-

- ner /zum /Herr der Ringe Abend /zu /sich /ein.
- b. Alle Männer /mögen /Filme. /Deswegen /lädt /Marie /fünf Männer /zum /Herr der Ringe Abend/ zu /sich /ein.
  - c. Die Männer /mögen /Filme. /Deswegen /lädt /Marie /zwölf Männer /zum /Herr der Ringe Abend /zu /sich /ein.
  - d. Die Männer /mögen /Filme. /Deswegen /lädt /Marie /fünf Männer /zum /Herr der Ringe Abend /zu /sich /ein.
- (4) In die Sprechstunde von Hannes kommen acht Studenten. Fünf der Studenten kommen aus Tübingen.
- a. Alle Studenten /brauchen /eine Unterschrift /von /Hannes. /Deswegen /gibt /Hannes /acht Studenten /seine Unterschrift.
  - b. Alle Studenten /brauchen /eine Unterschrift /von /Hannes. /Deswegen /gibt /Hannes /fünf Studenten /seine Unterschrift.
  - c. Die Studenten /brauchen /eine Unterschrift /von /Hannes. /Deswegen /gibt /Hannes /acht Studenten /seine Unterschrift.
  - d. Die Studenten /brauchen /eine Unterschrift /von /Hannes. /Deswegen /gibt /Hannes /fünf Studenten /seine Unterschrift.
- (5) Zu einer Zimmerbesichtigung in Toms WG kommen acht Bewerber. Fünf der Bewerber sind im ersten Semester.
- a. Alle Bewerber /sind /ausländische Studenten. /Deswegen /redet /Tom /mit /acht Bewerbern /Englisch.
  - b. Alle Bewerber /sind /ausländische Studenten. /Deswegen /redet /Tom /mit /fünf Bewerbern /Englisch.
  - c. Die Bewerber /sind /ausländische Studenten. /Deswegen /redet /Tom /mit /acht Bewerbern /Englisch.
  - d. Die Bewerber /sind /ausländische Studenten. /Deswegen /redet /Tom /mit /fünf Bewerbern /Englisch.
- (6) In Johannes Chor sind zehn Frauen. Sechs der Frauen singen Sopran.
- a. Alle Frauen /haben /ein Auto. /Deswegen /kommen /zehn Frauen /mit /dem Auto /zur /Chorprobe.
  - b. Alle Frauen /haben /ein Auto. /Deswegen /kommen /sechs Frauen /mit /dem Auto /zur /Chorprobe.
  - c. Die Frauen /haben /ein Auto. /Deswegen /kommen /zehn Frauen /mit /dem Auto /zur /Chorprobe.

- d. Die Frauen /haben /ein Auto. /Deswegen /kommen /sechs Frauen /mit /dem Auto /zur /Chorprobe.
- (7) In Lisas Kindergarten sind zwölf Kinder. Sieben der Kinder kommen bald in die Schule.
- a. Alle Kinder /sind /Allergiker. /Deswegen /kocht /Lisa /zwölf Kindern /ein separates Mittagessen.
- b. Alle Kinder /sind /Allergiker. /Deswegen /kocht /Lisa /sieben Kindern /ein separates Mittagessen.
- c. Die Kinder /sind /Allergiker. /Deswegen /kocht /Lisa /zwölf Kindern /ein separates Mittagessen.
- d. Die Kinder /sind /Allergiker. /Deswegen /kocht /Lisa /sieben /Kindern /ein /separates Mittagessen.
- (8) In Franks Malkurs sind neun Hausfrauen. Sechs der Hausfrauen haben Kinder.
- a. Alle Hausfrauen /haben /ein eigenes Pinsel-Set. /Deswegen /muss /Frank /neun Hausfrauen /keinen Pinsel /für /den Malkurs /leihen.
- b. Alle Hausfrauen /haben /ein eigenes Pinsel-Set. /Deswegen /muss /Frank /sechs Hausfrauen /keine /Pinsel /für /den Malkurs /leihen.
- c. Die Hausfrauen /haben /ein eigenes /Pinsel-Set. /Deswegen /muss /Frank /neun Hausfrauen /keine Pinsel /für /den Malkurs /leihen.
- d. Die Hausfrauen /haben /ein /eigenes Pinsel-Set. /Deswegen /muss /Frank /sechs Hausfrauen /keine Pinsel /für /den Malkurs /leihen.
- (9) In Ritass Buchclub sind acht Lehrer. Fünf der Lehrer unterrichten am Gymnasium.
- a. Alle Lehrer /sind /Single. /Deswegen /lädt /Rita /acht Lehrer /zu /einer Single-Party /ein.
- b. Alle Lehrer /sind /Single. /Deswegen /lädt /Rita /fünf Lehrer /zu /einer Single-Party /ein.
- c. Die Lehrer /sind /Single. /Deswegen /lädt /Rita /acht Lehrer /zu /einer Single-Party /ein.
- d. Die Lehrer /sind /Single. /Deswegen /lädt /Rita /fünf Lehrer /zu /einer Single-Party ein.



- (10) In Pias Yogakurs sind sieben Rentner. Vier der Rentner kommen regelmäßig in den Kurs.
- Alle Rentner /sind /verheiratet. /Deswegen /gibt /Pia /sieben Rentnern /eine Broschüre /für /Partner-Yoga.
  - Alle Rentner /sind /verheiratet. /Deswegen /gibt /Pia /vier Rentnern /eine Broschüre /für /Partner-Yoga.
  - Die Rentner /sind /verheiratet. /Deswegen /gibt /Pia /sieben Rentnern /eine Broschüre /für /Partner-Yoga.
  - Die Rentner /sind /verheiratet. /Deswegen /gibt /Pia /vier Rentnern /eine Broschüre /für /Partner-Yoga.
- (11) In Hans Fußballverein spielen sechs Schreiner. Vier der Schreiner spielen schon lange in dem Verein.
- Alle Schreiner /haben /Knieprobleme. /Deswegen /empfiehlt /Hans /sechs Schreibern /einen Orthopäden.
  - Alle Schreiner /haben /Knieprobleme. /Deswegen /empfiehlt /Hans /vier Schreibern /einen Orthopäden.
  - Die Schreiner /haben /Knieprobleme. /Deswegen /empfiehlt /Hans /sechs Schreibern /einen Orthopäden.
  - Die Schreiner /haben /Knieprobleme. /Deswegen /empfiehlt /Hans /vier Schreibern /einen Orthopäden.
- (12) Zu Inas Geburtstagsparty kommen acht Ärzte. Vier der Ärzte arbeiten in der Uniklinik von Tübingen.
- Alle Ärzte /sind /mit /dem Auto /gekommen. /Deswegen /trinken /acht Ärzte /keinen Alkohol /auf /der Party.
  - Alle Ärzte /sind /mit /dem Auto /gekommen. /Deswegen /trinken /vier Ärzte/ keinen Alkohol /auf /der Party.
  - Die Ärzte /sind /mit /dem Auto /gekommen. /Deswegen /trinken /acht Ärzte /keinen Alkohol /auf /der Party.
  - Die Ärzte /sind /mit /dem Auto /gekommen. /Deswegen /trinken /vier Ärzte /keinen Alkohol /auf /der Party.
- (13) In der Tanzgruppe von Irina sind dreizehn Jungen. Sechs der Jungen haben blaue Augen.
- Alle Jungen /haben /heute /Quatsch /gemacht. /Deswegen /erteilt /Irina /dreizehn Jungen /eine Standpauke.

- b. Alle Jungen /haben /heute /Quatsch gemacht. /Deswegen /erteilt /Irina /sechs Jungen /eine Standpauke.
- c. Die Jungen /haben /heute /Quatsch /gemacht. /Deswegen /erteilt /Irina /dreizehn /Jungen /eine Standpauke.
- d. Die Jungen /haben /heute /Quatsch /gemacht. /Deswegen /erteilt /Irina /sechs Jungen /eine Standpauke.
- (14) Im Zirkus Mahagnoi gibt es sieben Elefanten. Fünf der Elefanten können auf einem Ball balancieren.
- a. Alle Elefanten /haben /eine Kolik. /Deswegen /erteilt /der Tierarzt /sieben Elefanten /Auftrittsverbot.
- b. Alle Elefanten /haben /eine Kolik. /Deswegen /erteilt /der Tierarzt /fünf Elefanten /Auftrittsverbot.
- c. Die Elefanten /haben /eine Kolik. /Deswegen /erteilt /der Tierarzt /sieben Elefanten /Auftrittsverbot.
- d. Die Elefanten /haben /eine Kolik. /Deswegen /erteilt /der Tierarzt /fünf Elefanten /Auftrittsverbot.
- (15) In Antons Kleintierzüchterverein gibt es elf Züchter. Sieben der Züchter haben sich auf Kaninchen spezialisiert.
- a. Alle Züchter /interessieren sich /für Gartenbau. /Deswegen /lädt /Anton /elf Züchter /in /seine Kleingartenanlage /ein.
- b. Alle Züchter /interessieren sich /für Gartenbau. /Deswegen /lädt Anton /sieben Züchter /in /seine Kleingartenanlage /ein.
- c. Die Züchter /interessieren sich /für /Gartenbau. /Deswegen /lädt /Anton /elf Züchter /in /seine Kleingartenanlage /ein.
- d. Die Züchter /interessieren sich /für Gartenbau. /Deswegen /lädt /Anton /sieben Züchter /in /seine Kleingartenanlage /ein.
- (16) In Mariannes Handarbeitsgruppe sind neun Näherinnen. Fünf der Näherinnen besitzen eine Nähmaschine.
- a. Alle Näherinnen /haben /beim /letzten Treffen /ein Projekt /beendet. /Deswegen /gibt /Marianne /neun Näherinnen /eine neue Aufgabe.
- b. Alle Näherinnen /haben /beim /letzten Treffen /ein Projekt /beendet. /Deswegen /gibt /Marianne /fünf Näherinnen /eine neue Aufgabe.

- c. Die Näherinnen /haben /beim /letzten Treffen /ein Projekt /beendet. /Deswegen /gibt /Marianne /neun Näherinnen /eine neue Aufgabe.
- d. Die Näherinnen /haben /beim /letzten Treffen /ein Projekt /beendet. /Deswegen /gibt /Marianne /fünf Näherinnen /eine neue Aufgabe.
- (17) In der Theatergruppe von Bernd sind elf Schauspieler. Sechs der Schauspieler sind verheiratet.
- a. Alle Schauspieler /haben /Lampenfieber. /Deswegen /redet /Bernd /elf Schauspielern /Mut zu.
- b. Alle Schauspieler /haben /Lampenfieber. /Deswegen /redet /Bernd /sechs Schauspielern /Mut zu.
- c. Die Schauspieler /haben /Lampenfieber. /Deswegen /redet /Bernd /elf Schauspielern /Mut zu.
- d. Die Schauspieler /haben /Lampenfieber. /Deswegen /redet /Bernd /sechs Schauspielern /Mut zu.
- (18) Im Gemeinderat von Trochtelfingen sitzen sieben Rechtsanwälte. Fünf der Rechtsanwälte haben eine eigene Kanzlei.
- a. Alle Rechtsanwälte /wurden /der Steuerhinterziehung /überführt. /Deswegen /schließt /der Bürgermeister /sieben Rechtsanwälte /aus /dem Gemeinderat /aus.
- b. Alle Rechtsanwälte /wurden /der Steuerhinterziehung /überführt. /Deswegen /schließt /der Bürgermeister /fünf Rechtsanwälte /aus /dem Gemeinderat /aus.
- c. Die Rechtsanwälte /wurden /der Steuerhinterziehung /überführt. /Deswegen /schließt /der Bürgermeister /sieben Rechtsanwälte /aus /dem Gemeinderat /aus.
- d. Die Rechtsanwälte /wurden /der Steuerhinterziehung /überführt. /Deswegen /schließt /der Bürgermeister /fünf Rechtsanwälte /aus /dem Gemeinderat /aus.
- (19) In der Abnehmgruppe von Birgit sind vierzehn Abnehmwillige. Acht der Abnehmwilligen machen zum ersten Mal eine Diät.
- a. Alle Abnehmwilligen /haben /seit /dem letzten Treffen /zugenommen. /Deswegen /verordnet /Birgit /vierzehn Abnehmwilligen

- /einen strikteren Ernährungsplan.
- b. Alle Abnehmwilligen /haben /seit /dem /letzten Treffen /zugenommen. /Deswegen /verordnet /Birgit /acht Abnehmwilligen /einen strikteren Ernährungsplan.
- c. Die Abnehmwilligen /haben /seit /dem /letzten Treffen /zugenommen. /Deswegen /verordnet /Birgit /vierzehn Abnehmwilligen /einen strikteren Ernährungsplan.
- d. Die Abnehmwilligen /haben /seit /dem letzten Treffen /zugenommen. /Deswegen /verordnet /Birgit /acht Abnehmwilligen /einen strikteren Ernährungsplan.
- (20) In Jörns Bekanntenkreis gibt es sieben Paare. Vier der Paare kennen sich seit ihrer Schulzeit.
- a. Alle Paare /wollen /demnächst /heiraten. /Deswegen /sucht /Jörn /für /sieben Paare /nach /Hochzeitsgeschenken.
- b. Alle Paare /wollen /demnächst /heiraten. /Deswegen /sucht /Jörn /für /vier Paare /nach /Hochzeitsgeschenken.
- c. Die Paare /wollen /demnächst /heiraten. /Deswegen /sucht /Jörn /für /sieben Paare /nach /Hochzeitsgeschenken.
- d. Die Paare /wollen /demnächst /heiraten. /Deswegen /sucht /Jörn /für /vier Paare /nach /Hochzeitsgeschenken.
- (21) Zu Gregors Geburtstag kommen sechs Basketballer. Vier der Basketballer spielen zusammen in einem Verein.
- a. Alle Basketballer /sind /gerade /Vater /geworden. /Deswegen /gratuliert /Gregor /sechs Basketballern /zum /Baby.
- b. Alle Basketballer /sind /gerade /Vater geworden. /Deswegen /gratuliert /Gregor /vier Basketballern /zum /Baby.
- c. Die Basketballer /sind /gerade /Vater /geworden. /Deswegen /gratuliert /Gregor /sechs Basketballern /zum /Baby.
- d. Die Basketballer /sind /gerade /Vater /geworden. /Deswegen /gratuliert /Gregor /vier Basketballern /zum /Baby.
- (22) In Thorstens Betrieb arbeiten acht Auszubildende. Fünf Auszubildende haben einen Hauptschulabschluss.
- a. Alle Auszubildenden /machen /viele Zusatzaufgaben. /Deswegen /lobt /Thorsten /acht Auszubildende.

- b. Alle Auszubildenden /machen /viele Zusatzaufgaben. /Deswegen /lobt /Thorsten /fünf Auszubildende.
- c. Die Auszubildenden /machen /viele Zusatzaufgaben. /Deswegen /lobt /Thorsten /acht Auszubildende.
- d. Die Auszubildenden /machen /viele Zusatzaufgaben. /Deswegen /lobt /Thorsten /fünf Auszubildende.
- (23) In Janas Tierheim arbeiten sechs Schüler ehrenamtlich. Vier der Schüler kommen jeden Nachmittag.
- a. Alle Schüler /sind /über /18 Jahre alt. /Deswegen /dürfen /sechs Schüler /rauchen.
- b. Alle Schüler /sind /über /18 Jahre alt. /Deswegen /dürfen /vier Schüler /rauchen.
- c. Die Schüler /sind /über /18 Jahre alt. /Deswegen /dürfen /sechs Schüler /rauchen.
- d. Die Schüler /sind /über /18 Jahre alt. /Deswegen /dürfen /vier Schüler /rauchen.
- (24) In Fridas Hundeschule sind neun Hunde. Sechs der Hunde sind Schäferhunde.
- a. Alle Hunde /sind /noch /Welpen. /Deswegen /steckt /Frida /neun Hunde /in /die /Welpen-Gruppe.
- b. Alle /Hunde /sind /noch /Welpen. /Deswegen /steckt /Frida /sechs Hunde /in /die Welpen-Gruppe.
- c. Die Hunde /sind /noch /Welpen. /Deswegen /steckt /Frida /neun Hunde /in /die Welpen-Gruppe.
- d. Die Hunde /sind /noch /Welpen. /Deswegen /steckt /Frida /sechs Hunde /in /die /Welpen-Gruppe.

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