Presuppositions, Implicatures and the Scope of Exhaustification

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Signed: 

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Abbreviations

CP	Complementiser phrase
DP	Determiner phrase
IE	Innocently excludable
LF	Logical Form
M&R	Marty & Romoli (2021)
obj	Object
PP	Prepositional phrase
psp	Presupposition
QUD	Question Under Discussion
s.t.	such that
S&S	Spector & Sudo (2017)
SMN	Superlative modified numeral
SPT	Soft presupposition trigger
subj	Subject
TP	Tense phrase
VP	Verb phrase

Abstract

Exh is a covert grammatical operator posited to be responsible for generating scalar implicatures. However, the syntactic constraints on the distribution of Exh remain an open problem. In this thesis, I build on the work of Marty & Romoli (2021) (M&R), who study the interaction of Exh with disjunction and additive particles in accounting for the problem of presupposed ignorance first introduced by Spector & Sudo (2017). While M&R assume that additive particles may scope at the matrix level, I argue that *also* takes scope in its surface position below the subject. I show how this provides an argument against Meyer's (2013) Matrix K theory and in favour of a theory where ignorance implicatures may be generated in embedded positions. I further extend the empirical coverage considered by M&R by examining the interaction of various logical operators with various presupposition triggers. I argue for a syntactic constraint which requires an instance of Exh to associate with disjunction, unstressed *some* and bare numerals as low as possible, and discuss the distribution of Exh with respect to other operators including stressed *some*, superlative modified numerals and scalar adjectives. I further show that global application of Exh makes incorrect predictions when disjunction is embedded under factive predicates. I hence argue in favour of adopting the *pex* operator proposed by Bassi et al. (2021), which can be embedded under factive predicates.

Chapter 1

Introduction

Scalar implicatures are inferences that a stronger alternative proposition is false. For instance, in (1a), *some* may be interpreted as "some but not all". In (1b), scalar implicature gives rise to an exclusive interpretation of disjunction. Additionally, disjunction is also associated with ignorance implicatures that the speaker is ignorant about the individual disjuncts.

(1) a. Some of the students passed.

Scalar implicature: Not all of the students passed.

b. John speaks French or Japanese.

Scalar implicature: John does not speak both French and Japanese.

Ignorance implicatures: The speaker does not know whether John speaks French, and does not know whether John speaks Japanese.

In the Neo-Gricean approach, scalar implicatures are derived via pragmatic reasoning that operates on the meaning of complete sentences (Grice 1989, Horn 1972). Specifically, a pragmatic listener assumes that the speaker obeys the Maxim of Quantity, which requires speakers to choose the most informative proposition from a formally defined set of alternatives (Fox 2007). Thus, scalar implicatures arise because a listener reasons that the speaker chose to utter a weaker proposition because he does not believe that the stronger alternative is true.

More recently, since Fox (2007) and Chierchia et al. (2012), scalar implicatures

have been proposed to be generated not by pragmatic reasoning but in the grammar by a covert syntactic operator known as Exh (pronounced "exhaust"). The main motivation for positing a covert grammatical operator is that scalar implicatures are not necessarily a root level phenomenon, but may arise in embedded positions. For instance, in (2), Exh must occur within the scope of negation such that *or* receives an exclusive interpretation.

(2) John doesn't Exh [speak French *or* Japanese], he speaks both.

The global application of Exh does not deliver the correct reading, since implicatures involve the negation of stronger and not weaker alternatives. Because negation reverses the direction of entailment, the alternative in (3) is entailed by the prejacent and cannot be excluded by Exh.

(3) John doesn't speak French and Japanese.

However, the precise constraints on the syntactic distribution of Exh remains an open debate in the literature. Recently, Spector & Sudo (2017) (S&S) and Marty & Romoli (2021) (M&R) have explored the interaction of Exh with presupposition triggers such as additive particles and factive predicates. While S&S present their account using Exh, they consistently apply Exh at the global level, and emphasise that their ideas "might be alternatively cashed out in Neo-Gricean terms". In M&R's approach, speaker-oriented ignorance implicatures are derived in the grammar but still generated as root-level phenomena.

In this thesis, I build upon M&R's approach to analysing the interaction of scalar implicatures with presupposition triggers. I argue that contrary to M&R's approach, ignorance implicatures can be generated in embedded positions, and propose syntactic locality constraints on the position of Exh when associating with

disjunction and various other logical operators. In this chapter, I first introduce the operator Exh and the presupposed ignorance problem posed by S&S. I then explain M&R's proposed solution before highlighting the limitations of their account.

1.1 Exh

Following Katzir (2007), the set of alternatives $\textsc{Alt}(\phi)$ on which Exh operates is standardly understood to contain structural alternatives of the prejacent ϕ which are no more complex than ϕ. A structure ψ is no more complex than ϕ if it can be derived via deletions of constituents and substitutions of terminal nodes in ϕ.

For instance, the alternative set of the disjunctive phrase in (4) includes alternatives involving the individual disjuncts *French* and *Japanese*, derived via deletion. It also includes the stronger conjunctive alternative, derived via substitution of *or* with *and*. I use F and J to abbreviate the propositions *John speaks French* and *John speaks Japanese*, respectively.

(4) ϕ = John speaks French or Japanese. (F $\vee$ J)

$$\textsc{Alt}(\phi) = \left\{ \begin{array}{l} \text{John speaks French. (F)} \\ \text{John speaks Japanese. (J)} \\ \text{John speaks French and Japanese. (F} \wedge \text{J)} \end{array} \right\}$$

Various definitions of Exh exist, but its basic definition from M&R and adapted from Fox (2007), given in (5), adds to the asserted content the negation of innocently excludable (IE) alternatives. The set of IE alternatives includes alternatives of ϕ which can be negated simultaneously without contradicting ϕ or entailing any other alternative.

(5) a. $IE(\phi, A) = \bigcap \left\{ \begin{array}{l} A' \subset A : A' \text{ is a maximal set in } A, \\ \text{such that } \{\neg\psi : \psi \in A\} \cup \{\phi\} \text{ is consistent} \end{array} \right\}$

b. $[\![\text{Exh } \phi]\!](w) = [\![\phi]\!](w) \wedge \forall \psi \in IE(\phi, \textsc{Alt}(\phi)[\neg[\![\psi]\!](w)]$

Going back to (4), to derive the set of IE alternatives, we consider all maximal subsets of $\textsc{Alt}(\phi)$ which can be consistently negated with the prejacent, as in (6a). The larger subset {F, J, F∧ J} is not included, since negating all its members would contradict the prejacent. The intersection of these sets leaves the conjunctive alternative as the only IE alternative. Intuitively, the individual disjuncts are not IE, because negating both F∧J and F would entail J. Exh thus negates only the conjunctive alternative, and outputs the reading in (6b).

(6) a. $IE(\phi, \textsc{Alt}(\phi)) = \bigcap \left\{ \begin{array}{l} \{\text{F}, (\text{F} \wedge \text{J})\}, \\ \{\text{J}, (\text{F} \wedge \text{J})\} \end{array} \right\} = \{ \text{F} \wedge \text{J} \}$

b. $[\![\text{Exh } \phi]\!](w)$ = John speaks French or Japanese, but not both French and Japanese.

Since the individual disjuncts are not IE, a separate mechanism is required to derive ignorance implicatures involving the individual disjuncts. I will discuss this in Section 1.3.

1.2 Spector and Sudo (2017)

Following Rullmann (2003), additive particles such as *too* and *also* are focus particles which make reference to a set of focus alternatives. Focus alternatives are derived via the substitution of focus-marked constituents in the prejacent (Rooth 1985). *also* and *too* are synonymous and are defined in (7).

(7) [also/too α] presupposes that there is at least one contextually salient proposition $p \in \text{ALT}(\alpha)$ such that $p \neq \alpha$ and p is true.

For instance, in (8), *also* associates with the subject *John*, triggering the presupposition that there exists some other contextually salient individual who speaks Japanese.

(8) $[\text{John}]_F$ also speaks Japanese.

Spector & Sudo (2017) (S&S) explore the interactions between Exh and additive particles through a phenomenon they call *presupposed ignorance*. S&S observe that we do not expect both examples in (9) to be infelicitous, given the standardly assumed meaning of *too*. In both cases, the additive presupposition triggered by *too* is that some other individual speaks Japanese or French. Since both the simple antecedent in (9a) and the conjunctive antecedent in (9b) entail the disjunctive predicate (i.e. Mary does speak Japanese or French), we expect the additive presupposition to be satisfied.[1]

(9) a. Mary speaks Japanese. #John, too, speaks Japanese or French.

b. Mary speaks Japanese and French. #John, too, speaks Japanese or French.

(9b) is predicted to be infelicitous if there is a scalar implicature that produces an exclusive reading of disjunction within the scope of *too*, as in (10). I assume that the overtly pronounced *too* is semantically inert, but signals the presence of a covert operator attached at the matrix level. *too* thus triggers the unsatisfied

[1] I omit discussion of S&S's account of (9a), which makes use of an additional principle, and focus on Marty & Romoli's (2021) account.

presupposition that there is some salient individual who speaks Japanese or French, but not both.

(10) Mary speaks Japanese and French. #too [Exh [John speaks Japanese or French]].

a. Assertion: John speaks either Japanese or French but not both.

b. Presupposition: Some salient individual (not John) speaks either Japanese or French but not both.

However, S&S acknowledge that their account cannot rule out a parse where Exh scopes above *too*, as in (11), which incorrectly predicts (9b) to be felicitous.

(11) Mary speaks Japanese and French. Exh [too [John speaks Japanese or French]].

a. Implicature: It's false that John, too, speaks Japanese and French.

b. Presupposition: Some salient individual (not John) speaks Japanese and French.

Under S&S's account, the negation used by Exh to exclude IE alternatives is a presupposition hole, such that $\neg\phi$ is defined if and only if ϕ is defined, and hence presupposes whatever ϕ presupposes. Exh thus behaves as a presupposition hole which projects the presuppositions of negated alternatives. Thus, the implicature in (11a) where negation scopes over *too* projects the presupposition that some other individual speaks both Japanese and French. Since this is satisfied in the context, the sentence is wrongly predicted to be felicitous.

Furthermore, they argue that such a parse where Exh scopes above *too* must be possible in principle, given that there are cases which require it. (12) is felicitous,

with the interpretation that it is cold but not freezing in Paris, and correctly presupposes that it is freezing somewhere else.

(12) It's freezing in New York. It's cold in Paris, too.

a. Parse: Exh [too [It's cold in Paris]].

b. Implicature: It's not also freezing in Paris.

c. Presupposition: There exists some other location where is it freezing.

S&S do not explain why Exh must scope below *too* in (10) but not (12), and leave it as an open problem for future work.

1.3 Marty and Romoli (2021)

I will first explain M&R's formulation of Exh, before explaining their proposed solution to S&S's presupposed ignorance problem.[2] According to M&R, speakers entertain two sets of alternatives of a sentence ϕ that are distinguished by Strawson entailment (von Fintel 1999). A proposition ϕ Strawson-entails ψ if and only if ϕ entails ψ and all the presuppositions of ψ are satisfied. Presuppositional alternatives (13a) are the alternatives of ϕ that are not logically entailed but Strawson-entailed by ϕ, and can only be undefined when ϕ is true, while assertive alternatives (14a) are the alternatives to ϕ that are not Strawson-entailed by ϕ, and can be false when ϕ is true.

(13) Excludable and innocently excludable presuppositional alternatives

a. $E^{psr}(\phi) = \{\psi : \psi \in \textsc{Alt}(\phi) \;\&\; \phi \not\models \psi \;\&\; \phi, psp(\psi) \models \psi\}$

b. $IE^{psr}(\phi, A) = \bigcap \left\{ \begin{array}{l} A' \subseteq A : A' \text{ is a maximal set in } A, \text{ s.t.} \\ \{\neg psp(\psi) : \psi \in A\} \cup \{\phi\} \text{ is consistent} \end{array} \right\}$

[2]Definitions (13-15) are taken directly from Marty & Romoli (2021).

(14) Excludable and innocently excludable assertive alternatives

a. $E^{asr}(\phi) = \{\psi : \psi \in \textsc{Alt}(\phi)\ \&\ \phi, psp(\psi) \not\models \psi\}$

b. $$IE^{asr}(\phi, A) = \bigcap \left\{ \begin{array}{l} A' \subseteq A : A' \text{ is a maximal set in } A \text{, s.t.} \\ \{\neg\psi : \psi \in A\} \cup \{\neg psp(\chi) : \chi \in IE^{prs}(\phi, E^{prs}(\phi))\} \\ \cup\{\phi\} \text{ is consistent} \end{array} \right\}$$

The innocently excludable (IE) presuppositional alternatives (13b) are presuppositional alternatives whose presuppositions can be negated consistently with the prejacent. The IE assertive alternatives (14a) are assertive alternatives can be negated consistently with the prejacent (as in the standard definition) and also with the negations of the presuppositional alternatives.

Exh then performs innocent exclusion on both sets of alternatives, as given in (15). First, the presuppositions of the IE presuppositional alternatives are negated, giving rise to presuppositional implicatures, as in (15a-iii). Next, the IE assertive alternatives are negated, giving rise to implicatures added to the asserted content, as in (15b-ii). These presuppositions of assertive implicatures themselves become presuppositions of the output of Exh, as in (15a-ii).

(15) a. $[\text{Exh}_R\ \phi]$ is defined at a world w only if

i. $psp(\phi)$ is true in w,

ii. for all ψ s.t. $\psi \in IE^{asr}(\phi, E^{asr}(\phi))$ and $\psi \in R$, $psp(\psi)$ is true in w,

iii. for all ψ s.t. $\psi \in IE^{prs}(\phi, E^{prs}(\phi))$ and $psp(\psi) \in R$, $\neg psp(\psi)$ is true in w.

b. Where defined, $[\text{Exh}_R\ \phi]$ is true in w iff,

i. ϕ is true in w,

ii. for all ψ s.t. $\psi \in IE^{asr}(\phi, E^{asr}(\phi))$ and $\psi \in R$, $\neg\psi$ is true in w.

Thus, under this framework, Exh can lead to presupposition strengthening in two ways. Firstly, like in S&S's definition of Exh, the presuppositions of the negated IE^{asr} alternatives are projected. Second, Exh can also directly project the negation of the presuppositions of the IE^{psr} alternatives. M&R's distinction between presuppositional and assertive alternatives will become relevant in Chapter 4. In the cases I discuss in the first three chapters, the alternatives are not Strawson-entailed by the prejacent and are hence assertive alternatives.

In M&R's approach, the domain of Exh is restricted by a relevance predicate R which varies across contexts depending on the Question Under Discussion (QUD) (Roberts 2004, Beaver & Clark 2009).[3] Furthermore, they assume that the disjuncts of a disjunctions are generally understood as relevant alternatives, and cannot be pruned from R if the whole disjunction is itself in R.

Recall that disjunction as in (16) is associated with a scalar implicature (16a) and ignorance implicatures about the individual disjuncts (16b). However, Exh only generates the scalar implicature, because the individual disjuncts are not IE.

(16) John speaks French or Japanese.

a. Scalar implicature: John does not speak French and Japanese.

b. Ignorance implicatures: The speaker does not know whether John speaks French, and whether John speaks Japanese.

To derive ignorance implicatures, M&R adopt the Matrix K theory introduced by Meyer (2018), where ignorance implicatures are derived in the grammar from

[3]Specifically, M&R define the notion of relevance as in (1). A proposition is thus relevant if and only if it does not distinguish between two worlds within a cell of the partition Q, which is the set of complete answers to the QUD.

(1) Let Q be a partition of the context set. A proposition p is relevant given Q iff for any cell $q \in$ Q and any two worlds w, $w' \in q$, $p(w) = p(w')$.

the interaction of Exh with a covert doxastic operator K_x, defined in (17). In Meyer's account, K is adjoined at the matrix level in the LF of all assertive sentences. K_s represents the speaker's beliefs and can be read as "the speaker believes that". Furthermore, Exh can be adjoined at any propositional node of type $< s, t >$.

(17) $[\![K_x(\phi)]\!] = \lambda w.\forall w' \in Dox(x)(w)[[\![\phi]\!](w')]$

$w' \in Dox(x)(w)$ iff given the beliefs of x in w, w' could be the actual world.

In (18), I illustrate how Exh below and under K derive the implicatures in (16). First, exhaustification below K derives the scalar implicature in (18a-ii), since the conjunctive alternative is the only IE alternative. Next, exhaustification above K negates the six alternatives in (18b-i). There are six alternatives in total as there is an option to delete or preserve the inner Exh_2 from the prejacent. All six alternatives are IE since they can be simultaneously negated without contradiction.

(18) Exh_1 K_s Exh_2 [John speaks French or Japanese]]

a. Exhaustification below K_s:

i. IE^{asr} = {[F and J]}

ii. Implicature: ¬[F and J]

b. Exhaustification above K_s:

i. $IE^{asr} = \left\{ \begin{array}{l} [K_s\ Exh_2\ F],\ [K_s\ Exh_2\ J],\ [K_s\ Exh_2\ F\ and\ J], \\ [K_s\ F],\ [K_s\ J],\ [K_s\ F\ and\ J] \end{array} \right\}$

ii. Implicatures: $\neg K_s[F \wedge \neg J]$, $\neg K_s[J \wedge \neg F]$, $(\neg K_s[F \wedge J])$, $\neg K_s[F]$, $\neg K_s[J]$, $(\neg K_s[F \wedge J])$

c. Overall meaning: $K_s[F \vee J] \wedge K_s\neg[F \wedge J] \wedge \neg K_s[F] \wedge \neg K_s[J]$

$[Exh_2\ F]$ is equivalent to $[F \wedge \neg\ J]$, and $[Exh_2\ F\ and\ J]$ is equivalent to $[F \wedge J]$. The two conjunctive alternatives give rise to the same implicature $\neg K_s[F \wedge J]$,

which is disregarded because the inner Exh has already produced the stronger implicature $K_s[\neg[F \wedge J]]$. The resulting meaning is that the speaker knows that John speaks Japanese or French but not both, but does not know whether John speaks Japanese and whether John speaks French.[4]

M&R use the Matrix K approach to account for the data in (19). They observe that (19) is felicitous with a disjunctive antecedent (19a) and a split antecedent (19b), but infelicitous with a simple antecedent (19c) and a conjunctive antecedent (19d).

(19) John, too, speaks French or Japanese.

a. Disjunctive antecedent: Mary speaks French or Japanese. John, too, speaks French or Japanese.

b. Split antecedent: Bill speaks French and Mary speaks Japanese. John, too, speaks French or Japanese.

c. Simple antecedent: Mary speaks French. #John, too, speaks French or Japanese.

d. Conjunctive antecedent: Mary speaks French and Japanese. #John, too, speaks French or Japanese.

They consider two possible parses of (19). On the first parse in (20), an instance of Exh scopes under *too*, which scopes under Exh K. The inner Exh_2 produces the scalar implicature in (20a-ii), and the presupposition in (20b) is triggered by *too*. The outer Exh_1 scopes over K and targets the alternatives in (20c-i), which include *too* within their scope.

[4]Strictly speaking, a speaker's ignorance about ϕ requires not only $\neg K_s(\phi)$ but also $\neg K_s(\neg\phi)$ to be true. Meyer (2013) assumes that $\neg K_s(\phi)$ can be strengthened to a true ignorance inference $\neg K_s(\phi) \wedge \neg K_s(\neg\phi)$ via contextual strengthening.

(20) Exh_1 K_s too [John_F λx Exh_2 [x speaks French or Japanese]]

a. Exhaustification below K_s and *too*:

i. IE^{asr} = {[F and J]}

ii. Implicature: ¬[F and J]

b. Presupposition triggered by *too* following (a):

Some salient individual distinct from John speaks Japanese or French but not both.

c. Exhaustification above K_s:

i. $IE^{asr} = \left\{ \begin{array}{l} [\text{K}_s \text{ too } \text{Exh}_2 \text{ F}], [\text{K}_s \text{ too } \text{Exh}_2 \text{ J}], \\ [\text{K}_s \text{ too } \text{Exh}_2 \text{ F and J}], \\ [\text{K}_s \text{ too F}], [\text{K}_s \text{ too J}], [\text{K}_s \text{ too F and J}] \end{array} \right\}$

ii. Implicatures: $\neg\text{K}_s$[too F $\wedge$ ¬J], $\neg\text{K}_s$[too J $\wedge$ ¬F], $\neg\text{K}_s$[too F], $\neg\text{K}_s$[too J]

d. Presuppositions triggered by *too* following (c):

Some salient x distinct from John speaks French but not Japanese. Some salient y distinct from John speaks Japanese but not French.

Crucially, because presuppositions project from implicatures, additional presuppositions in (20d) are triggered by the *too* present in the implicatures in (20c-ii). Overall, this parse presupposes that there are two salient individuals distinct from John, x and y, who speak French but not Japanese, and Japanese but not French, respectively. This predicts that the sentence is felicitous in the split antecedent case, but infelicitous in the conjunctive and simple antecedent case. However, it wrongly predicts that it is infelicitous with a disjunctive antecedent.

In the second parse in (21), the operators Exh K_s Exh scope under *too*. This parse generates the implicatures in (21a-ii) and (21b-ii), which are similar to the

first parse except that *too* does not occur within any of the implicatures. The crucial difference is that because *too* scopes over both Exh operators, *too* triggers the presupposition in (21c), that there is a single salient individual x for whom both the scalar implicature (21a-ii) and the ignorance implicatures (21b-ii) apply. This parse predicts the felicity of sentence with a disjunctive antecedent and its infelicity in the other cases.

(21) too Exh_1 K_s [John_F λx Exh_2 [x speaks French or Japanese]]

a. Exhaustification below K_s:

i. IE^{asr} = {[F and J]}

ii. Implicature: ¬[F and J]

b. Exhaustification above K_s:

i. $IE^{asr} = \left\{ \begin{array}{l} [\text{K}_s\ \text{Exh}_2\ \text{F}],\ [\text{K}_s\ \text{Exh}_2\ \text{J}],\ [\text{K}_s\ \text{Exh}_2\ \text{F and J}], \\ [\text{K}_s\ \text{F}],\ [\text{K}_s\ \text{J}],\ [\text{K}_s\ \text{F and J}] \end{array} \right\}$

ii. Implicatures: $\neg\text{K}_s[\text{F} \wedge \neg\text{J}]$, $\neg\text{K}_s[\text{J} \wedge \neg\text{F}]$, $\neg\text{K}_s[\text{F}]$, $\neg\text{K}_s[\text{J}]$

c. Presuppositions triggered by *too* following (a) and (b):
Some salient x distinct from John speaks French or Japanese but not both, and the speaker is ignorant as to whether x speaks French and as to whether x speaks Japanese.

The empirical judgements and the predictions for each of the possible parses are summarised in Table 1.1. Both parses make the correct predictions for simple and conjunctive antecedents, but only the first parse makes the correct prediction for the split antecedent, while the second parse makes the correct prediction for the disjunctive antecedent.

Cases	**Observed**	**Exh K_s too Exh**	**too Exh K_s Exh**
Disjunctive antecedent	OK	Odd	OK
Split antecedent	OK	OK	Odd
Simple antecedent	Odd	Odd	Odd
Conjunctive antecedent	Odd	Odd	Odd

Table 1.1: Summary of observed judgements and predictions from different parses with different antecedents

1.4 Problem

However, M&R do not explain why the parses in (22-23) are ruled out, where no instance of Exh scopes under *too*. In (22), exhaustification below K_s produces the implicature in (22a), which presupposes that there is some salient individual other than John who speaks French and Japanese. (I omit the output of Exh_1 for brevity.) Furthermore, this presupposition also arises in (23) where the inner Exh under K_s is absent, since exhaustification above K_s minimally produces the implicature $\neg K_s$[too F $\wedge$ J]. Thus, any parse without Exh under *too* wrongly predicts that the conjunctive antecedent case should be felicitous, since the presupposition that some salient individual speaks French and Japanese is satisfied.

(22) Exh_1 K_s Exh_2 [$John_F$ λx too [x speaks French or Japanese]].

a. Exhaustification below K_s:

i. IE^{asr} = {[too F and J]}

ii. Implicature: $\neg$[too F and J]

(23) Exh K_s [$John_F$ λx too [x speaks French or Japanese]].

a. Exhaustification above K_s:

i. $IE^{asr} = \left\{ \text{ [}K_s\text{ too F and J], [}K_s\text{ too F], [}K_s\text{ too J] } \right\}$

ii. Implicatures: $\neg K_s$[too F $\wedge$ J], $\neg K_s$[too F], $\neg K_s$[too J]

M&R implicitly assume that that the two parses they propose are the only possible parses. However, they do not explain why their approach rules out the problematic parses where no Exh scopes under *too*, despite explicitly highlighting the same limitation of S&S's account. Thus, some independent constraint is necessary to rule out such parses.

1.5 Outline

The overarching goal of this thesis is to propose constraints on the syntactic distribution of Exh, building on M&R's approach to the interaction of Exh with presupposition triggers.

In Chapter 2, I argue that additive particles take scope in their surface position below the subject, contrary to M&R's assumption that additive particles take matrix scope. This provides evidence against Meyer's Matrix K theory and in favour of an approach where ignorance implicatures can be generated in embedded positions. Furthermore, I argue that there is a syntactic constraint that requires at least one instance of Exh to associate with disjunction as low as possible.

In Chapter 3, I examine a wider range of empirical data in support of this constraint, and argue that it applies to disjunction, bare numerals and unstressed *some*. I also discuss the position of Exh with respect to other logical operators including stressed *some*, superlative modified numerals and epistemic indefinites.

In Chapter 4, I discuss problems with the global exhaustification approach adopted by M&R to account for the interaction of scalar implicatures with factive predicates. I then discuss how these problems can be resolved by adopting the variant of Exh known as *pex* proposed by Bassi et al. (2021). Chapter 5 concludes.

Chapter 2

Embedded ignorance and the scope of Exh

In this chapter, I argue that contrary to M&R and Meyer's (2013) approach where ignorance implicatures are generated globally by Matrix K, K may be embedded and hence generate ignorance implicatures in embedded positions. I further propose a syntactic constraint that at least one instance of Exh must scope as low as possible with respect to disjunction.

I first review the overall shape of examples such as (24) involved in the presupposed ignorance puzzle introduced by S&S, which are schematically represented in (25). The examples involve two predicates ψ and ϕ, where ψ is a stronger predicate which entails ϕ. Henceforth, I discuss examples involving *also* instead of *too*, as *also* adjoins more naturally to the left of the *vP* compared to *too*, which typically adjoins to the right.

(24) a. Mary speaks Japanese and French. #[John]$_F$ also speaks Japanese or French.

b. It's freezing in New York. It's also cold in Paris.

(25) $\psi(x)$ e.g. x speaks Japanese and French.

$\phi(y)$ e.g. y speaks Japanese or French.

a. $\psi(x)$; also [Exh [$\phi(y)$]].

Implicature: $\neg\psi(y)$

Additive presupposition: $\phi(x)$, $\neg\psi(x)$ (unsatisfied)

b. $\psi(x)$; Exh [also [$\phi(y)$]].

Implicature: ¬[also [$\psi(y)$]]

Additive presupposition: $\psi(x)$ (satisfied)

In (25a), exhaustification under *also* produces the implicature $\neg\psi(y)$. *also* then triggers an additive presupposition that there is some individual for whom the stronger predicate ψ does not apply, i.e. $\neg\psi(x)$, which is not satisfied in the context. In (25b), exhaustification above *also* produces an implicature which contains *also*. *also* within the implicature triggers the additive presupposition that there is some individual for whom the stronger predicate applies.

Since (25a) produces a satisfied presupposition while (25b) produces an unsatisfied presupposition, if the sentence is empirically observed to be infelicitous, as is (24a), the parse in (25b) where Exh scopes over *also* must be ruled out independently. Conversely, if the sentence were felicitous as is (24b), we conclude that the parse where Exh scopes over *also* is available. Such data can hence be used as a diagnostic for the scope of Exh.

2.1 The scope of additive particles

M&R follow S&S in assuming that additive particles like *too* may scope over the entire clause. However, Rullmann (2003) has argued that additive particles like *too* and *also* take scope at their surface position as *v*P adjuncts, underneath the subject. Evidence for this view comes from the competition between *either* and *too* within the scope of negation, as in (26).

(26) Mary doesn't like pizza. John doesn't like pizza (either/*too).

I follow Erlewine (2014) in assuming that the additive particles *also* and *too* take scope at their surface position immediately above the vP. This pattern of backward association of a focus particle with the subject is possible assuming both the VP internal subject hypothesis and the Copy Theory of Movement. As illustrated in (27), *also* associates with the copy of the subject in the specifier of vP.

(27) $[\text{John}]_F$ λx also $[_{vP}$ ~~John~~ went to school].

An analysis where additive particles take scope at their surface position makes better empirical predictions than one where they take matrix scope, as it can account for the contrast in (28). (28a) is infelicitous, but when both clauses are passivised such that disjunction occurs in subject instead of object position as in (28b), the infelicity disappears.

(28) a. Mary was chasing Bryan and Oliver. #$[\text{John}]_F$ was also chasing Bryan or Oliver.

b. Bryan and Oliver were being chased by Mary. Bryan or Oliver was also being chased by $[\text{John}]_F$.

Suppose *also* scopes over the subject at the matrix level. As demonstrated in the (a) and (b) parses in (29) and (30), these assumptions would derive infelicity with a conjunctive antecedent regardless of whether disjunction occurs in subject or object position, thus failing to predict the felicity of (30). Furthermore, the parses in (29c) and (30c) fail to derive an asymmetry since they both predict the sentence to be felicitous.

(29) Disjunction in object position (from Chapter 1)

a. Exh K_s also [John λx was Exh $[_{vP}$ x chasing Bryan or Oliver]].
Predicted: #

b. also Exh K_s [John λx was Exh [$_{vP}$ x chasing Bryan or Oliver]].
Predicted: #

c. Exh K_s (Exh) also [John λx was [$_{vP}$ x chasing Bryan or Oliver]].
Predicted: OK

(30) Disjunction in subject position

a. Exh K_s also Exh [[Bryan or Oliver] λx was [x being chased by John]].

i. Presupposition: There is another individual x such that Bryan was being chased by x, and there is another individual y such that Oliver was being chased by y.

ii. Predicted: #

b. also Exh K_s Exh [[Bryan or Oliver] λx was [x being chased by John]].

i. Presupposition: There is another individual x such that Bryan or Oliver but not both was being chased by x, and the speaker does not know whether Bryan or Oliver was being chased by x.

ii. Predicted: #

c. Exh K_s (Exh) also [[Bryan or Oliver] λx was [x being chased by John]].

i. Presupposition: There is another individual x such that both Bryan and Oliver were being chased by x.

ii. Predicted: OK

Conversely, if *also* is taken to attach at the *v*P edge, it is straightforwardly predicted that (31a), where disjunction is in subject position, is felicitous with a conjunctive antecedent. This is since Exh associates with disjunction and has to scope above the subject, and hence necessarily scopes over *also*. This is in contrast

to (31b) where disjunction is in object position, and Exh occurs within the scope of *also*, and is hence infelicitous with a conjunctive antecedent.

(31) a. Exh K_s Exh [[Bryan or Oliver] λx was also [x being chased by [John]$_F$]]
Presupposition: There is another individual x such that Bryan and Oliver were being chased by x.

b. [John]$_F$ λx was also Exh K_s Exh [x chasing Bryan or Oliver]
Presupposition: There is another individual x chasing Bryan or Oliver but not both, and the speaker doesn't know who x is chasing.

The same contrast can also be observed with *some* in (32). (32a) is infelicitous since *some* occurs in object position below *also*, while (32b) is felicitous since *some* is in subject position above *also*.

(32) a. Mary passed all of the students. #[John]$_F$ also passed some of the students.

b. All the students were passed by Mary. Some of the students were also passed by [John]$_F$.

One might wonder whether the asymmetry may be due to the position of the focus associate of *also*, rather than the position of disjunction. (33) shows that infelicity arises even if the focus associate of *also* is within the *v*P.

(33) a. Mary sent chocolate and ice cream to Sally. #Mary also sent chocolate or ice cream to [John]$_F$.

b. Mary sent Sally chocolate and ice cream. #Mary also sent [John]$_F$ chocolate or ice cream.

Furthermore, (34) shows that a conjunctive antecedent is infelicitous whenever disjunction occurs within the *v*P.

(34) a. Disjunction of PPs: John went to store on Monday and Tuesday. #Mary also went to the store on Monday or on Tuesday.

b. Disjunction of Vs: John walks and bathes his dog daily. #Mary also walks or bathes her dog daily.

Thus far, I have established that the idea that *also* scopes at its surface position below the subject correctly predicts an asymmetry between cases where disjunction occurs in the subject position, above *also*, and cases where disjunction occurs within the *v*P. When disjunction occurs within the *v*P, *also* is infelicitous with a conjunctive antecedent. This indicates that at least one instance of Exh must scope below *also*. In contrast, when disjunction occurs in subject position, Exh necessarily scopes above *also*, thus correctly predicting such cases to be felicitous.

We can further test the predictions of this approach by introducing an additive particle at a higher position in the clause. In (35), *too* scopes above the subject by taking a sentence-level adjunct as its focus associate. Since (35a) is infelicitous, at least one Exh scopes under *too*. This is also true of (35b), although it is not possible to determine the exact position of Exh.

(35) a. Yesterday, John and Mary went to the supermarket. #[Today]$_F$ too, Exh K_s Exh [John or Mary went to the supermarket].

b. Yesterday, John ate chocolate and ice-cream. #[Today]$_F$ too, John Exh K_s Exh [ate chocolate or ice-cream].

(36) is felicitous with a split antecedent, which indicates the availability of a parse where K scopes above *too*.

(36) Two days ago, John went to the supermarket. Yesterday, Mary went to the supermarket. Exh K_s [Today]$_F$ too, Exh [John or Mary went to the supermarket].

2.2 Proposal

I have shown that an analysis where additive particles take surface scope makes better empirical predictions than one where they may scope higher at the matrix level. This has implications on the scope of K. Recall that a parse independently supported by the empirical facts requires that the sequence of operators, Exh K_s Exh, scopes underneath the additive particle. It is thus necessary to give up the assumption that the doxastic operator K may only adjoin at the matrix level. Instead, like epistemic modals, it may occur in embedded contexts as in (37), and hence give rise to ignorance implicatures derived in embedded positions.

(37) John λx also Exh K_s Exh [x speaks Japanese or French].

I have thus provided an empirical argument against Meyer's (2013) approach where all ignorance implicatures are derived from the interaction of Exh with K obligatorily attached at the matrix level. It provides evidence in favour of the approach assumed by Chierchia (2013) and Mihoc (2019), where ignorance implicatures are generated by a necessity modal which may be freely inserted under Exh.

I summarise the possible parses in (38). The generalisation is that *at least one* instance of Exh must associate with disjunction below the additive particle.[5] This

[5]I show in Section 3.2 that the parse in (38a) without an Exh under K still correctly predicts infelicity with simple and conjunctive antecedents.

can be captured by a constraint that requires at least one instance of Exh to occur as low as possible.

(38) Possible parses with *also*/*too* taking surface scope

a. $[\text{DP}_{subj}]_F$ λx also Exh K_s (Exh) [$_{vP}$ x V [$_{DP}$ X or Y]]

b. Exh K_s $[\text{DP}_{subj}]_F$ λx also Exh [$_{vP}$ x V [$_{DP}$ X or Y]]

c. *Exh K_s $[\text{DP}_{subj}]_F$ λx also [$_{vP}$ x V [$_{DP}$ X or Y]]

d. [Adjunct]$_F$ too Exh K_s (Exh) [$_{DP}$ X or Y] λx [$_{vP}$ x V DP_{obj}]

e. Exh K_s [Adjunct]$_F$ too Exh [$_{DP}$ X or Y] λx [$_{vP}$ x V DP_{obj}]

f. *Exh K_s [Adjunct]$_F$ too [$_{DP}$ X or Y] λx [$_{vP}$ x V DP_{obj}]

I propose a syntactic locality condition formulated using features, following Chierchia (2013). Disjunction has a feature [uExh] which must be checked by Exh as soon as possible in the derivation. To capture the generalisation that an instance of Exh must occur at the edge of *v*P containing disjunction, we can propose the [uExh] feature must be checked as soon as possible by adjoining to the lowest node of type $< s, t >$.

The patterns of association of Exh with disjunction resembles the "as low as possible" requirement proposed for focus particles in Vietnamese by Erlewine (2017) and also Chinese in Erlewine (2015), as stated in (39). Similar "closeness"-based locality constraints have also been proposed for German focus particles (Büring & Hartmann 2001).

(39) Sentential focus particles must be as low as possible while c-commanding their focus associate, within a given phase.[6] (Erlewine 2017)

[6]The "as low as possible" constraint for Vietnamese and Mandarin focus particles is evaluated relative to phases. Thus, a focus particle in a matrix clause can associate long-distance with a focus

A crucial point is that Exh is still able to take a phrase as its focus associate while attaching to a higher position that does not obey the "as low as possible" requirement. However, because the [uExh] feature must be checked as soon as possible in a derivation, at least one Exh must occur close to disjunction.

Like the constraint proposed in Erlewine (2017), a semantic criterion grounded in Scope Economy (Fox 1995) is insufficient to capture the empirical facts. This is since different meanings are derived from a different parse, but the parse where only one Exh scopes over *also* incorrectly predicts the sentence to be felicitous. A syntactic requirement is thus required to rule out this parse.

Additionally, because Exh only excludes the conjunctive alternative without generating ignorance implicatures, the simple antecedent case in (40) would be wrongly predicted to be felicitous without an instance of Exh scoping above K_s.

(40) Mary speaks French. $[\text{John}]_F$ also Exh [speaks French or Japanese].

Thus, I propose that disjunction also has a [uExh$_D$] feature which is checked when exhaustification targets domain alternatives in Chierchia's (2013) sense, which are all the subsets of the domain of quantification of disjunction (Fălăuş 2014).[7] In the case of disjunction $p \vee q$, the domain alternatives are the individual disjuncts $\{p, q\}$, because disjunction existentially quantifies over $\{p, q\}$, requiring at least one disjunct to be true. Thus, an instance of [Exh K_s] is required to check [uExh$_D$] by generating ignorance implicatures about individual disjuncts. Unlike

associate within an embedded clause, as long as the focus particle is lowest within its phase. As I will discuss in Chapter 4, the locality constraint proposed here is not evaluated relative to phases.

[7] [uExh$_D$] is equivalent to the +D feature which must be checked by O$_{DA}$ in Chierchia's (2013) approach. O$_{DA}$ is a version of Exh which targets domain alternatives, i.e. the individual disjuncts in the case of disjunction. I continue to follow M&R's notation, but note that the discussion can be formulated following Chierchia's approach.

[uExh], there is no locality requirement on the checking of [uExh$_D$], and a single Exh can check both [uExh] and [uExh$_D$].

2.3 Pruning conjunctive alternatives

One immediate objection to the claim that disjunction obligatorily associates with Exh is that there are cases where embedded implicatures need not arise. For instance, sentences with a universal quantifier in the subject such as (41) do not require either an exclusive interpretation of disjunction for each student (41a), nor a distributed ignorance reading where the speaker does not know the language studied by each student (41b). This possibly leads to the conclusion that Exh is not obligatory in every *v*P containing disjunction.

(41) Every student studies Japanese or French.

a. With embedded Exh:

$\forall x[\text{student}(x) \rightarrow [\text{J}(x) \vee \text{F}(x) \wedge \neg(\text{J}(x) \wedge \text{F}(x))]]$

b. With embedded Exh K_s:

$\forall x[\text{student}(x) \rightarrow [(\text{J}(x) \vee \text{F}(x)) \wedge \neg\text{K}_s[\text{J}(x)] \wedge \neg\text{K}_s[\text{F}(x)]]]$

However, as Nicolae (2017) notes, there are two ways of understanding the optionality of scalar implicature. The first involves assuming that Exh is optional. Another option proposed by Magri (2011) assumes Exh to be obligatorily inserted across the board, but allows for the pruning of alternatives.

I adopt the latter approach, where Exh associates obligatorily with disjunction. The readings involving an embedded implicature in (41) are optional because the conjunctive alternative may be pruned from the alternative set in the parse with an embedded Exh. When conjunctive alternative is not pruned, the reading in

(41a) arises. Both readings have been independently shown by Crnič et al. (2015) and Benz & Gotzner (2018) to be attested.

I suggest that the presence of *also* prevents the conjunctive alternative from being pruned from the alternative set, based on data involving downward entailing environments. Scalar implicatures are not generated in downward entailing contexts since they would lead to weaker meanings (Fox & Spector 2018). For instance, in (42), exclusive disjunction produces a weaker meaning under negation than inclusive disjunction. Hence, without special prosody on *or*, the conjunctive alternative is pruned and the exclusive reading does not arise.

(42) Mary speaks Japanese and French, but John doesn't Exh [speak Japanese or French].

However, (43) shows that disjunction is infelicitous with *also* even in downward entailing contexts. Because *also*'s presupposition is satisfied by the preceding sentence, the presence of *also* strengthens the relevance of the conjunctive antecedent such that it is unprunable from the domain of Exh.

(43) Mary speaks Japanese and French. #John doesn't also Exh [speak Japanese or French].

In summary, cases where disjunction does not give rise to implicatures can be explained by the pruning of alternatives, and do not challenge the use of *also* as a diagnostic for the scope of Exh.

Chapter 3

Extending the empirical coverage

In this chapter, I extend the empirical coverage of the discussion by examining in addition to disjunction and *some*, the interaction of bare numerals, modified numerals and epistemic indefinites with the presupposition triggers *also* and *again*.

3.1 Data

All the cases in (44) involve *also* scoping over a weaker predicate with a stronger antecedent. *also* is infelicitous with disjunction with a conjunctive antecedent (44a) and simple antecedent (44b). It is also infelicitous with bare numerals with a stronger numeral antecedent (44c), and with superlative modified numerals (SMNs) (44d) (reported by S&S). (44e) is infelicitous with *some* with an *all* antecedent, but improves with stress on *some*. Finally, *also* is felicitous with *some* used as an epistemic indefinite (44f) and scalar adjectives (44g).

(44) Also

a. Mary speaks Japanese and French. #John also speaks Japanese or French.

b. Mary speaks Japanese. #John also speaks Japanese or French.

c. Mary speaks 3 languages. #John also speaks 2 languages.

d. QUD: How many kids do Mary and John have?
Mary has 3 kids. #John also has (at least 2/at most 4) kids.

e. Mary likes all of her students. John also likes (#some/SOME) of his students.

f. Mary speaks French. John also speaks some Romance language.

g. It's freezing in New York. It's also cold in Paris.

Another presupposition trigger which can be used to diagnose the position of Exh is *again*. Following Beck & Johnson (2004), I assume that *again* takes a property as its argument, and introduces a presupposition that there is some past event during which the property held. The judgements for *again* in (45) are largely similar to those for *also*. The main difference is that disjunction with a conjunctive antecedent (45a) is felicitous.

(45) Again

a. Yesterday, Mary ate chocolate and ice-cream. Today, Mary ate chocolate or ice-cream again.

b. Yesterday, Mary ate chocolate. #Today, Mary ate chocolate or ice-cream again.

c. Yesterday, Mary ate 3 apples. #Today, Mary ate 2 apples again.

d. Yesterday, Mary ate 3 apples. Today, Mary ate (?at least 2/#at most 4) apples again.

e. Context: Mary teaches different students each year.
Last year, Mary failed all of her students. This year, Mary failed (#some/SOME) of her students again.

f. Yesterday, Mary ate a banana. Today, she ate some fruit again.

g. Yesterday, it was freezing. Today, it's cold again.

There is a possible confound in the judgements involving bare numerals due to the scope ambiguity between *again* and quantificational objects (Nissenbaum 2006). (46) is felicitous with *again* under an interpretation that Mary met the same students.

(46) Yesterday, Mary met 5 students. Today, she met 3 students again.

a. $\exists >$ AGAIN: $\exists x[\ |x| = 3 \wedge \text{AGAIN}[\text{Mary met each of } x]]$

b. AGAIN $> \exists$: $\text{AGAIN}[\ \exists x[\ |x| = 3 \wedge \text{Mary met each of } x]]$

A context such as (47), where it is not possible for the quantifier to scope over *again*, makes the infelicity clearer because it is not possible to eat the same cake twice.

(47) Yesterday, Mary ate 5 cakes. #Today, she ate 3 cakes again.

a. $\exists >$ AGAIN: $\exists x[\ |x| = 3 \wedge \text{AGAIN}[\text{Mary ate each of } x]]$

b. AGAIN $> \exists$: $\text{AGAIN}[\ \exists x[\ |x| = 3 \wedge \text{Mary ate each of } x]]$

M&R and S&S also discuss at length an asymmetry between factive predicates such as *unaware* and *aware*. In these cases, there is no overt antecedent, but the sentences are uttered by the speaker in a context where a proposition which is stronger or more precise is within the common ground. (48) shows that it is uniformly infelicitous to embed a weaker proposition under *unaware* given such contexts, with the exception of the scalar adjective case in (48g).

(48) Unaware

a. Context: Mary ate chocolate and ice-cream.

#John was unaware that Mary ate chocolate or ice-cream.

b. Context: Mary ate chocolate.

   #John was unaware that Mary ate chocolate or ice-cream.

c. Context: Mary ate 3 apples.

   #John was unaware that Mary ate 2 apples.

d. Context: Mary ate 3 apples.

   #John was unaware that Mary ate (at least 2/at most 4) apples.

e. Context: All the students passed.

   #John was unaware that (some/SOME) of the students passed.

f. Context: Mary speaks French.

   #John is unaware that Mary speaks (some/SOME) Romance language.

g. Context: It is freezing in New York.

   John is unaware that it is cold in New York.

When *aware* is used, most cases (49a-c) remain infelicitous. However, putting stress on *some* ameliorates its infelicity in (49e) and (49f). SMNs are also felicitous under *aware* in (49d). Intuitively, this is because ignorance of the exact number of apples in (49d) can be attributed to the agent John instead of the speaker.

(49) Aware

a. Context: Mary ate chocolate and ice-cream.

   #John was aware that Mary ate chocolate or ice-cream.

b. Context: Mary ate chocolate.

   #John was aware that Mary ate chocolate or ice-cream.

c. Context: Mary ate 3 apples.

   #John was aware that Mary ate 2 apples.

d. Context: Mary ate 3 apples.

   John was aware that Mary ate (at least 2/at most 4) apples.

e. Context: All the students passed.

   John was aware that (#some/SOME) of the students passed.

f. Context: Mary speaks French.

   John is aware that Mary speaks (#some/SOME) Romance language.

g. Context: It is freezing in New York.

   John is aware that it is cold in New York.

	too/also	again	unaware	aware
or (conjunctive antecedent)	*	✓	*	*
or (simple antecedent)	*	*	*	*
bare numerals (stronger antecedent)	*	*	*	*
some (*all* antecedent)	*	*	*	*
SOME (*all* antecedent)	✓	✓	*	✓
some (specific antecedent)	✓	✓	*	*
SOME (specific antecedent)	✓	✓	*	✓
SMNs (specific antecedent)	*	*	*	✓
Scalar adjectives (stronger antecedent)	✓	✓	✓	✓

Table 3.1: Summary of felicity of various operators under presupposition triggers (*: infelicitous, ✓: felicitous)

There are various questions that arise from the empirical facts summarised in Table 3.1.

1. Why is disjunction felicitous under *also* but not under *again*, with a conjunctive antecedent?

2. Why is there a contrast between stressed and unstressed *some*?

3. Why are epistemic indefinites felicitous with *also* and *again* with a stronger antecedent?

4. Why is there an asymmetry between *unaware* and *aware*?

In this chapter, I will answer the first three questions. I discuss question 4 in the following chapter.

3.2 Disjunction

In this section, I explain the patterns involving *also* and *again* with disjunction in object position. I propose the structure in Figure 3.1 which schematically represents the minimum height Exh must attach when disjunction occurs in object position. I assume that *too/also* adjoins outside the *v*P, while *again* always adjoins within the *v*P. This assumption is supported by the fact that *again* may scope below other *v*P adjuncts as in (50).

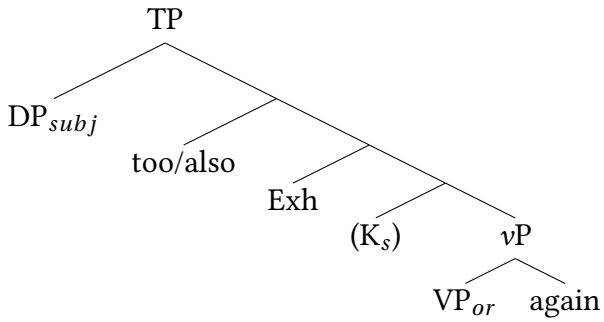

Figure 3.1: Exh with disjunction in object position

(50) John went to the party again on Sunday.

Firstly, as already established, any parse where Exh scopes under *also* such as (51) correctly predicts infelicity with a conjunctive and simple antecedent. Unlike

a parse with an additional Exh below K, disjunction is not interpreted exclusively, but ignorance implicatures regarding both disjuncts are derived within the scope of *also*.

(51) John also Exh K_s [$_{vP}$ speaks Japanese or French].

Presupposition: There is some salient x who speaks Japanese or French, but the speaker does not know whether x speaks Japanese, and whether x speaks French.

(52) where Exh scopes over *again* correctly predicts infelicity with a conjunctive antecedent. However, this analysis may suggest that the existing constraint that Exh is adjoined as low as possible is incorrect, since it may attach higher above *again*.

(52) John λx Exh K_s [$_{vP}$ [$_{vP}$ x ate chocolate or ice-cream] again].

a. Implicature: John did not eat chocolate and ice-cream again.

b. Presupposition: There is some salient past event when John ate chocolate and ice-cream.

Instead, I propose that when disjunction occurs within a DP in object position, disjunction actually scopes higher over the entire *v*P via conjunction reduction, as in (53) (Ross 1967, Hirsch 2017). Since *again* is present within both disjuncts, two separate presuppositions in (53b) are triggered. The parse hence correctly predicts the sentence to be felicitous with a conjunctive antecedent where John ate both chocolate and ice-cream previously, but not in a simple antecedent context where John ate only chocolate previously. This parse obeys the constraint that Exh adjoins as low as possible with respect to disjunction.

(53) John λx Exh K_s [$_{vP}$ x [ate chocolate ~~again~~] or [~~ate~~ ice-cream again]].

a. Implicature: The speaker does not know whether John ate chocolate again, and whether John ate ice-cream again.

b. Presuppositions: There is some salient past event e when John ate chocolate, and some salient past event e' when John ate ice-cream.

Rooth & Partee (1982) provide evidence for the availability of a parse involving conjunction reduction where *or* scopes above *again* by examining the scope ambiguity that arises between an intentional verb and disjunction, as in (54).[8]

(54) Yesterday, John was looking for an apple and a pear. Today, John was looking for an apple or a pear again.

a. #John λx was [$_{vP}$ [Exh [$_{vP}$ x looking for an apple or a pear]] again].
De dicto reading: John wants to find either an apple or a pear, but it's false that he wants to find both, again.

b. John λx was Exh [$_{vP}$ x [looking for an apple ~~again~~] or [~~looking for~~ a pear again]].
De re reading: John was looking for an apple again, or he was looking for a pear again.

(54) is felicitous only with the *de re* reading, where disjunction scopes over *again*. Thus, adjunction of Exh to the outer *v*P to scope over disjunction correctly predicts the *de re* reading to be felicitous. In the *de dicto* reading, Exh adjoins to the inner *v*P within the scope of *again*, and is correctly predicted to be infelicitous. The ambiguity in (54) thus supports an analysis where Exh attaches as low as

[8]For simplicity, I omit [Exh K_s] from the next two examples. Similar results are obtained when [Exh K_s] adjoins directly above Exh.

possible to any node of type $< s, t >$ which contains an operator with a [uExh] feature.

The relative scope of Exh with respect to *again* is similar to that of other *v*P modifiers, which may be analysed as presupposition triggers (Simons 2013). Although the reading in (55b) is available, the parse in (55a) is more natural, as discussed in Romoli & Renans (2020). This can be explained if disjunction in object position is interpreted by default as taking scope over the entire *v*P.

(55) John went to France or Germany by train.

a. John λx Exh [$_{vP}$ x [went to France ~~by train~~] or [~~went to~~ Germany by train]].

Presupposition: John went to France and Germany.

b. John λx [$_{vP}$ [Exh [$_{vP}$ x went to France or Germany]] by train].

Presupposition: John went to France or Germany but not both.

3.3 Bare numerals and unstressed *some*

The same reasoning explains the data involving the infelicity of bare numerals and unstressed *some* with both *also* and *again*. I assume that bare numerals have an underlying "at least" reading which is strengthened to an "exactly" reading by Exh, as proposed by Horn (1972) and Spector (2013). This view is motivated by the observation that the "exactly" meaning does not arise in downward entailing contexts, such as under negation (56a) and within the antecedent of conditionals (56b).[9]

[9] I note that a view where numerals have an inherent "exactly" reading would not require Exh.

(56) a. John didn't eat two cakes.

⇒ John didn't eat three cakes.

b. If John eats two cakes, he will get sick.

⇒ If John eats three cakes, he will get sick.

In (57a), Exh must scope lower within the *v*P under *again*. This is since Exh scoping over *again* produces the presupposition that wrongly predicts (57b) to be felicitous.

(57) Yesterday, Mary ate three cakes.

a. #Today, Mary λx [$_{vP}$ [Exh [$_{vP}$ x ate two cakes]] again].

Presupposition: Mary ate exactly two cakes previously.

b. Today, Mary λx Exh [$_{vP}$ x ate two cakes again].

Implicature: Mary did not eat three cakes again.

Presupposition: Mary ate three cakes previously.

Thus far, I have only considered repetitive readings of *again* which scope over the agent. In restitutive readings of *again*, *again* adjoins to a constituent lower within the *v*P which excludes the agent argument (Bale 2007).[10] According to Yu & Smith (2020), there are two possible restitutive readings, a quantificational reading where the quantifier takes scope below *again*, and a bound reading where the quantifier scopes above *again*.

(58) Mary [$_{vP}$ [$_{VP}$ [opened two doors] again]]. (Adapted from Yu & Smith (2020))

[10] In Yu & Smith's (2020) presentation, the lower constituent to which *again* adjoins in the restitutive reading is a $\sqrt{}$RootP.

a. Quantificational reading: There are four doors. Two doors were built open, and the other two were built closed. The wind blows, closing the previously open doors. Mary then opens the two doors that were always shut before.

b. Bound reading: Mary opened two doors which were originally open and then closed.

(59) with the quantificational reading is unavailable in the given context. This provides evidence that Exh must attach even lower within the scope of *again* to the VP.

(59) Mary [$_{vP}$ [$_{VP}$ [Exh [opened two doors]] again]].

a. Quantificational reading: There are five doors. Three doors were built open, and the other two were built closed. The three doors are then closed by the wind. Mary opens the two previously closed doors.

Similarly, Exh must associate with *some* below *again* in (60), given that a higher position of Exh would wrongly predict its felicity.

(60) Context: Every year, Mary teaches a different class of students.
Last year, Mary failed all of her students. #This year, Mary [$_{vP}$ [Exh [$_{vP}$ failed some of her students]] again].

The generalisation that Exh must be adjoined as low as possible to a node of type $< s, t >$ thus applies not only to disjunction, but also to bare numerals and unstressed *some*.

3.4 Stressed *some*

In this section, I discuss the contrast between stressed and unstressed *some*. (61a) is marginally acceptable at best, while (61b) with stress on *some* becomes significantly more acceptable.

(61) a. Mary ate all of the chocolate. #JOHN also ate some of the chocolate.

b. Mary ate all of the chocolate. John also ate SOME of the chocolate.

As argued previously, without stress on *some*, the default parse involves Exh scoping close to *some* as in (62).

(62) Mary ate all of the chocolate. John also Exh [$_{vP}$ ate some of the chocolate].

a. Implicature: John also ate some but not all of the chocolate.

b. Presupposition: There is some salient x who ate some but not all of the chocolate.

c. Predicted: Odd. Observed: Odd.

I suggest that placing stress on *some* allows Exh to occur at a higher position, above *also*, as in (63).

(63) Mary ate all of the chocolate. Exh [$_{CP}$ John also ate SOME of the chocolate].

a. Implicature: ¬[John also ate all of the chocolate].

b. Presupposition: There is some salient x who ate all of the chocolate.

c. Predicted: OK. Observed: OK.

We observe the same contrast in (64) when *some* is embedded within a non-finite clause.

(64) Mary wants to pass all of her students.

Jane also wants to pass (#some/SOME) of her students.

However, there is no contrast in (65b), where stressed *some* is embedded within a full finite clause. The generalisation is that Exh is allowed to associate with the embedded *some* at the matrix scope only if it is embedded within a non-finite clause, as in (65) and (66).

(65) a. Mary (expects/hopes) to see all her students tomorrow. Jane also (expects/hopes) to see SOME of her students tomorrow.

b. Mary (expects/hopes) that she will see all her students tomorrow. #Jane also (expects/hopes) that she will see SOME of her students tomorrow.

(66) a. Mary promised to pass all her students. Jane also promised to pass SOME of her students.

b. Mary promised that she will pass all her students. #Jane also promised that she will pass SOME of her students.

This generalisation can be analysed with the parses in (67). If *some* is embedded within a non-finite clause as in (67a), Exh is allowed to scope over *also* at the matrix level. If *some* is embedded within a finite clause, only the parse in (67b) is possible, while the parse in (67c) is not possible.

(67) a. Exh Jane also expects [$_{TP}$ to see SOME of her students tomorrow].

b. Jane also Exh expects [$_{CP}$ that she will see SOME of her students tomorrow].

c. *Exh Jane also expects [$_{CP}$ that she will see SOME of her students tomorrow].

One might wonder whether the observed contrast is actually related to the scope of the indefinite, given that it is known that quantifier raising may not occur across finite clause boundaries (Wurmbrand 2018). We can ensure that it is the narrow-scope reading that is relevant by explicitly asserting the agent's ignorance of the identity of the indefinite DPs, as in (68).

(68) Mary expects to see all her students tomorrow. Jane has no idea which students will come.

a. Nevertheless, she also expects to see SOME students tomorrow.

b. #Nevertheless, she also expects that she will see SOME students tomorrow.

In (67b), Exh scopes above the verb of the matrix clause. One may ask whether Exh scopes within the embedded clause as in (69).

(69) Jane also expects [$_{CP}$ Exh that she will see SOME of her students tomorrow].

The problem with (69) is that embedded Exh within the scope of factive predicates would produce implicatures in conflict with the context. In (70a), if Exh is embedded under the factive predicate *aware*, the unsatisfied presupposition that not all the students passed is generated. Instead, Exh should scope above *aware* as in (70b), such that the implicature derived is that Jane is not aware that all of the students passed.

(70) Context: All of the students passed.

a. Jane is aware [$_{CP}$ Exh that SOME of the students passed].
Assertion: Jane is aware that some but not all of the students passed.
Presupposition: Some but not all the students passed.

b. Jane is Exh aware [$_{CP}$ that SOME of the students passed].

Assertion: Jane is aware that some of the students passed, but is not aware that all of the students passed.

Presupposition: All the students passed.

I propose that these patterns can be modelled using a variant [uExh*] feature on stressed *some*. Unlike [uExh] which occurs on unstressed *some*, [uExh*] does not have to be checked immediately. When stressed *some* is unembedded or embedded within a non-finite clause, checking may be delayed indefinitely and Exh may take matrix scope. However, when [uExh*] is embedded within a finite clause, it must be checked at latest after the attitude verb which embeds the finite clause is merged, allowing Exh to scope only as high as above the embedding predicate.[11]

3.5 SMNs

SMNs are associated with ignorance implicatures involving exact numerals, which are the domain alternatives of the SMN. SMNs hence carry a [uExh$_D$] feature which requires specific alternatives involving exact numerals to be exhaustified. (71) is thus infelicitous for similar reasons to why disjunction is infelicitous with *also* with a simple antecedent. Ignorance implicatures involving exact numbers of cakes in (71a) are generated, which triggers at least the unsatisfied presupposition that some other individual ate exactly 5 cakes.[12]

[11]The requirement that Exh adjoins directly to the factive predicate resembles a proposal in Uegaki (2015).

[12]The same result is obtained even if we assume following Schwarz (2016) and Buccola & Haida (2021) that the relevant alternatives to *at most 5* are *exactly 5* and *less than 5*, since the presupposition that some other individual ate exactly 5 cakes is unsatisfied.

(71) QUD: How many cakes did Mary and John eat?

Mary ate 3 cakes. #Exh K_s John also ate at most 5 cakes.

a. Implicatures: $\left\{ \begin{array}{l} \neg K_s[\text{John also ate exactly 5 cakes}] \\ \neg K_s[\text{John also ate exactly 4 cakes}] \\ \ldots \end{array} \right\}$

b. Presuppositions: $\left\{ \begin{array}{l} \exists x[x \text{ ate exactly 5 cakes}] \\ \exists x[x \text{ ate exactly 4 cakes}] \\ \ldots \end{array} \right\}$

I propose that SMNs carry a [uExh*] feature, like stressed *some*, because of the felicity of (72), where Exh scopes above *aware*. Furthermore, the same asymmetries are observed when SMNs are embedded within finite and non-finite clauses, as in (73).

(72) Context: 3 students passed.

Jane is Exh aware [that at most 4 students passed].

(73) a. Mary promised to see 5 students. John also promised to see at least 4 students.

b. Mary promised that she will see 5 students. #John also promised that he will see at least 4 students.

In (72), Exh can check [uExh$_D$] without K_s because scoping over *aware* makes the domain alternatives IE, since (72) is compatible with Jane being unaware that any specific number of students passed. I will revisit the analysis of (72) in the next chapter.

3.6 Epistemic indefinites

Epistemic indefinites, like disjunction, are associated with ignorance about more specific propositions and hence also carry a [uExh$_D$] feature. (74) shows that the same asymmetry between stressed and unstressed *some* occurs with a stronger specific proposition within the common ground.

(74) Context: Mary speaks French.

John is aware that Mary speaks (#some/SOME) Romance language.

However, (75) is felicitous even when *some* is unstressed. In the given context, *some Romance language* is synonymous with the disjunctive phrase *Spanish or French*, since there are only two Romance languages made relevant by the QUD.

(75) QUD: What languages do Mary and John speak? Spanish, French, German?

Mary speaks French. John also Exh K_s speaks some Romance language.

a. Alt(some Romance language) = { French, Spanish }

b. Expected ignorance implicatures: $\neg K_s$[John also speaks French], $\neg K_s$[John also speaks Spanish]

c. Presuppositions triggered by (b): There is some salient individual who speaks French, and some salient individual who speaks Spanish.

To capture the contrast between (75) and disjunction, I propose that specific alternatives of epistemic indefinites may be pruned from the alternative set. It is thus possible to prune *Spanish* from the alternative set to avoid the presupposition that someone else speaks Spanish. This differs from disjunction, which is subject to a constraint which prevents the pruning of individual disjuncts.[13]

[13] A similar idea has also been proposed by Chierchia (2013) and Mihoc (2019), who distinguish between disjunction and epistemic indefinites based on how their alternatives may be pruned.

3.7 Summary

In summary, different operators have different syntactic requirements on the maximum distance within which they must associate with Exh, as summarised in Table 3.2. Exh attaches as low as possible to any node of type $< s, t >$ in order to check a [uExh] feature on disjunction, bare numerals and unstressed *some*.

Operator	**[uExh$_D$]**	**Locality feature**	**Scope of Exh**
Disjunction	Yes	uExh	As low as possible
Bare numerals	No		
Unstressed *some*	Epistemic indefinite *some*: Yes Quantifier *some*: No		
Stressed SOME		uExh*	Within finite clause: Adjoin immediately to verb taking finite CP containing [uExh*] as complement Unembedded/within non-finite clause: Matrix scope
SMNs	Yes		
Scalar adjectives	No	-	Exh is not obligatory

Table 3.2: Summary of scope of Exh with respect to various operators

	too/also	again	unaware	aware
or (conjunctive antecedent)	*	✓	*	*
or (simple antecedent)	*	*	*	*
bare numerals (stronger antecedent)	*	*	*	*
some (*all* antecedent)	*	*	*	*
SOME (*all* antecedent)	✓	✓	*	✓
some (specific antecedent)	✓	✓	*	*
SOME (specific antecedent)	✓	✓	*	✓
SMNs (specific antecedent)	*	*	*	✓
Scalar adjectives (stronger antecedent)	✓	✓	✓	✓

Table 3.3: Summary table (*: infelicitous, ✓: felicitous). Red cells indicate data points which have been accounted for.

Stressed *some* and SMNs differ in that they carry a variant feature [uExh*] which need not be checked as soon as possible. When an operator with [uExh*] is unembedded or embedded in a non-finite clause, Exh is able to take matrix scope. However, when [uExh*] is embedded in a finite clause, it must be checked as soon as the verb taking the finite clause as complement is merged. This accounts for the asymmetry between stressed and unstressed *some* embedded under *aware* and other positive attitude verbs.

Ignorance inducing operators such as disjunction, SMNs and epistemic indefinite *some* have a [uExh$_D$] feature, which may be checked anywhere in the derivation. Finally, scalar adjectives have neither a [uExh] or a [uExh*] feature, and Exh is free to optionally associate with scalar adjectives at the matrix level. This accounts for the felicity of all the cases involving scalar adjectives.

Chapter 4

Exh/*pex* in embedded clauses

I have argued that Exh must occur as close as possible to disjunction, bare numerals and unstressed *some*, but have yet to demonstrate that this is also true when these operators occur within embedded clauses. In this chapter, I first explain M&R's approach which involves the global application of Exh. I then provide two arguments against M&R's approach and in favour of local exhaustification within the scope of factive predicates. I will argue in favour of redefining the Exh operator as the *pex* operator proposed in Bassi et al. (2021), which generates implicatures as presuppositions.

4.1 Asymmetry between *aware* and *unaware*

As S&S and also Ippolito (2010) discuss, embedded Exh within the scope of the factive predicate *aware* makes the wrong predictions. For instance, in (76), exhaustification below *aware* produces the unsatisfied presupposition that some but not all the students passed.

(76) Context: All the students passed.

John is aware Exh [that (#some/SOME) of the students passed].

a. Assertion: John is aware that some but not all of the students passed.

b. Presupposition: Some but not all of the students passed.

It would seem that the global application of Exh makes better predictions. Under the parse in (77), the sentence is correctly predicted to be felicitous in a context where all the students passed. Both S&S and M&R also observe that the sentence is much more natural when *some* is stressed.

(77) Context: All the students passed.

Exh [John is aware that (#some/SOME) of the students passed].

a. Assertion: John is aware that some of the students passed, but not aware that all of the students passed.

b. Presupposition: All of the students passed.

However, when *aware* is replaced with the negative factive *unaware* in (78), both stressed and unstressed *some* is infelicitous. M&R account for this asymmetry as follows. Recall that M&R distinguish two types of alternatives based on whether they are Strawson-entailed by the prejacent. The alternative in (78) is a presuppositional alternative because it is Strawson-entailed by the prejacent. The implicature that not all the students passed comes from negating the presupposition of the IE^{prs} alternative, and is obligatory as presuppositional alternatives may not be pruned. This implicature contradicts the context, in contrast with (77) where the presupposition is satisfied.

(78) Context: All the students passed.

Exh [John is unaware that (some/SOME) of the students passed].

a. IE^{prs}: John is unaware that all of the students passed.

b. Obligatory implicature: Not all the students passed.

I now illustrate M&R's analysis of a case with disjunction embedded under the negative factive *unaware* as in (79). The presuppositions of each alternative are

represented in subscripts.[14] First, exhaustification under K_s negates the presuppositions of the single conjunctive presuppositional IE alternative, leading to the presuppositional implicature in (79a-ii).

(79) Exh_1 K_s Exh_2 John is unaware that Mary speaks French or Japanese.

a. Exhaustification under K_s:

i. IE^{prs} = [John is unaware that F∧J]$_{F \wedge J}$

ii. Presuppositional implicature: ¬[F ∧ J]

Next, the outer Exh_1 considers three presuppositional alternatives in (80a) and three assertive alternatives in (80b). The alternatives in (80b) are assertive alternatives as they are not Strawson-entailed by the prejacent. For instance, [K_s Exh [John is unaware that F]] is equivalent to [K_s John is unaware that F ∧ John is aware that J], which M&R analyse as presupposing [K_s [F ∧ J]]. Since all the presuppositional alternatives are innocently excludable, their presuppositions are negated to give the presuppositional implicatures in (80d). Because the presuppositions of the assertive alternatives contradict the presuppositional implicatures generated in (80d), none of them are innocently excludable.

(80) Exhaustification above K_s:

a. $E^{prs} = \left\{ \begin{array}{l} [K_s \text{ John is unaware that F}\wedge\text{J}]_{K_s[F \wedge J]} \\ [K_s \text{ John is unaware that F}]_{K_s[F]} \\ [K_s \text{ John is unaware that J}]_{K_s[J]} \end{array} \right\}$

b. $E^{asr} = \left\{ \begin{array}{l} [K_s \text{ } Exh_2 \text{ John is unaware that F}\wedge\text{J}]_{K_s[F \wedge J]} \\ [K_s \text{ } Exh_2 \text{ John is unaware that F}]_{K_s[F \wedge J]} \\ [K_s \text{ } Exh_2 \text{ John is unaware that J}]_{K_s[F \wedge J]} \end{array} \right\}$

[14] As before, I will abbreviate *Mary speaks French* as F and *Mary speaks Japanese* as J.

c. $\text{IE}^{prs} = \text{E}^{prs}$

d. Presuppositional implicatures: $\neg \text{K}_s[\text{F}]$, $\neg \text{K}_s[\text{J}]$, $\neg \text{K}_s[\text{F} \wedge \text{J}]$

e. $\text{IE}^{asr} = \emptyset$

This parse thus makes the correct prediction that (79) presupposes that the speaker is aware that Mary speaks either French or Japanese but not both, and that the speaker does not know which language Mary speaks.

(81) a. Presupposition of (79): $\text{K}_s[[\text{F or J}] \wedge \neg[\text{F and J}]] \wedge \neg \text{K}_s[\text{F}] \wedge \neg \text{K}_s[\text{J}]$

b. Assertion of (79): $\text{K}_s[\text{John is unaware that F or J}]$

In M&R's account, Exh must occur above the factive predicates in order to derive an asymmetry between upward and downward entailing predicates. I will now present two challenges to M&R's approach which involves the global adjunction of Exh.

4.2 Problem 1: Disjunction under *aware*

M&R do not demonstrate the predictions of their account with disjunction embedded under *aware*. Unlike the case of *some*, disjunction under *aware* and *unaware* are equally infelicitous given a conjunctive antecedent.

(82) Context: Mary speaks French and Japanese.

#John is aware that Mary speaks French or Japanese.

The parse in (83) where Exh scopes globally makes the wrong prediction that (82) is felicitous. In (83a), the inner Exh produces an (optional) implicature with a presupposition that Mary speaks both French and Japanese. This alone is sufficient to incorrectly predict the felicity of the sentence. For brevity, I focus on

the two alternatives in (83b) which involve the individual disjuncts and cannot be pruned. In contrast to the case with *unaware*, the alternatives in (83b) are assertive alternatives and innocently excludable. These alternatives give rise to the implicatures in (83b-ii), and presuppose that the speaker knows that Mary speaks Japanese, and that Mary speaks French.

(83) Context: Mary speaks French and Japanese.

Exh K_s Exh [John is aware that Mary speaks French or Japanese]].

Predicted: OK. Actual: Odd.

a. Exhaustification below K_s:

i. Implicature: John is not aware that F∧J

ii. Presupposition from (i): F∧J

b. Exhaustification above K_s:

i. $IE^{asr} = \left\{ \begin{array}{l} [K_s \text{ John is aware that F}]_{K_s[F]} \\ [K_s \text{ John is aware that J}]_{K_s[J]} \end{array} \right\}$

ii. Implicatures: $\neg K_s$[John is aware that F], $\neg K_s$[John is aware that J]

iii. Presuppositions from (ii): K_s[F], K_s[J]

Thus, the global application of Exh K_s Exh makes the incorrect prediction that (82) may presuppose that Mary speaks both French and Japanese, thus predicting (82) to be felicitous.

4.3 Problem 2: *also* under *unaware*

In this section, I show that ignorance implicatures must also be derived within the scope of factive predicates. If all exhaustification occurs above the scope of the negative factive, we wrongly predict the felicity of (84), where disjunction

with a conjunctive antecedent occurs within the scope of *also*. The full steps are illustrated in (84). The end result is that since Exh scopes over *also*, additional presuppositions are triggered by *also* within the implicatures in (84a-i) and (84b-iii). The overall presupposition is that there is some salient individual who speaks both French and Japanese.

(84) Context: Jane speaks French and Japanese.
Exh K_s Exh [John is unaware that Mary also speaks French or Japanese]].
Predicted: OK. Actual: Odd.

a. Exhaustification below K_s:

i. Presuppositional implicature: ¬[also F∧J]

ii. Presupposition triggered by *also*: Some salient individual (not Mary) speaks French and Japanese.

b. Exhaustification above K_s:

i. $E^{asr} = \left\{ \begin{array}{l} [K_s \text{ Exh [John is unaware that also F}\wedge\text{J]]}_{K_s[\text{also } [F\wedge J]]} \\ [K_s \text{ Exh [John is unaware that also F]]}_{K_s[\text{also } [F\wedge J]]} \\ [K_s \text{ Exh [John is unaware that also J]]}_{K_s[\text{also } [F\wedge J]]} \end{array} \right\}$

ii. $IE^{prs} = E^{prs} = \left\{ \begin{array}{l} [K_s \text{ John is unaware that also F}\wedge\text{J]}_{K_s[\text{also } [F\wedge J]]} \\ [K_s \text{ John is unaware that also F]}_{K_s[\text{also } F]} \\ [K_s \text{ John is unaware that also J]}_{K_S[\text{also } J]} \end{array} \right\}$

iii. Implicatures from IE^{prs}: ¬K_s[also F], ¬K_s[also J]

iv. $IE^{asr} = \emptyset$

v. Presuppositions triggered by *also*: Some salient individual (not Mary) speaks French and Japanese.

4.4 The *pex* operator

Just as in the basic unembedded cases, in order to predict infelicity of a conjunctive antecedent with *also*, the sequence of operators Exh K_s Exh has to scope under *also*. The problem is that since speaker-oriented ignorance implicatures are added to the asserted content, they are factored into the content of the agent's beliefs as in (85), which is clearly an unattested reading.

(85) John is unaware that Mary also Exh K_s Exh speaks Japanese or French.
Additional assertion/implicature: John is unaware that the speaker does not know whether Mary also speaks Japanese or French.

There is an alternative account of Exh proposed by Bassi et al. (2021) which derives the desired result. The idea is to minimally redefine Exh as the operator *pex*, defined in (86), which derives all implicatures as presuppositions and leaves the assertion unchanged. *pex* is hence a presupposition trigger, and the mirror image of overt *only*, since *pex* presupposes the assertion of *only* and vice versa.

(86) $$[\![pex(\phi)]\!](w) = \left\{ \begin{array}{l} \text{presupposition}: \forall \psi \in IE(\phi, \textsc{Alt}(\phi)[\neg[\![\psi]\!](w)] \\ \text{assertion}: [\![\phi]\!](w) \end{array} \right\}$$

Bassi et al. (2021) discuss the case of negative factives in (78) and show how the *pex* approach makes the correct predictions. However, they do not discuss S&S's presupposed ignorance problem nor demonstrate how the *pex* account predicts the infelicity of (85). To integrate the *pex* operator with the present account, I assume that *pex*, like M&R's Exh operator, is a presupposition hole with respect to negated alternatives. Thus, *pex* presupposes not only the negated IE alternatives, but also their presuppositions. *pex* nevertheless differs from M&R's Exh operator in that it does not distinguish between presuppositional and assertive alternatives.

As discussed in Del Pinal et al. (2021), there are two independently proposed options for how presuppositions project from the complement of belief predicates. Given a complement p' which presupposes p, the belief predicate B_x either projects as its presupposition $B_x(p)$ or p.

(87) a. Heim (1992):

$B_x(p'_p) = B_x(p')_{B_x(p)}$

b. Geurts (1999) (DRT):

$B_x(p'_p) = B_x(p')_p$

Adopting the latter account in (87), we ensure that ignorance implicatures generated within the scope of the negative factive do not project as agent-oriented beliefs. There is independent evidence for this from examples such as (88) from Heim (1992), where the presupposition triggered by *also*, that there is another salient individual who is in bed, need not be a belief of Mary's parents. Thus, like the presupposition of *also*, ignorance implicatures generated as presuppositions within the scope of belief predicts may project independently without being understood as beliefs of the agent.

(88) Context: John is talking to Mary on the phone.
John: I am already in bed.
Mary: My parents think $[\text{I}]_F$ am *also* in bed.

The account thus far requires that implicatures generated by Exh factor into the content of presuppositions triggered by additive particles. A question which arises from redefining implicatures as presuppositions is hence whether additive particles are sensitive to presuppositions generated within their scope. I argue that

this is the case. For instance, in (89), the presuppositional implicature triggered by *pex* is included in the presupposition triggered by *also*.

(89) [John]$_F$ also *pex* speaks Japanese or French.

a. Presuppositional implicature triggered by *pex*: John does not speak both Japanese and French.

b. Presupposition triggered by *also*: Some salient individual (not John) speaks Japanese or French, but not both.

However, it is not uncontroversial that presuppositions carry over to focus alternatives. Walker (2012) argues that the presuppositions generated by "soft" presupposition triggers (SPTs) can be cancelled from focus alternatives. According to Walker, factive verbs, change of state verbs, and the definite article are SPTs. Walker observes that (90) does not presuppose that Alice is sick, thus showing that the presuppositions triggered by *aware* can be eliminated from the focus alternatives of *only*.[15]

(90) There are two patients, Alice and Birgit. The doctor is only aware that [Birgit]$_F$ is sick.

a. Assertion (negated focus alternative): The doctor is not aware that Alice is sick.

b. Cancelled presupposition: Alice is sick.

[15]One might wonder what implications this observation that the presuppositions of focus alternatives can be removed entirely has for the overall analysis, given that I have been assuming following M&R that presuppositions triggered by *also* project from implicatures. However, Walker's account predicts that only presuppositions triggered by Soft Presupposition Triggers can be cancelled. Since *also* is a Hard Presupposition Trigger, presuppositions triggered by *also* cannot be removed from the focus alternatives of Exh/*pex*.

Similarly, in (91), the presupposition that Pub B used to serve wine can be removed from the focus alternative.

(91) Scenario: Pub A serves beer and wine, but Pub B only serves beer. New legislation makes it illegal to serve either beer or wine.
Pub A stopped serving wine and beer. Pub B only stopped serving beer.

a. Negated focus alternative: Pub B did not stop serving wine.

b. Cancelled presupposition: Pub B used to serve wine.

However, I argue that that the presuppositions of SPTs cannot be cancelled from the focus alternatives of *also*, unlike *only*. For instance, if presuppositions can be removed from focus alternatives triggered by *also*, (92) is wrongly predicted to be felicitous. It is also difficult to construct a scenario where (93) can be uttered without satisfying its presupposition.

(92) Scenario: John is learning French, while Mary never learnt French.
Mary never learnt French. #$[\text{John}]_F$ also stopped learning French.
Presupposition: There is some other individual who does not learn French now ~~and used to learn French~~.

(93) $[\text{John}]_F$ is also aware that Mary likes mangoes.
Presupposition: Mary likes mangoes.

A relevant difference between *also* and *only* is that the focus alternatives of *only* are negated while those of *also* are not. I suggest that presupposition cancellation is only available if the focus alternatives are negated.

Finally, several technical fixes are required when two pex operators are present. First, an inner pex produces a presupposition which becomes unavailable to the

outer pex. As suggested by Bassi et al. (2021), a local accommodation operator can be inserted above the inner pex to convert its presupposition into asserted content.

(94) $$[\![\mathscr{A}(\phi)]\!] = \begin{cases} 0, & \text{if } [\![\phi]\!] = 1 \\ 1, & \text{if } [\![\phi]\!] = 0 \text{ or } \# \end{cases}$$

A further problem is that the K operator should not produce speaker-oriented beliefs which enter into the assertion. However, it cannot trigger presuppositions, since they would be unavailable to pex. I thus propose that the operators pex and K must be conceived as a single operator in (95), giving rise to presuppositions involving speaker-oriented beliefs which do not arise in the assertion.

(95) $$[\![pex\ K_x(\phi)]\!] = \begin{cases} \text{presupposition:} & K_x(\phi) \wedge \forall \psi \in IE(\phi, \textsc{Alt}(\phi)[\neg[\![K_x(\psi)]\!](w)] \\ \text{assertion:} & [\![\phi]\!] \end{cases}$$

Given this background, (96) shows how the pex account derives the correct readings when *also* is embedded under a negative factive. All the presuppositions triggered within the scope of *unaware* do not affect the asserted content in (96).

(96) John is unaware that Mary also pex K_s $\mathscr{A}$ pex [speaks Japanese or French].

a. Presupposition (implicature) triggered by pex K_s $\mathscr{A}$ pex: The speaker knows that Mary speaks Japanese or French but not both, but does not know which language Mary speaks.

b. Presupposition triggered by *also*: There is some x (not Mary) who speaks Japanese or French but not both, and the speaker does not know which language x speaks.

c. Presupposition triggered by *unaware*: Mary speaks Japanese or French.

d. Assertion: John is unaware that Mary speaks Japanese or French.

4.5 Accounting for the remaining data

In this section, I account for the remaining data in Table 4.1.

	unaware	aware
or (conjunctive antecedent)	*	*
or (simple antecedent)	*	*
bare numerals (stronger antecedent)	*	*
some (*all* antecedent)	*	*
SOME (*all* antecedent)	*	✓
some (specific antecedent)	*	*
SOME (specific antecedent)	*	✓
SMNs (specific antecedent)	*	✓
Scalar adjectives (stronger antecedent)	✓	✓

Table 4.1: Summary table (*: infelicitous, ✓: felicitous).

The local adjunction of pex within the scope of the factive predicate produces implicatures as presuppositions without affecting the asserted context. This correctly predicts the infelicity of the disjunction, bare numeral and unstressed *some* cases under both *unaware* and *aware*, since pex produces implicatures which contradict the context. For instance, (97a) is infelicitous since the "not all" implicature is unsatisfied.

When *some* is stressed, (97) becomes felicitous, because pex may scope above the factive predicate as in (97b).[16] In contrast, pex scoping above *unaware* in (98) does not produce any implicature, since negating the "all" alternative would contradict the prejacent. The pex account thus derives a contrast between positive and negative factives, without having to distinguish between presuppositional and assertive alternatives, unlike M&R's Exh operator.

[16]Bassi et al. (2021) do not discuss their analysis of positive factive predicates.

(97) Context: All the students passed.

John is aware that (#some/SOME) of the students passed.

a. #John is aware [that *pex* some of the students passed].

Implicature: Not all of the students passed. (False)

b. John is *pex* aware [that SOME of the students passed].

Implicature: John is not aware that all of the students passed. (True)

(98) Context: All the students passed.

John is unaware that (#some/#SOME) of the students passed.

a. John is *pex* unaware [that SOME of the students passed].

Impossible implicature: John is not unaware that all of the students passed. (Contradiction)

The same reasoning explains the patterns in (99), where stressed *some* is used as an epistemic indefinite.

(99) Context: Mary speaks French.

a. John is aware that Mary speaks (#some/SOME) Romance language.

b. John is unaware that Mary speaks (#some/#SOME) Romance language.

Finally, SMNs resemble stressed *some* in that *pex* may associate with them above the factive predicate. Following Walker's (2012) observation that the presuppositions triggered by SPTs such as *aware* can be cancelled from focus alternatives, (100) is correctly predicted to be felicitous with the given implicatures.

(100) Context: 3 students passed.

Jane is *pex* aware [that at most 4 students passed].

Implicatures: $\left\{ \begin{array}{l} \text{Jane is not aware that exactly 4 students passed} \\ \text{Jane is not aware that exactly 3 students passed} \\ \ldots \end{array} \right\}$

Chapter 5

Conclusion

Based on the fact that *also* takes surface scope, I have argued that ignorance inferences may be generated by an embedded necessity modal, as opposed to a Matrix K operator that only adjoins at the matrix level. Furthermore, I proposed that disjunction, unstressed *some* and bare numerals carry a [uExh] feature which must be checked by at least one instance of Exh as low as possible. Stressed *some* and SMNs carry a variant [uExh*] feature which allows Exh to exceptionally take scope at a higher position, subject to constraints based on clause finiteness.

I provided two arguments against M&R's global exhaustification account of the asymmetry between positive and negative factives. I thus argued in favour of local exhaustification within the scope of factive predicates by *pex* instead of Exh. No modifications are required to the features described above, which can be checked by *pex*, subject to the same locality constraints.

My discussion began with S&S, who leave open the possibility of recouching their analysis in Neo-Gricean terms. I have argued that contrary to the Neo-Gricean approach which predicts implicatures to be generated globally, an account where both ignorance and scalar implicatures are generated locally respect to certain logical operators better captures the empirical facts. My account thus provides further support for the grammatical approach to scalar implicature.

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