Multiple Exhaustifications and Multiple Scalar Items

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Background Observing that scalar implicatures (SIs) can be generated in embedding contexts, the *grammatical view of exhaustification* (Chierchia 2006; Fox 2007; Chierchia et al. 2012; a.o.) argues that SIs are compositionally derived from the lexicon of scalar items: propositions containing scalar items are associated with sets of alternatives; a covert exhaustivity operator O affirms the prejacent and negates all the alternatives that can be negated consistently.

The problem Sauerland (2012) indicates that the grammatical view predicts wrong interpretations for structures with multiple scalar items. For instance, (1a) should be read as "only p or only q or only r". But the grammatical view predicts (1a) to take the LF (1b) and be interpreted as "only p or only q or only r or all of the three" (i.e. $[(p \vee_s q) \vee_s r]$; $\vee_s$ stands for exclusive disjunctive).

(1) a. p or q or r b. $O_1(O_2(p \vee q) \vee r)$

My proposal Inspired by Fox and Spector's (2009) analysis on local exhaustifications, I propose that an O-operator activates an alternative that is equivalent to its prejacent, as schematized in (2).

(2) $\mathscr{A}lt(O\phi) = \{O\phi, \phi\}$

Under the assumption (2), the alternative set used by the matrix operator O_1 in (1b) is (3). Applying O_1 negates both the alternative $O_2(p \vee q) \wedge r$ (where the embedded *or* is strengthened) and the alternative $(p \vee q) \wedge r$ (where the embedded *or* isn't strengthened), yielding the (global) SI (underlined). Crucially, the negation of the former alternative is weaker than the negation of the latter, predicting the embedded scalar item to take its plain reading in the SI. This analysis predicts the correct reading for (1a) from (1b), as schematized in (4).

(3) $\mathscr{A}lt(O_2(p \vee q) \vee r) = \{O_2(p \vee q) \vee r, O_2(p \vee q) \wedge r, (p \vee q) \wedge r\}$

(4) $(1b) = [O_2(p \vee q) \vee r] \wedge \underline{\cancel{\neg[O_2(p \vee q) \wedge r]} \wedge \neg[(p \vee q) \wedge r]} = [(p \vee_s q) \vee r] \wedge \underline{\neg[(p \vee q) \wedge r]}$

The heart of (2) is to generate the strongest SI, in spirit of the *Maximal Strength Constraint* (Chierchia et al. 2012). A more general formalization is given in (5). Let S = $\beta(\alpha)$, where α and β (sloppily used for both phrases and values) be subparts of the sentence S, each of which contains a weak scalar item. β^+ is the non-weaker alternative of β; α_s stands for the strengthened reading of α. (5) says that the embedded item α takes its plain reading in the SI iff the global alternative $\beta^+(\alpha)$ is upward-entailing (UE) w.r.t. the embedded item α (i.e., $\beta^+(\alpha_s)$ entails $\beta^+(\alpha)$).

(5) $$O\beta(O\alpha) = \beta O\alpha \wedge \neg\beta^+(\alpha) \wedge \neg\beta^+(O\alpha) = \begin{cases} \beta(\alpha_s) \wedge \underline{\neg\beta^+(\alpha)} & \text{if } \beta^+(\alpha) \text{ is UE w.r.t. } \alpha \\ \beta(\alpha_s) \wedge \underline{\neg\beta^+(\alpha_s)} & \text{Otherwise} \end{cases}$$

In the following, I will demonstrate the idea of (5) in more details.

1. UE If the global alternative is UE w.r.t. the embedded scalar item, the embedded scalar item uses its plain reading in the SI. Take (6) for instance. I assume that the LF of (6) takes multiple exhaustifications (cf. Sauerland 2004). The alternative of the embedding scalar item *or* is *and*, the projection of which is UE w.r.t. the embedded scalar item *some*. The embedded *some* isn't strengthened in the SI, yielding the desired inferences, as in (7).

(6) Kai had **some** of the peas **or** the broccoli last night.

a. $\rightsquigarrow$ $\neg$[Kai had the broccoli and some of the peas last night]

b. $\rightsquigarrow \neg$[Kai had all of the peas last night]

(7) $O_1(O_2\phi_{\text{SOME}} \vee \phi_{\text{B}}) = (O_2\phi_{\text{SOME}} \vee \phi_{\text{B}})\ \underline{\cancel{\wedge\neg(O_2\phi_{\text{SOME}} \wedge \phi_{\text{B}})} \wedge\neg(\phi_{\text{SOME}} \wedge \phi_{\text{B}})}$
$= (\phi_{\text{SOME}} \vee \phi_{\text{B}}) \wedge (\neg\phi_{\text{ALL}} \vee \phi_{\text{B}}) \wedge\ \underline{(\neg\phi_{\text{SOME}} \vee \neg\phi_{\text{B}})}$

a. If $\phi_{\text{B}} = 1$, then $\phi_{\text{SOME}} = 0$. "Kai had the broccoli, and he didn't have any of the peas."

b. If $\phi_{\text{B}} = 0$, then $\phi_{\text{SOME}} = \neg\phi_{\text{ALL}} = 1$. "Kai only had some and not all of the peas."

Scalar items embedded under focus are also compatible with this idea. For instance, (8) implicates (8b) but not (8c), showing that the embedded item *some* takes its plain meaning in the SI.

(8) (*Context: Only John and Mary took a test.*)
"Only **JOHN** answered **some** of the questions."

a. $\rightsquigarrow$ John answered some but not all the questions.

b. $\rightsquigarrow \neg$ [Mary answered *at least some* questions]

c. $\not\rightsquigarrow \neg$ [Mary either answered *some but not all* questions]

2. Non-UE If the global alternative isn't UE w.r.t. the embedded scalar item, then the embedded scalar item takes its strengthened reading in the SI. As in (9), the alternative of *some* is *all*, which is downward-entailing (DE) w.r.t. the numeral *three* in its restriction. As predicted, the numeral *three* takes its strengthened meaning in the SI, implying the stronger inference (9b). Note that if (9c) were implied, then (9) would be incorrectly judged as true if all the applicants with exactly three children got the funding and some applicants with four or more children didn't.

(9) (*Context: The government provides funding for applicants that have four or more children. The speaker complains that this policy isn't performed strictly.*)

"**Some** of the applicants with **three** children got the funding."

a. $\rightsquigarrow$ Some of the applicants with only three children got the funding.

b. $\rightsquigarrow \neg$ [all of the applicants with *only three* children got the funding]

c. $\not\rightsquigarrow \neg$ [all of the applicants with *three or more* children got the funding]

Note to distinguish (9) and (10). In (10), the embedded scalar item *or* takes its plain reading in both the assertion and the SI, because scalar alternatives are not activated (marked as [-σ]) in DE contexts (Chierchia 2004, 2006; a.o.). Accordingly, I assume that the LF of (10) takes only global exhaustification, as schematized in (11). Therefore, the monotonicity pattern of the global alternative [*not some* ...] doesn't play a role in the SI.

(10) Not all students wrote a paper or made a presentation.

a. $\rightsquigarrow$ Not all students wrote a paper or made a presentation or did both.

b. $\rightsquigarrow$ Some student wrote a paper or made a presentation or did both.

(11) $O \neg$ [[all$_{[+\sigma]}$ students]$_i$ λx [x_i wrote a paper or$_{[-\sigma]}$ x_i made a presentation]]

Chierchia, G. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. **Chierchia, G. 2006.** Broaden your views: implicatures of domain widening and the "logicality" of language. *LI*. **Chierchia, G., D. Fox, and B. Spector. 2012.** The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. **Fox, D. 2007.** Free choice and the theory of scalar implicatures. **Fox, D. and B. Spector. 2009.** Economy and embedded exhaustification. **Sauerland, U. 2004.** Scalar implicatures in complex sentences. *L&P*. **Sauerland, U. 2012.** The computation of scalar implicatures: pragmatic, lexical or grammatical? *LLC*.