# On the locus of question exhaustification

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**1. Introduction.** [11] argued that *wh*-questions are systematically ambiguous between non-exhaustive ([14]) and exhaustive ([6]) readings. Question exhaustivity has been credited to a syntactically represented operator, with two different views regarding its position: (i) "high exhaustification" applies to the question meaning as a whole ([11],[2],[5]); (ii) "low exhaustification" applies in the *wh*-question nucleus, below the *wh*-phrase ([8],[17]). This paper offers an argument that only high exhaustification exists.

**2. Exhaustification, high and low.** For concreteness, suppose the domain D comprises three singular (human) individuals and their plural sums ([16]), as in (1). The non-exhaustive denotation of (2) is the set of propositions in (3a) ([9],[14]); the exhaustive denotation can be given as in (3b) ([5],[17]). Note that under both options, the disjunction of all the propositions in the question denotation encodes the question's existence presupposition (e.g.[14]), here l(a)∪l(b)∪l(c).

(1) D = {a, b, c, a+b, b+c, a+c, a+b+c}

(2) Who lied?

(3) a. {l(a), l(b), l(c), l(a+b), l(a+c), l(b+c), l(a+b+c)}
b. {l(a)–l(b)–l(c), l(b)–l(a)–l(c), l(c)–l(a)–l(b), l(a+b)–l(c), l(a+c)–l(b), l(b+c)–l(a), l(a+b+c)}

Simplifying somewhat (for expository transparency), the non-exhaustive meaning (3a) can be attributed to the logical form in (4), assuming the denotation for *who* in (5). One possible structure for the exhaustive meaning (3b) is (6a), assuming the denotation (7a) for the high exhaustifier H ([5]); an alternative structure for (3b) is (6b) (cf.[17]), assuming the denotation in (7b) for the low exhaustifier L (cf.[3]).

(4) who λx [x lied]

(5) $[\![\text{who}]\!] = \lambda f.\ \{f(x) \mid x \in D\}$

(6) a. H [who λx [x lied] ]
b. who λx [ [L x] lied]

(7) a. $[\![H]\!] = \lambda Q.\ \{\{w:\ p(w)\ \&\ \forall q \in Q[q(w) \rightarrow p \subseteq q]\} \mid p \in Q\}$
b. $[\![L]\!] = \lambda x.\lambda f.\ \{w:\ f(x)(w)\ \&\ \forall y \in D[f(y)(w) \rightarrow f(x) \subseteq f(y)]\}$

**3. A first case for high exhaustification.** In *wh else*-questions like (8), *else* makes two meaning contributions: (i) an additive presupposition ([13],[10]), here the proposition that a salient individual r lied; (ii) subtraction of answers about r from the question denotation ([18]). (i) and (ii) are encoded in (9): (i), as a condition in the domain of the denotation function; (ii) (which will ultimately require refinement), as a condition on the question's membership. For (10a) and r=a, this yields the additive presupposition l(a), as well as the question denotation in (10b), and hence the existence presupposition l(b)∪l(c).

(8) Who else lied?

(9) $[\![\text{who else}]\!]^w = \lambda f$**: f(r)(w)**$.\ \{f(x) \mid x \in D$ **& f(x)**$\not\subseteq$**f(r)**$\}$

(10) a. [who else] λx [x lied]
b. {l(b), l(c), l(b+c)}

(11) a. H [ [who else] λx [x lied] ]
b. [who else] λx [ [L x] lied]

Consider now the effects of high and low exhaustification as in (11a) and (11b), again for r=a. (11a) again yields the additive presupposition l(a), as well as the question denotation in (12a), and hence again the existence presupposition l(b)∪l(c). In contrast, (11b) yields the additive presupposition l(a)–l(b)–l(c), as well as the question denotation (12b), and hence again the existence presupposition l(b)∪l(c).

(12) a. {l(b)–l(c), l(c)–l(b), l(b+c)}
b. {l(b)–l(a)–l(c), l(c)–l(a)–l(b), l(a+b)–l(c), l(a+c)–l(b), l(b+c)–l(a), l(a+b+c)}

Given the inconsistency of {l(a)–l(b)–l(c), l(b)∪l(c)}, this illustrates that low exhaustification with *wh else* renders the additive and existence presupposition contradictory, aligned with what is actually perceived in cases like (13), where overt low exhaustification (by *the/only*) transparently creates a conflict between the additive and existence presupposition. In *wh else*-questions, low exhaustification is therefore not expected to give rise to a usable or attested interpretation.

(13) #Who else is the (only) one who lied?

And yet, the reasons for positing exhaustive *wh*-question meanings in the first place, originally articulated in [6], turn out extend to the particular case of *wh else*-questions. [6] took the perceived validity of an inference like (14) to call for a exhaustive meaning of *wh*-questions without *else*; the perceived validity of the inference in (15) makes the very same case for *wh else*-questions.

(14) x knows who lied;
Ann lied; Bill and Chris didn't lie
---
x knows that only Ann lied

(15) Ann lied; x knows that Ann lied;
x knows who else lied;
Bill lied; Chris didn't lie
---
x knows that only Ann and Bill lied

Given that in *wh else*-questions, low exhaustification is preempted by contradiction, the validity of the inference in (15) furnishes an argument for the existence of high exhaustification.

**4. A second case for high exhaustification.** [17] proposes that weak negative polarity items (NPIs) in *wh*-questions, as in (16), are licensed by a low exhaustifier much like L: [17] replaces L with a silent version of *only*, O. [17] employs [12]'s classic presuppositional semantics for *only*, but also assumes that the presupposition is locally accommodated, positing the accommodation operator A ([1]), as in (17). Modulo NPI licensing, (17) winds up equivalent to (18), while at the same time, the internal syntax in (17) provides O to serve as an NPI licenser akin to *only* in (19).

(16) Who lied about anything?

(17) who λx A[ [O x] lied about anything]

(18) who λx [ [L x] lied about anything]

(19) Only Ann lied about anything.

This provides an elegant account of [7]'s generalization that *wh*-questions that license weak NPIs must be exhaustive. However, under the assumptions above, it also makes an incorrect prediction about *wh else*-questions. Just like low exhaustification by L in (11b), low exhaustification by O under A in (20) delivers a contradictory presupposition. And yet, (21) is no less acceptable than (16) is. Hence NPI licensing does not actually require low exhaustification. High exhaustification, as in (22), must be available to the NPI's need for exhaustification ([7]), which constitutes a second argument for its existence.

(20) [who else] λx A[ [O x] lied about anything]

(21) Who else lied about anything?

(22) H [ [who (else)] λx [x lied about anything] ]

**5. A problem for low exhaustification.** Singular *which*-questions like (23) carry a presupposition of existence and uniqueness ([4]), here the presupposition that exactly one witness lied; [4] analyses this as the presupposition that the question denotation has a unique maximally informative true member.

(23) Which witness lied (about something)?

(24) Which witness lied about anything?

[15] and [17] adduce cases of singular *which*-questions that license weak NPIs, such as (24). However, a new observation is that singular *which*-questions that license NPIs are not actually understood to carry the expected existence/uniqueness presupposition. In fact, they are not fully felicitous in contexts where those presuppositions are satisfied. Suppose, for example, that Holmes told Watson that exactly one of the four witnesses lied. Watson may well use the question in (23) to inquire about the identity of the sole witness who lied. However, the question in (24) would not naturally serve that purpose, apparently in virtue of having to license an NPI contained in it. This constraint is unexpected if low exhaustification is in principle at hand in *wh*-questions to license NPIs: the NPI could be licensed by O as in (25), for which [4]'s analysis derives the existence/uniqueness presupposition just as it does for (23).

(25) [which witness] λx A[ [O x] lied about anything]

This overgeneration problem is a potential argument against low exhaustification, since a straightforward solution excludes logical forms like (25) by positing that low exhaustification does not exist at all.

**6. Conclusion.** Inference patterns and NPI licensing data with *wh else*-questions (sections 3 and 4) provide an argument *for high* exhaustification. The interpretation of singular *which*-questions that license NPIs provides provides an argument *against low* exhaustification (section 5). The second argument is less conclusive than the first, as it could be countered by motivating a constraint that specifically excludes low exhaustification in questions that carry a uniqueness presupposition, rather than doing away with low exhaustification altogether. Even so, what is currently lacking is an argument *for low* exhaustification. It is moreover clear that an account of NPI licensing in wh-questions is needed that does not rely on low exhaustification. [20] observes that [19]'s account, which shuns low exhaustification, correctly predicts a question's existence and uniqueness presuppositions to interfere with NPI licensing. Does that account also also capture [7]'s generalization that NPI licensing in questions requires exhaustivity? [20] leaves this question open, but if the answer is affirmative, [19]'s account might suffice to replicate the benefits of [17]'s low exhaustification analysis reviewed above while avoiding the problems identified here.

**References.** [1] Beaver & Krahmer 2001. A partial account of presupposition projection. [2] Beck & Rullmann 1999. A flexible approach to exhaustivity in questions. [3] Chierchia, Fox, Spector. 2011. The grammatical view of scalar implicatures. [4] Dayal 1996. Locality in wh quantification. [5] Fox 2013. Mention some readings. Lecture notes. [6] Groenendijk & Stokhof 1984. Studies on the semantics of questions and the pragmatics of answers. [7] Guerzoni & Sharvit 2007. A question of strength. [8] Guerzoni & Sharvit 2014. Whether or not anything but not whether anything or not. [9] Hamblin 1973. Questions in Montague English. [10] Harris 2014. Who else but Sarah? [11] Heim 1994. Interrogative semantics and Karttunens semantics for *know*. [12] Horn 1969. A presuppositional analysis of *only* and *even*. [13] Isac & Reiss 2004. Romance and 'something else'. [14] Karttunen 1977. Syntax and semantics of questions. [15] Krifka 1995. The semantics and pragmatics of polarity items. [16] Link 1983. The logical analysis of plurals and mass terms. [17] Nicolae 2015. Questions with NPIs. [18] Romero 1998. Focus and reconstruction effects in *wh*-phrases. [19] van Rooy 2003. Negative polarity items in questions: Strength as relevance. [20] Schwarz, B. 2017. Negative polarity items: a case for questions as licensers. SALT 27.