Sorting Out Multiple Questions*

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Claim: recent accounts of the syntax & semantics of multiple questions both over- and under-generate possible readings: a *set of Pair-List questions* reading is incorrectly predicted to be available; *Single-Pair* readings of superiority-violating questions are incorrectly predicted to be unavailable. These observations motivate an account according to which, (i) Pair-List readings are generated in a dedicated position, and (ii) superiority is semantically insensitive.

1 Introduction

- A roadmap:
  - In §2 I motivate the assumption that Multiple Questions (MQs) can denote two distinct semantic objects: a *set of propositions* (corresponding to the Single-Pair reading; SP), and a *set of questions* (corresponding to the Pair-List reading; PL).
  - In §3 I look questions with three *wh*-phrases. I observe that a *set of PL questions* reading is absent, and argue that this can shed light on the semantic composition of PL MQs.
  - In §4, I argue that Golan's (1993) economy-based theory of *superiority*, recently adopted by Reinhart (1998), Fox (2012) and Kotek (2012, 2014a,b) makes incorrect predictions, and provide a different account of their data.
  - In §5, I sketch an analysis that captures the basic interpretive properties of MQs, and accounts for the observations in §2-4.
  - In §6 I conclude with some open questions.

*Thanks but no blame goes to Klaus Abels, Yasu Sudo, Hans van de Koot, Matt Barros, and Gary Thoms, and a long-suffering group of English informants, who are too many to list here.

2 Families of Questions

- Singular *which*-phrases, unlike simplex *wh*-phrases, seem to carry a uniqueness presupposition (illustrated in (1)).

(1) a. Which politician is widely reviled?
 b. ✓George Osborne is widely reviled.
 c. #George Osborne and Michael Gove are widely reviled.

(2) a. Who is widely reviled?
 b. ✓Osborne and Gove are widely reviled.

- One way to capture the infelicity of (1c) would be to say that *which*, like a definite determiner, carries a uniqueness presupposition as a matter of its lexical semantics.
- This can't be right, since the uniqueness presupposition disappears in a multiple question, as illustrated in (3).

(3) a. Which politician was pilloried by which newspaper?
 b. ✓Miliband was pilloried by The Sun.
 c. ✓Miliband was pilloried by The Sun, and Cameron was pilloried by The Mirror.

- One widely adopted solution (see, e.g., Hagstrom 1998, Fox 2012, Nicolae 2013, Kotek 2014a), which I will assume here, is to say that the uniqueness presupposition of a singular *which*-question emerges due to the interaction of two factors:

 1. Singular NPs denote sets of atoms.
 2. A question presupposes the existence of a unique, maximally informative answer.

 Crucially, interrogatives with $n \geq 2$ *wh*-phrases will be taken to be ambiguous; they may denote either a *question*, or a *family of questions*.

- Consider the Hamblin/Karttunen denotation[1] for the question in (1a). Crucially, the proposition *Osborne⊕Cameron are widely reviled* is not a member of the answer-set, since *which politician* only ranges over atoms (*politician* is singular, and singular NPs denote a set of atoms).

(4) $$[\![\text{Which politician is widely reviled?}]\!]^g = \left\{\begin{array}{c}\text{George Osborne is widely reviled,}\\ \text{David Cameron is widely reviled,}\\ \text{Ed Miliband is widely reviled,}\\ \ldots\end{array}\right\}$$

[1] On Hamblin's (1973) analysis, questions denote the set of possible answers, whereas Karttunen (1977) argues that questions denote the set of *true* possible answers. Karttunen claims that the latter approach is necessary to account for *weakly exhaustive* readings. The difference will not be crucial here, although I largely follow Hamblin for ease of exposition.

- Simplex *wh*-words, on the other hand, are assumed to be underspecified for number, and therefore may range over pluralities.[2]

(5) $$[\![\text{Who is widely reviled?}]\!]^g = \left\{ \begin{array}{c} \text{Osborne is widely reviled,} \\ \text{Cameron is widely reviled,} \\ \text{Osborne}\oplus\text{Cameron are widely reviled,} \\ ... \end{array} \right\}$$

- Dayal (1996) introduces the idea that a question presupposes the existence of a unique, maximally-informative answer.[3] For concreteness, I follow Fox (2012) and Kotek (2014a) and incorporate this as an answerhood operator in the LF of an interrogative – essentially a definite determiner that applies to Hamblin/Karttunen denotations.

(6) $$[\![\mathrm{D_Q}]\!]^g = \lambda Q \in D_{\langle\langle s,t\rangle,t\rangle}.\lambda w \in D_s.\iota p \in Q[w \in p \wedge \forall q \in Q[w \in q \rightarrow p \subseteq q]]$$

- If we apply $\mathrm{D_Q}$ to the question in (4), it will only be defined if the answer-set contains a unique, maximally informative proposition of the form *x is widely reviled*, where x is an atom. This derives the uniqueness presupposition of questions with a singular *which*-phrase.

- On the other hand, if we apply $\mathrm{D_Q}$ to the question in (5), it is defined just so long as there is a unique maximally informative proposition of the form *x is widely reviled.* This requirement is satisfied even if more than one person is widely reviled, since x can be non-atomic.

- The 'disappearance' of the uniqueness presupposition in (3a) is derived by assuming that multiple questions can denote a 'family' (set) of questions, which are of type $\langle\langle s,t\rangle,t\rangle$.

(7) $[\![\text{Which politician was pilloried by which newspaper?}]\!]^g =$

$$\left\{ \begin{array}{c} [\![\text{Which Newspaper was Miliband pilloried by?}]\!]^g = \left\{ \begin{array}{c} \text{The Sun pilloried Miliband,} \\ ... \end{array} \right\} \\ [\![\text{Which Newspaper was Cameron pilloried by?}]\!]^g = \left\{ \begin{array}{c} \text{The Mirror pilloried Cameron} \\ ... \end{array} \right\} \\ [\![\text{Which Newspaper was Osborne pilloried by?}]\!]^g = \left\{ \begin{array}{c} \text{The Guardian pilloried Osborne} \\ ... \end{array} \right\} \end{array} \right\}$$

- The answerhood conditions on a family of questions are (roughly) as follows: Every member of the plurality must be defined for $\mathrm{D_Q}$. There are various ways of cashing this out, e.g., a universal quantifier inserted at LF (see Fox 2012 for details). This

[2] We can cash this out by assuming that a simplex *wh*-phrase such as *who* is syntactically complex and made up of *which*, in *D*, plus a null restrictor PEOPLE that ranges over animate individuals; both atoms and i-sums.

(i) $[\![\text{PEOPLE}]\!]^g = \{$George Osborne, David Cameron, George Osborne $\oplus$ David Cameron, etc.$\}$

$[_{DP}$ which $[_{NP}$ PEOPLE $]]$ is exponed as *who.*

[3] This has been important in recent work on weak islands. See Abrusán (2014) for an overview.

captures the observation that a PL multiple question presupposes *domain exhaustivity* and *point-wise uniqueness* (Dayal 2002).

(8) **Domain Exhaustivity**
Every member of the set quantified over by the overtly moved *wh* is paired with a member of the set quantified over by the in-situ *wh*.

(9) **Point-wise Uniqueness**
Every member of the set quantified over by the overtly moved *wh* is paired with no more than one member of the set quantified over by the in-situ *wh*.

3 Higher-Order Questions

- Multiple questions are not limited to just two *wh*-expressions. Consider (10):

(10) Which boy returned which book to which library?

- We can observe any question with n *wh*-expressions can easily receive a *single n-tuple* reading (of which the *single pair* reading is a special case). We can bias this reading by giving an explicit discourse context.

(11) A certain boy returned a certain book to a certain library.
Tell me which boy returned which book to which library.

- Under this reading, the interrogative denotes a set of propositions (it is of type $\langle\langle s,t\rangle,t\rangle\rangle$).

(12) $$[\![(11)]\!] = \left\{\begin{matrix}\text{that John returned } \textit{Syntactic Structures} \text{ to the Main Library,}\\ \ldots\end{matrix}\right\}$$

- The presupposition introduced by D_Q is satisfied just so long as there is a unique tuple (x,y,z) s.t., x, y and z are atoms, x a boy, y a book, and z a library, and x returned y to z.
- There is also a reading where every member of the set quantified over by the overtly moved *wh* is mapped to a single pair, as in (13). We can model this as a family of questions.

(13) Each boy returned a certain book to a certain library.
Tell me which boy returned which book to which library.

(14) $$[\![(13)]\!] = \left\{\begin{matrix}\text{Which book did Tom return to which library? (SP),}\\ \text{Which book did Dick return to which library? (SP),}\\ \text{Which book did Harry return to which library? (SP),}\\ \ldots\end{matrix}\right\}$$

- We can now ask whether an interrogative with three *wh*-expressions can receive a higher-order interpretation. It can be interpreted as a *set of propositions* and a *set of sets of propositions* (a family of questions/set of SP questions). Can it be interpreteted as a *set of sets of sets of propositions*, i.e., a *set of PL questions*? We can set-up a discourse context in which such a reading is biased.

(15) Context: Each boy has borrowed three books from university libraries across the city. By coincidence, they are were all due back yesterday. Each boy returned each book he had borrowed to the library that he borrowed it from.

a. #Tell me, which boy returned which book to which library?

- The infelicity of (15a) in the context given indicates that it cannot be used to ask about a mapping from each boy to a list of pairs corresponding to that boy. In other words, it seems like a (mono-clausal) interrogative with three *wh*-expressions cannot denote a *set of PL questions*.

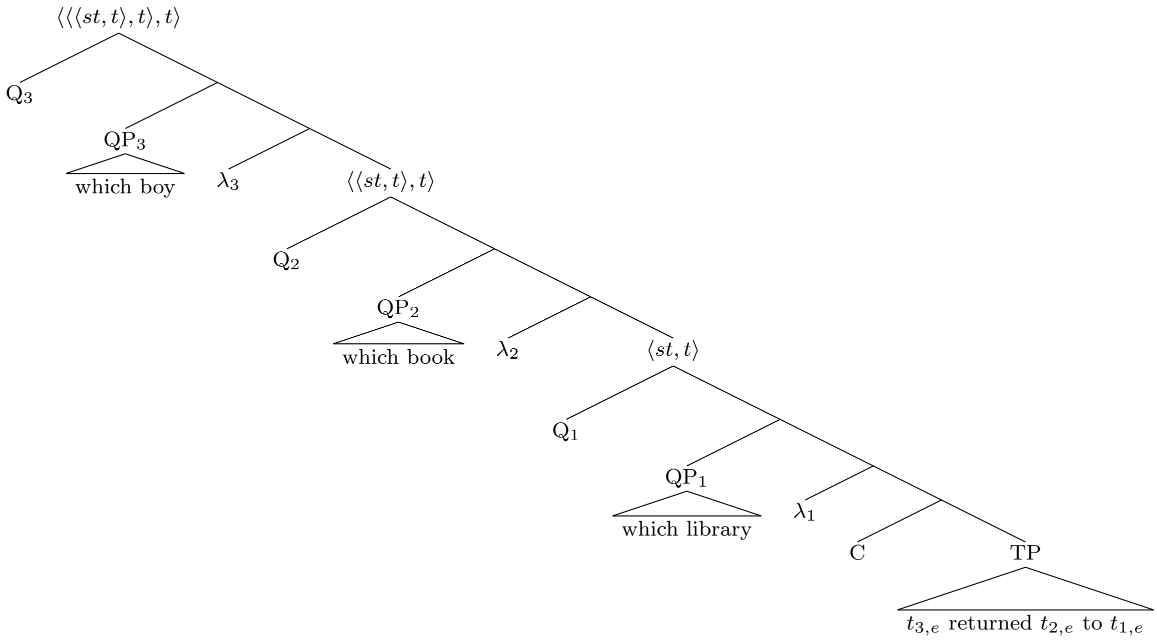
(16) $[\![(15a)]\!] \neq \left\{ \begin{array}{c} \text{Which book did Tom return to which library? (PL),} \\ \text{Which book did Dick return to which library? (PL),} \\ \text{Which book did Harry return to which library? (PL),} \\ \ldots \end{array} \right\}$

(17)
a. ✓$\langle\langle s,t\rangle,t\rangle$ standard question meaning
b. ✓$\langle\langle\langle s,t\rangle,t\rangle,t\rangle$ family of questions
c. $*\langle\langle\langle\langle s,t\rangle,t\rangle,t\rangle,t\rangle$ family of PL questions (unattested)

- This is unexpected under a recent proposal regarding the syntax and semantics of multiple questions, outlined in Kotek (2014a). According to Kotek, higher-order question meanings are derived by recursively nesting Q-operators. Each *wh*-expression may potentially be associated with a distinct Q-operator.

- A possible LF for (15a) under Kotek's (2014a) approach is given in (18).

(18) Which boy returned which book to which library?



- Kotek (2014a) assigns the Q particle a very simple semantics – it 'imports' the focus-semantic value of its complement into the ordinary-semantic dimension.

(19) **The semantics of the Q particle:** (p. 66)

a. $[\![Q\,\alpha_\sigma]\!]_o = [\![\alpha_\sigma]\!]_f$

b. $[\![Q\,\alpha_\sigma]\!]_f = \{[\![Q\,\alpha_\sigma]\!]_o\}$ $\qquad \sigma \in \{\langle s,t\rangle, \langle st,t\rangle, \langle\langle st,t\rangle,t\rangle,\text{...etc.}\}$

- Without going into the details of Kotek's system, this is what the semantics does: coupled with the assumption (from Beck 1996) that *wh*-expressions range over sets of alternatives in the focus-semantic dimension, an additional layer of nesting is introduced for each recursively embedded Q particle. As illustrated, this allows us to derive a *set of PL questions* reading.

- The unavailability of this reading indicates that what we want is a **dedicated position** in the left-periphery for generating family of question readings. I explore this option in §5.

4 Superiority and Semantic Sensitivity

- In English, a one and only one *wh*-expression must be overtly fronted in a *wh*-question (unlike, e.g., Bulgarian, which instantiates the pattern in (20b), and Mandarin Chinese, which instantiates the pattern in (20c)).

(20) a. Bill asked which postcard$_i$ John sent t_i to which family member?

b. *Bill asked Which postcard$_i$ which family member$_j$ John sent t_i to t_j?

c. *Bill asked John sent which postcard to which family member?

- *Superiority* is a constraint on *wh*-movement, which can be stated descriptively as follows:

(21) **Superiority**

When an interrogative clause contains two *wh*-expressions, the one that undergoes *wh*-movement is the one closest to the interrogative C.

(22) a. John asked who$_i$ t_i bought what?

b. *John asked what$_i$ who bought t_i?

- Superiority effects are ameliorated when the *wh*-expressions in question are *which*-phrases ('D-linked' *wh*-phrases, in Pesetsky's 1987 parlance).

(23) a. John asked which contestant$_i$ t_i won which prize.

b. ?John asked which prize$_i$ which contestant won t_i.

- Reinhart (1998), Fox (2012) and Kotek (2014a) adopt an account of superiority inspired by Golan (1993).

- The idea, roughly, is as follows: a superiority-obeying derivation blocks a superiority-violating derivation, just in case the resulting question LFs are semantically equivalent.

(24) **Equivalence for Question LFs**
Two question LFs Q and Q' are equivalent iff:
$\forall w \forall w' [D_Q(\llbracket Q \rrbracket)(w')(w) = D_Q(\llbracket Q' \rrbracket)(w')(w)]$

- **Prediction 1**: Both superiority-obeying and superiority-violating multiple questions are predicted to be acceptable under a pair-list reading, since the sorting key is different in each case.

- (25a) presupposes that:
$\forall x[\text{boy}(x) \rightarrow \exists y[\text{girl}(y) \wedge \text{likes}(x, y) \wedge \forall z[\text{girl}(z) \wedge \text{likes}(x, z) \rightarrow z = y]]]$
(25b) presupposes that:
$\forall x[\text{girl}(x) \rightarrow \exists y[\text{boy}(y) \wedge \text{likes}(y, x) \wedge \forall z[\text{boy}(z) \wedge \text{likes}(z, x) \rightarrow z = y]]]$
Therefore, (25a) and (25b) are not equivalent.

(25) a. $\llbracket$Which boy$_i$ t_i likes which girl?$\rrbracket = \left\{\begin{array}{c}\text{Which girl does Tom like?,} \\ \text{Which girl does Dick like?,} \\ \text{Which girl does Harry like?,} \\ \text{...}\end{array}\right\}$

b. $\llbracket$Which girl$_i$ does which boy like t_i?$\rrbracket = \left\{\begin{array}{c}\text{Which boy likes Sally?,} \\ \text{Which boy likes Jane?,} \\ \text{Which boy likes Mary?,} \\ \text{...}\end{array}\right\}$

- Fox (2012) considers this to be a good prediction, but my informants all find superiority-violating questions unacceptable in an environment where a PL reading is forced, e.g., embedded under the predicate *list*.

(26) I know that each boy likes a different girl.
a. List which boy likes which girl.
b. ?*List which girl which boy likes.

- There is disagreement here in the literature. Hagstrom (1998) and Boškovic (1998) claim that only the SP reading is available in a superiority-violating multiple question. Some of the subsequent literature however follows Pesetsky (2000) in assuming that PL readings *are* in fact available. I do not think this has ever been firmly established however, and most of my informants agree with Hagstrom and Boškovic.

- **Prediction 2**: Superiority-violating questions should disallow a SP reading.

(27) $\llbracket$Which boy$_i$ t_i likes which girl?$\rrbracket =$
$\llbracket$Which girl$_i$ does which boy like t_i?$\rrbracket = \left\{\begin{array}{c}\text{that Tom likes Sally,} \\ \text{...}\end{array}\right\}$

- Again, this is considered by Fox (2012) to be a good prediction. Fox (2012) and Kotek (2014a) argue that in an environment where the PL reading is independently ruled-out, superiority-violating questions are unacceptable. Kotek (2014) gives the following example:[4]

[4] The PL reading is unavailable in (28) because both wh_1 and wh_2 range over the same two individuals:

(28) Context: Scientists have discovered a new planetary system, consisting of just two stars. They appear to be interacting with one another because of their gravitational fields. Researchers are now asking:

a. Which revolves around which?
b. *Which does which revolve around?

- I argue that what is responsible for the unacceptability of the superiority-violation in (28b) is the fact that both *wh*-phrases range over the same set of individuals. Consider the following example:

(29) Context: There are three well-known linguists (Ross, McCawley and Lakoff) here.

a. Which admires which?
b. *Which does which admire?

(30) a. $[\![(29a)]\!] = \left\{\begin{array}{c}\text{Which linguist does Ross admire?,}\\ \text{Which linguist does McCawley admire?,}\\ \text{Which linguist does Lakoff admire?}\end{array}\right\}$

b. $[\![(29b)]\!] = \left\{\begin{array}{c}\text{Which linguist admires Ross?,}\\ \text{Which linguist admires McCawley?,}\\ \text{Which linguist admires Lakoff?}\end{array}\right\}$

- (29b) is judged to be just as bad as (28b), but Fox (2012) incorrectly predicts it to be acceptable. This is because a PL reading is not independently ruled out, and (29a) and (29b) give rise to different presuppositions.

- (29a) presupposes that for each of the three linguists, there is a unique linguist that they admire. This would be satisfied, e.g., if everyone, including himself, admired Ross). (29b) presupposes that for each of the three linguists, there is a unique linguist that admires them, which fails to be satisfied in this context.

- Furthermore, Fox (2012) predicts that there should be a contrast if we pick a symmetric, non-reflexive predicate such as *collaborated with.*

(31) Context: There are three well-known linguists (Ross, McCawley and Lakoff) here.

a. Which collaborated with which?
b. *Which did which collaborate with?

(32) a. $[\![(31a)]\!] = \left\{\begin{array}{c}\text{Which linguist did Ross collaborate with?,}\\ \text{Which linguist did McCawley collaborate with?,}\\ \text{Which linguist did Lakoff collaborate with?}\end{array}\right\}$

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star$_1$ and *star*$_2$. Under the PL reading, the question in (27) would presuppose that for each of the two stars, there is a unique star that it rotates around. Since the stars cannot rotate around themselves, or each other (the *rotate around* relation is *non-reflexive* and *anti-symmetric*), the presupposition of the PL reading can never be satisfied.

b. $[\![(31b)]\!] = \left\{ \begin{array}{c} \text{Which linguist collaborated with Ross?,} \\ \text{Which linguist collaborated with McCawley?,} \\ \text{Which linguist collaborated with Lakoff?} \end{array} \right\}$

- (31a) presupposes that: for each of the three linguists, there is a unique linguist whom they collaborated with. (31b) presupposes that: for each of the three linguists, there is a unique linguist who collaborated with them. There is no context in which one of the presuppositions will be satisfied, but the other will not.

- Fox therefore predicts (31b) to be worse than (29b), but they are both equally unacceptable.

- Finally, Fox (2012) predicts that in a context where wh_1 and wh_2 range over different sets of individuals, but the superiority -obeying and -violating question LFs are nonetheless equivalent under the PL reading, the superiority-violating LF should be ruled out.

(33) <u>Context:</u> You attend a social event for married couples only, and encounter a group consisting of three men and three women.

a. Which of these three men is married to which of these three women?

b. ?Which of these three women is which of these three men married to?

(34) a. $[\![(33a)]\!] = \left\{ \begin{array}{c} \text{Which of these three women is Tom married to?,} \\ \text{Which of these three women is Dick married to?,} \\ \text{Which of these three women is Harry married to?} \end{array} \right\}$

b. $[\![(33b)]\!] = \left\{ \begin{array}{c} \text{Which of these three men is married to Mary?,} \\ \text{Which of these three men is married to Jane?,} \\ \text{Which of these three men is married to Sally?} \end{array} \right\}$

- (33a) presupposes that: for each of these three men, there is a unique woman whom he is married to. (33b) presupposes that: for each of these three woman, there is a unique man who is married to her. Since *is married to* is symmetric, and non-reflexive, and the cardinality of both sets is the same, there is no context in which one of the presuppositions will be satisfied while the other will fail to be.

- Fox (2012) therefore predicts (33b) to be just as bad as (29b) and (28b) under the PL reading, whereas in fact it is a lot better.

- In conclusion, it does not seem like superiority effects can straightforwardly be given a economy-based account. There must be a syntactic residue.

- The data offered by Fox (2012) and Kotek (2014a) in support of the claim that superiority-violating questions cannot receive SP readings seems better explained by the following descriptive claim:

(35) **Contrastiveness requirement:**
A superiority-violating question is only possible if the overtly-moved *wh*-phrase is contrastive.

- This captures the fact that superiority-violations are highly degraded, even with *which*-phrases, when both whs range over the same set of alternatives.

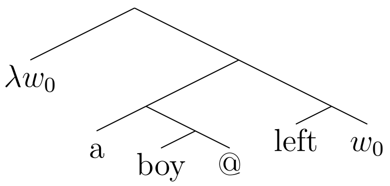
5 Analysis

- Desiderata:
  - (Superiority-obeying) MQs can denote either a *set of propositions* or a *set of questions.*
  - *Set of PL question* readings are unavailable; a dedicated position in the left-periphery is responsible for PL readings.
  - Superiority-violating questions cannot receive PL readings (for a subset of speakers).

5.1 Ingredients

- World arguments are explicitly represented in the object language (Heim and von Fintel 2011, chapter 8).[5]

(36)



(37) $[\![(36)]\!]^g = \lambda w.$ a boy$_@$ left$_w$

- *wh*-expressions denote sets of alternatives. We introduce a second interpretation function $[\![.]\!]^g_q$ that gives back the *question-semantic* value of an expression of the object language; $[\![.]\!]^g_o$ gives back the *ordinary-semantic* value of an expression. The question-semantic value is for all intents and purposes identical to the focus-semantic value.[6]

(38) **Question-semantic interpretation rule:**
$[\![X^0]\!]^g_q = \{[\![X^0]\!]^g_o\}$

- In the spirit of Beck (1996), *wh*-expressions are assumed to lack ordinary-semantic values, only being defined along the question-semantic dimension, where they denote sets of alternatives.[7]

[5] This means that a sentence denotes a proposition (or set of worlds). The principle for utterance truth is as follows (Heim and von Fintel 2011, p. 104):

(i) An utterance of a sentence (= LF) ϕ in world w is true iff $[\![\phi]\!]^g(w) = 1$

[6] To simplify the discussion, I introduce a seperate dimension of meaning; I am not concerned with the interaction between focus-alternatives and question alternatives here.

[7] The question arises how we derive the meaning for *which boy* given in (i) compositionally. We can achieve this by assuming that it is only *wh*-determiners that lack an ordinary-semantic value. The lexical item *which* can be taken to denote a *set of choice functions.*

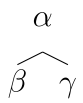
(i) Lexical entries
  a. $[\![\text{boy}]\!]^g_q = \{[\![\text{boy}]\!]^g_o\} = \{\lambda w.\lambda x.x \text{ is a boy}_w\}$

(39) a. $[\![\text{which boy}_{@}]\!]^g_q = \{x \in D_e : x \text{ is a boy}_{@}\}$
b. $[\![\text{which boy}_{@}]\!]^g_o = \text{undefined}$

- Question-semantic values compose via Pointwise Functional Application (PFA; after Kratzer and Shimoyama 2002, p. 7).

(40) **Pointwise Functional Application:**

a.



b. If $[\![\beta]\!]^g_q \subseteq D_\sigma$, $[\![\gamma]\!]_q \subseteq D_{\langle\sigma,\rho\rangle}$, then
$[\![\alpha]\!]^g_q = \{a \in D_\rho : \exists b \exists c[b \in [\![\beta]\!]^g_q \wedge c \in [\![\gamma]\!]^g_q \wedge a = c(b)]\}$

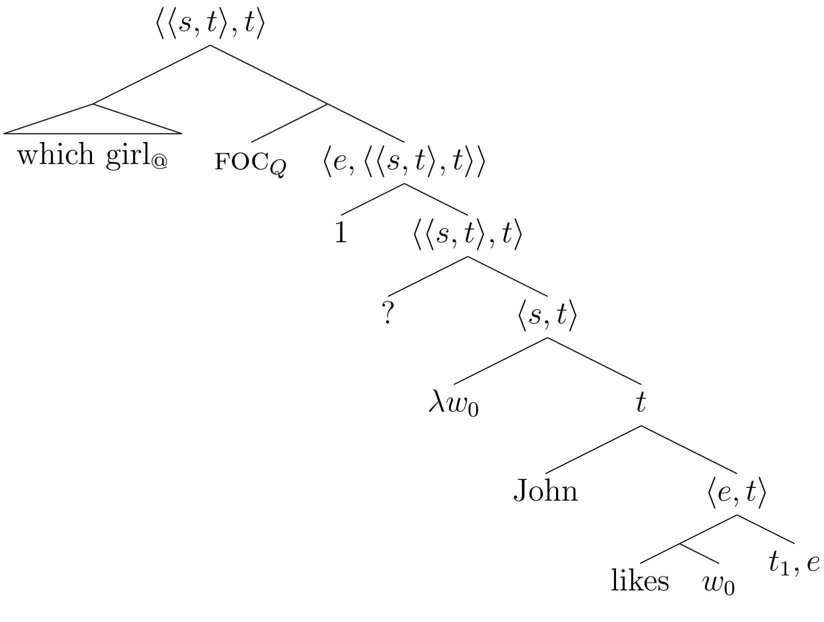
- Following Karttunen (1977), the question operator (here: '?') is assumed to be the locus of the question meaning. After Heim (2000):

(41) $[\![?]\!] = \lambda p_{\langle s,t\rangle}.\{q \in D_{\langle s,t\rangle} : q = p\}$

5.2 Computing the Meaning of a Simple *wh*-Question

- The LF of a simple *wh*-question is as given in (42):

(42)



- The question operator gives back an assignment-dependent question meaning.

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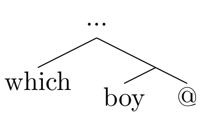
b. $[\![\text{which}]\!]^g_q = \lambda f \in D_{\langle\langle e,t\rangle,e\rangle}.CH(f)$

(ii)

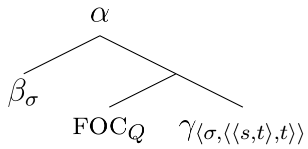


(iii) a. $[\![@]\!]^g_q = \{@\}$
b. $[\![[\text{boy } @]]\!]^g_q = \{\lambda x.x \text{ is a boy}_{@}\}$
c. $[\![\text{which [boy } @]]\!]^g_q = \{x \in D_e : \exists f \in D_{\langle\langle e,t\rangle,e\rangle}[CH(f) \wedge x = f(\{x : x \text{ is a boy}_{@}\})]\}$

- Movement of the *wh*-phrase leaves behind an index (here: '1'), triggering Heim and Kratzer's (1998) *Predicate Abstraction* rule. This gives back a *question abstract*; a function from individuals to questions, of type $\langle e, \langle\langle s,t\rangle, t\rangle\rangle$.

- We now need a way of combining the set of alternatives denoted by the moved *wh*-expression with the question abstract. I define a syncategorematic rule triggered by the presence of an operator in left-periphery $\textsc{foc}_Q$ which does just that.

(43) **Special composition rule for $\textsc{foc}_Q$:**



a. $[\![\alpha]\!]^g_o = \{p \in D_{\langle s,t\rangle} : \exists x_\sigma \in [\![\beta]\!]^g_q \text{ and } p \in [\![\gamma]\!]^g_o(x)\}$
b. $[\![\alpha]\!]^g_q = \{[\![\alpha]\!]^g_o\}$

- The special composition rule generates the answer-set by existentially quantifying over the set of alternatives denoted by the *wh*-expression in the question-semantic dimension.

(44) $[\![(42)]\!]^g_o = \{p \in D_{\langle s,t\rangle} : \exists x_e \in \{x \in D_e : x \text{ is a girl}_@\} \text{ and } p \in \{q \in D_{\langle s,t\rangle} : q = \lambda w_0.\ \text{John likes}_{w_0}\ x\}\}$

5.3 Computing the Single-Pair Reading

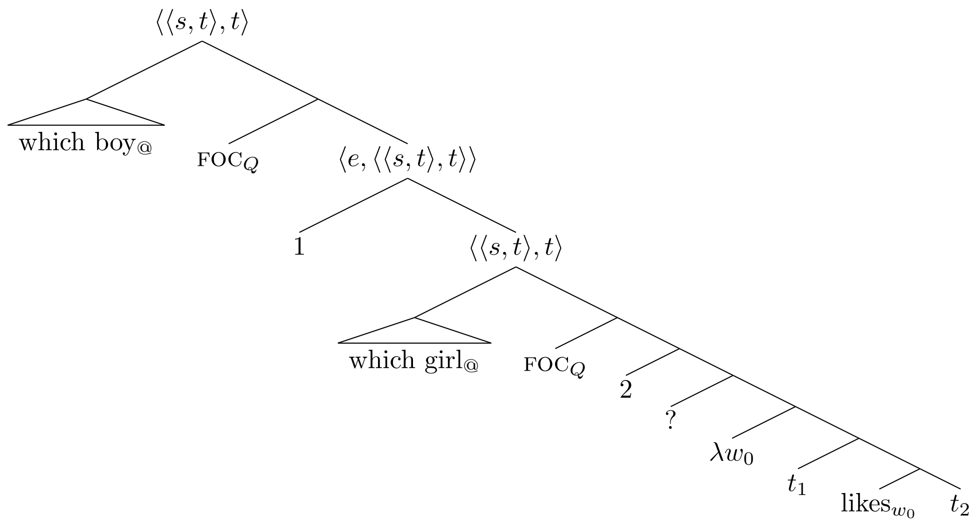
- Single-Pair readings are generated by nesting $\textsc{foc}_Q$ operators in the left-periphery.

- Since the $\textsc{foc}_Q$ operator takes a question-abstract as one of its arguments, $\textsc{foc}_Q$ can be recursively nested. This accurately predicts the availability of *single n-tuple* readings for questions with n *wh*-words.

- At this point, there is no reason to assume any constraints on movement. I assume rather that it takes place freely, as long as the sentence ultimately receives an ordinary-semantic value (Beck 1996). This predicts the availability of a SP reading for a superiority-violating question, as in (46a) (the *contrastiveness* requirement is needed in addition to block the SP reading when both *wh*s range over the same set of alternatives).

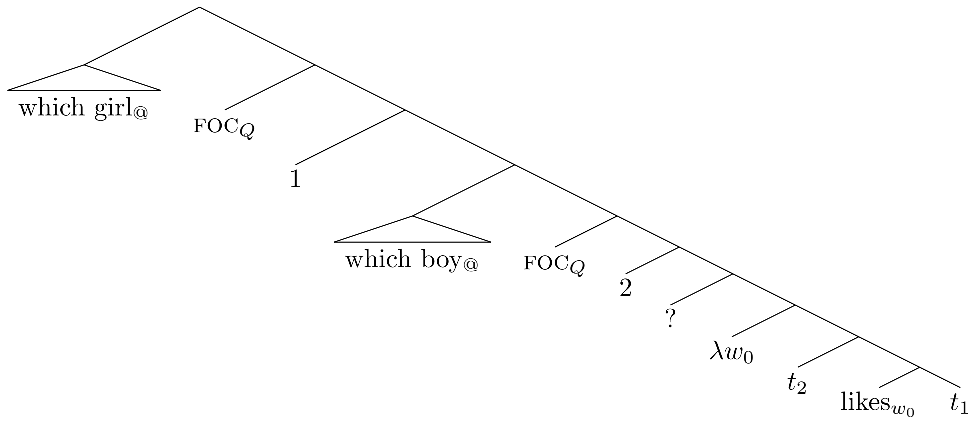
(45) a. Which boy likes which girl? (SP)

b.



(46) a. Which girl does which boy like? (SP)

b.



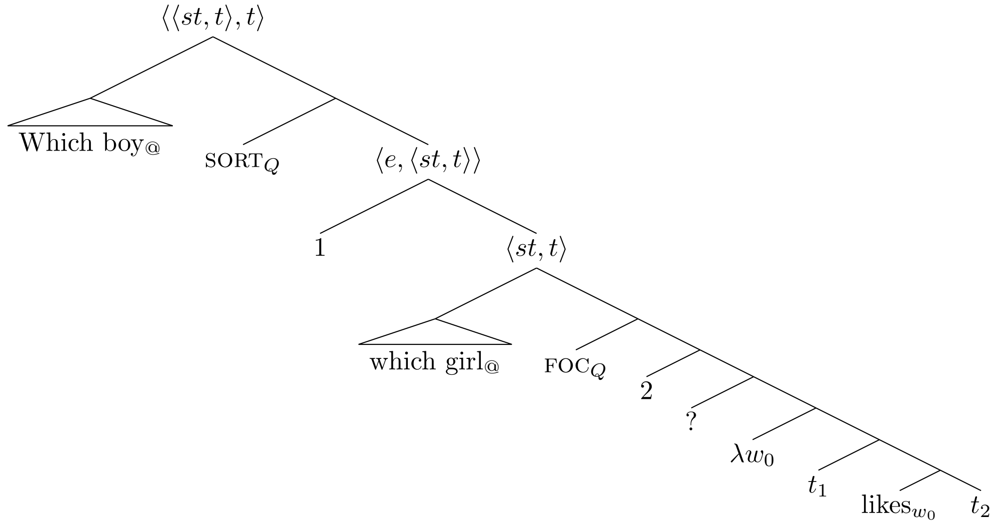
(47) $[\![(45a)]\!]^g_o/[\![(46a)]\!]^g_o = \{p \in D_{\langle s,t\rangle} : \exists y \in \{y \in D_e : y \text{ is a girl}_@\} \text{ and } \exists x \in \{x \in D_e : x \text{ is a boy}_@\} \text{ and } p = \lambda w_0.x \text{ likes}_{w_0}\ y\}$

5.4 Computing the Pair-List Reading

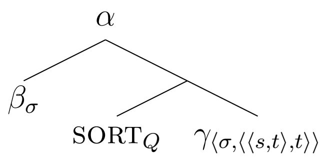
- To derive the PL reading, I define a dedicated operator SORT$_Q$. SORT$_Q$ takes a question-abstract and a *wh*-expression as its arguments, and gives back a set of questions.

(48) a. Which boy likes which girl? (PL)

b.



(49) **Special composition rule for** $\textsc{sort}_Q$**:**



a. $[\![\alpha]\!]^g_o = \{Q \in D_{\langle\langle s,t\rangle,t\rangle} : \exists x_\sigma \in [\![\beta]\!]^g_q \text{ and } Q = [\![\gamma]\!]^g_o(x)\}$
b. $[\![\alpha]\!]^g_q = \{[\![\alpha]\!]^g_o\}$

(50) $[\![(48\text{b})]\!]_o = \{Q \in D_{\langle\langle s,t\rangle,t\rangle} : \exists y \in \{y \in D_e : y \text{ is a boy}_@\} \text{ and } Q = \{p \in D_{\langle s,t\rangle} : \exists x \in \{x \in D_e : x \text{ is a girl}_@\} \text{ and } p = \lambda w_0.y \text{ likes}_{w_0}\ x\}\}$

- Since $\textsc{sort}_Q$ is defined for a question abstract, but not for an abstract over a set of questions, I derive the absence of a *set of PL questions* reading for a mono-clausal question.

- The semantic composition 'bottoms-out' once it reaches $\textsc{sort}_Q$, and thus the following cartographic consequences are derived.

(51) a. ✓[*wh* $\textsc{sort}_Q$ 1 [*wh* $\textsc{foc}_Q$ 2 [...]]]
b. *[*wh* $\textsc{foc}_Q$ 1 [*wh* $\textsc{sort}_Q$ 2 [...]]]
c. *[*wh* $\textsc{sort}_Q$ 1 [*wh* $\textsc{sort}_Q$ 2 [...]]]
d. ✓[*wh* $\textsc{foc}_Q$ 1 [*wh* $\textsc{foc}_Q$ 2 [...]]]

- I adopt a syntactic account of superiority, but crucially relativized to $\textsc{sort}_Q$. Descriptively, the *wh* whose base-position c-commands the base-position of every other *wh* moves to the spec of $\textsc{sort}_Q$; movement to $\textsc{sort}_Q$ (but not to $\textsc{foc}_Q$) obeys Starke's (2001) *Round Robin Constraint*, given in (52).

(52) **Round Robin Constraint:**
$*\alpha_i ... \alpha_j ... \alpha_j ... \alpha_i$ *base order has to be preserved*

- There are some kinks to work out in the syntax here, but since this isn't a syntax workshop I won't dwell on this.[8]

- We still need to account for speakers (see e.g., the judgements reported in Pesetsky 2000) who get PL readings for superiority violations.

- One way to do this would be to say that, for some speakers, (52) is a *violable* constraint. Namely, it can be violated just in case the moved *wh* is topical in the discourse (modulo contrastiveness). Importantly, this does not predict that superiority-violating questions lack a SP reading. For other speakers, (52) must be an *absolute* constraint.

6 Conclusion

- Summary:
  - The PL reading is the upper-limit on the interpretation of a mono-clausal question.
  - Economy-based theories of superiority make incorrect predictions for superiority-violating questions.
  - Constraints on interpretation favour a cartographic account, in which particular meanings are tied to dedicated positions. This was spelled out formally by positing two operators: $\textsc{foc}_Q$ and $\textsc{sort}_Q$.
  - Readings of superiority-violating questions indicate that the mechanisms for generating an SP interpretation should be less constrained than those that generate the PL interpretation, contra Fox (2012) a.o. Inter-speaker variation can be captured by positing a violable constraint governing the mechanism used to derive a PL interpretation.

- More careful empirical work needs to be done on superiority-violating questions, and the extent to which the apparent inter-speaker variation is real.

- The analysis offered here is in some respects non-compositional (syncategorematic rules), which is unsatisfactory.

- We should explore parallels between multiple questions and CT+Exh configurations (a sentence with a *contrastive topic* and an *exhaustive focus*). Recent work on contrastive topic has argued that CT+Exh configurations such as (53) are discourse-anaphoric on a family of questions (Constant 2014).

(53) What about the boys? who do *they* like?

  a. $[\text{Tom}]_{\text{CT}}$ likes $[\text{Sally}]_{\text{Exh}}$...

[8] Perhaps we could capture this under a Y-model architecture by assuming that movement to $\textsc{sort}_Q$ is feature-driven, and takes place in the narrow syntax, whereas movement to $\textsc{foc}_Q$ is post-syntactic, like quantifier raising, and takes place for purely interpretive reasons.

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