Scalar NPIs in questions
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1 Introduction

How are negative polarity items (NPIs) licensed in questions? I address this question for what I call ‘scalar NPIs’ (cf. ‘minimizers’ and ‘weak even’) — expressions consisting of a focused low endpoint of a scale and an implicit or explicit even. An existing theory of scalar-NPI licensing in questions due to Guerzoni (2003, 2004); Guerzoni & Sharvit (2014) does not explain two observations from English and Hebrew.

(1) Contrast between wonder-class and know/certain-class w.r.t. licensing of scalar NPIs

a. Both classes license weak NPIs
   (i) Sue wondered whether Bill read any articles from the reading list
   (ii) Sue wanted to know whether Bill read any articles from the reading list
   (iii) Sue knew whether Bill read any articles from the reading list
   (iv) Sue felt certain about whether Bill read any articles from the reading list

b. Only wonder-class licenses scalar NPIs
   (i) Sue wondered whether Bill read even ONE article from the reading list
   (ii) Sue wanted to know whether Bill read even ONE article from the reading list
   (iii) #Sue knew whether Bill read even ONE article from the reading list
   (iv) #Sue felt certain about whether Bill read even ONE article from the reading list

(2) Non-licensing of Hebrew afilu-NPIs in questions

a. Dani ana afilu al ha-she’ela haxi kasha
   Dani answer.PST even on the-question most difficult
   ‘Dani answered even the hardest question’

b. Dani lo ana afilu al ha-she’ela haxi kala
   Dani NEG answer.PST even on the-question most easy
   ‘Dani didn’t answer even the easiest question’

c. #Dani ana afilu al ha-she’ela haxi kala?
   Dani answer.PST even on the-question most easy
   Intended: ‘Did Dani answer even the easiest question?’

1. Background on NPIs and question semantics
2. Elaborate on new observations
3. Illustrate the puzzles they pose
4. Speculate about how to account for them
1.1 What are NPIs?

• The linguistic literature labels an expression an ‘NPI’ if it is grammatically ill-formed in a positive sentence but not in a negated sentence

(3)  
a. Bill has *(not) helped any of us  
b. Bill has *(not) been to Paris yet  
c. Bill has *(not) helped even ONE of us  
d. Bill has *(not) slept a wink  
e. Bill has *(not) been to work in weeks  
f. Bill need *(not) come to work today

• NPIs belong to many different syntactic categories (determiners, adverbs, prepositional phrases, auxiliary verbs, etc.)

1.2 What are scalar NPIs?

• Schmerling 1971, Heim 1984, Lahiri 1998 etc.: expressions consisting of a scalar particle like even and the low endpoint of a logical or contextual scale (e.g. one, easiest)

• Their ungrammaticality in positive sentences is a simple consequence of the meaning of the elements involved in their composition

(4)  
a. *Bill read even ONE article on the reading list  
b. Bill didn’t read even ONE article on the reading list

– Even (as in even BILL showed up) contributes a presupposition that its propositional argument (its ‘prejacent’) is less likely than all alternatives, which differ in terms of the value of the focus

– (4a) is unacceptable because even contributes an unsatisfiable presupposition; the alternatives to its prejacent are propositions in {‘that Bill read n books’: n ∈ N>0}, all of which entail the prejacent

– As emphasized by Lahiri 1998, it follows from the axioms of probability theory that if proposition p is entailed by proposition q, p cannot be less likely than q

– It’s false that it is less likely to read one vs. more articles (in fact, it’s always more likely to read one vs. more); (4a) has a built-in presupposition failure that no contextual manipulation can fix

• Why would negation, a presupposition hole, help? According to the scope theory (Karttunen & Peters 1979; Wilkinson 1996; Lahiri 1998; Schwarz 2000; Guerzoni 2004; Cricić 2011, etc.)...

– Even’s scope at LF is not entirely determined by its position in the surface syntax

– One possible LF for Bill didn’t read even ONE article has even scope above negation

– Even contributes the satisfiable presupposition that it’s less likely for Bill not to have read one article than for him not to have read more (i.e. reading one is the most expected)

1 Other views on the meaning of even differ with respect to (i) what scale is used to compare the prejacent to alternatives (e.g. noteworthiness, informativity, some contextually-supplied gradable property); (ii) whether the prejacent has to occupy a more extreme position on the scale than some, most, or all of its alternatives; and (iii) whether even also comes with an additive presupposition. For summaries of some of the different views, see Rullmann 1997, Cricić 2011, Greenberg 2015.
• In support of the assumption that even’s scope is variable, Karttunen & Peters 1979 discuss the possibility of drawing different inferences from even in sentences like (5)–(6)

(5) I find it hard to believe that Bill even understood MOTHER GOOSE
   a. Preferred high scope reading of even: Of all the books, the one that is least likely for me to find it hard to believe that Bill understood is Mother Goose

(6) (Bill is very clever, but do you really think he understood Syntactic Structures?...) I find it hard to believe that he even understood SYNTACTIC STRUCTURES
   a. Preferred low scope reading of even: Of all the books, the one that is least likely for Bill to have understood is Syntactic Structures

1.3 Matters of composition

• I assume the lexical entry in (7) for even; by Rooth’s (1992, 1996) method of focus-semantic composition, g(7) is a non-empty subset of the focus-semantic value of the constituent denoting even’s prejacent p, and ‘p ◁w q’ means ‘proposition p is less likely than proposition q in w’

(7) \[even-C_{(st,t),7}]^{g,w} = \lambda p_{st} : \forall q \in g(7) \backslash \{q \neq p\} \rightarrow \forall q \in g(7) \backslash \{q \neq p\} \rightarrow p ◁w q \]. p(w)

(8) Even BILL showed up
   a. LF: [even [BILL showed up]]
   b. \[\langle 8a \rangle \]^{g,w} is defined only if \[\forall q \in g(7) \backslash \{q \neq \text{‘that Bill showed up’}\} \rightarrow \text{‘that Bill showed up’} <_{w} q\], where g(7) \subseteq \{\text{‘that x showed up’: x} \in D_e\}.
   If defined, \[\langle 8a \rangle \]^{g,w} = 1 iff Bill showed up in w
   c. In prose: \[\langle 8a \rangle \]^{g,w} is defined only if it’s less likely for Bill to show up than for any other relevant person to show up

(9) Bill didn’t read even ONE article
   a. ✓ LF 1: [even [not [Bill read ONE article]]]
   b. \[\langle 9a \rangle \]^{g,w} is defined only if \[\forall q \in g(7) \backslash \{q \neq \text{‘that Bill didn’t read one article’}\} \rightarrow \text{‘that Bill didn’t read one article’} ◁w q\], where g(7) \subseteq \{\text{‘that Bill didn’t read n articles’: n} \in \mathbb{N}>0\}.
   If defined, \[\langle 9a \rangle \]^{g,w} = 1 iff Bill didn’t read one article in w
   c. In prose: \[\langle 9a \rangle \]^{g,w} is defined only if it’s less likely for Bill not to read one article than for Bill not to read some greater number of articles

   d. *LF 2: [not [even [Bill read ONE article]]]
   e. \[\langle 9d \rangle \]^{g,w} is defined only if \[\forall q \in g(7) \backslash \{q \neq \text{‘that Bill read one article’}\} \rightarrow \text{‘that Bill read one article’} ◁w q\], where g(7) \subseteq \{\text{‘that Bill read n articles’: n} \in \mathbb{N}>0\}.
   If defined, \[\langle 9d \rangle \]^{g,w} = 1 iff Bill didn’t read one article in w
   f. In prose: \[\langle 9d \rangle \]^{g,w} is defined only if it’s less likely for Bill to read one article than for Bill to read some greater number of articles (impossible)

1.4 Formulating a licensing condition

• The presupposition of a scalar NPI’s even will not be satisfied if its proposition-denoting sister is upward-entailing (UE) with respect to the position of the focus; this is because the prejacent is entailed
by all alternatives, making it impossible for it to be less likely than them

• The presupposition will be satisfied if even’s sister is downward entailing (DE) with respect to the position of the focus; the prejacent entails all alternatives, making it less likely than all of them\(^2\)

• Crnič 2011, 2014 emphasizes that when the sister of a scalar NPI-even is non-monotonic with respect to the position of the focus, even’s presupposition may be satisfied

• Because the prejacent and alternatives are not related by logical entailment, we depend on contextual information to determine whether even’s presupposition is acceptable (cf. even BILL showed up)

• This can explain the licensing of NPIs in the scope of non-monotonic quantifiers (Linebarger 1987)

\[(10)\]
\[
\text{a. Even exactly one student read one article from the reading list} \quad \Downarrow \\
\text{b. Even exactly one student read two articles from the reading list} \quad \Downarrow 
\]

\[(11)\]
Sue is deeply disappointed in the 12 students in her seminar. She assigned five articles as summer reading. None of them had read all five and...

\[(12)\] Scalar NPI licensing condition

A scalar NPI is licensed in sentence S only if there is a constituent A of S containing the associate of even such that \([A] \in D_{st} \text{ and A is not UE (i.e. DE or non-monotonic)} \text{ with respect to the position of even’s associate}\]

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\(^2\)I assume the following definitions of entailment, DEness, and non-monotonicity:

i. **Cross-Categorial Entailment**, ⇒ (von Fintel 1999: 99)
   For p, q of type t: p ⇒ q if f = 0 ∨ q = 1, and for f, g of type \(⟨σ, t⟩\): f ⇒ g iff for all x of type σ: f(x) ⇒ g(x)

ii. **Strawson DE function** (von Fintel 1999: 104)
   A function f of type \(⟨σ, t⟩\) is Strawson DE iff for all x, y of type σ such that x ⇒ y and f(x) is defined: f(y) ⇒ f(x)

iii. **Non-monotonic function** (Crnič 2011: 30)
   A function f of type \(⟨σ, t⟩\) is (Strawson) non-monotonic iff (i) there are x, y of type σ such that x ⇒ y, f(x) is defined, and f(y) ≠ f(x) and (ii) there are x, y of type σ s.t. x ⇒ y, f(y) is defined, and f(x) ⇒ f(y)

iv. **Strawson DE environment** (Gajewski 2005: 33; Homer 2011)
   A constituent A is DE with respect to the position of β (where \([β]\) is of type σ) iff λx.\([A[β/σ, t]] \parallel g[7→ x]\) is Strawson DE. A[β/σ] is the result of replacing β with t in A.
2 Established observations and a theory of NPIs in questions

• Guerzoni & Sharvit 2007, 2014: main-clause questions always license weak NPIs like any and ever

(13)  
   a. Which of Bill’s students were admitted to any grad programs?  
   b. Which of Bill’s students were ever admitted to grad programs?

• Scalar NPIs are also licensed in main-clause questions, where they induce a negative bias (Borkin 1971, Heim 1984, Guerzoni 2004)

(14) Jen is the administrative secretary of the department of linguistics. She is preparing a document for the department archives that lists current students and their official advisors. Prof. Calendar is a new faculty member and Jen doesn’t know which students she is advising, if any. She asks Stephanie:
   a. Is Prof. Calendar advising any students?  
   b. #Is Prof. Calendar advising even ONE student? (adapted from Guerzoni 2004: 322)

• The same authors observe that weak NPIs are not licensed in all embedded questions

(15)  
   a. Bill knew [which of his students were admitted to any grad programs]
   b. Bill wondered [which of his students were admitted to any grad programs]
   c. Bill knew [which of his students had ever been admitted to grad programs]
   d. Bill wondered [which of his students had ever been admitted to grad programs]

(16)  
   a. *It surprised Bill [which of his students were admitted to any grad programs]
   b. *It disappointed Bill [which of his students were admitted to any grad programs]
   c. *It surprised Bill [which of his students had ever been admitted to grad programs]
   d. *It disappointed Bill [which of his students had ever been admitted to grad programs]

• According to Guerzoni & Sharvit 2007, 2014, the distribution of NPIs correlates with a well-known contrast in the interpretation of embedded questions; potentially strongly-exhaustive embedded questions license NPIs, while necessarily weakly-exhaustive ones do not\(^3\)

(17) Bill knows [which of his students were admitted to the grad program]
   a. Weakly-exhaustive reading: Bill knows the conjunction of all the true propositions in {‘that x was admitted’ : x is B’s student}
   b. Strongly-exhaustive reading: Bill knows the conjunction of all the true propositions in {‘that x was admitted’ : x is B’s student} ∪ {‘that x wasn’t admitted’ : x is B’s student}
   c. Bill has three students: Mary, John, and Sue. Mary and John got into the program, while Sue did not. Bill knows that Mary and John got in and is uncertain about Sue. T/F?

\(^3\)Discussion of this ambiguity with questions dates back to Karttunen 1977, who assumes embedded questions generally receive the weakly-exhaustive reading. Groenendijk & Stokhof 1984 criticize his account for this reason, arguing that there are only strongly-exhaustive readings. I follow Heim 1994; Guerzoni & Sharvit 2007 in assuming that both readings exist (and that certain predicates select for one or the other). More recent discussion on the existence of these different readings, and more, is found in Klinedinst & Rothschild 2011, George 2013, Cremers & Chemla 2016, etc.
• As argued by Guerzoni & Sharvit (2007), certain predicates like *know* support both readings, while other predicates support only the weakly-exhaustive reading; Heim 1994 argues that *surprise* embeds only weakly-exhaustive questions

(18) It surprised Bill [which of his students were admitted to the program]
   a. **Weakly-exhaustive reading:** The conjunction of all the true propositions in \{‘that x was admitted’ : x is B’s student\} surprised Bill
   b. **Strongly-exhaustive reading:** The conjunction of the true propositions in \{‘that x was admitted’ : x is B’s student\} ∪ \{‘that x wasn’t admitted’ : x is B’s student\} surprised Bill
   c. *Bill has three students: Mary, John, and Sue. He expected all of them to be admitted into the grad program, but John was not admitted. Bill knows all of this. T/F?*

• Guerzoni & Sharvit 2007 provide contrasts like (19) to show that (i) *know* supports both weak and strong readings and (ii) NPIs induce a strong reading (see also Nicolae 2015: 31)

(19) a. Bill knows which of his students were admitted to the grad program, but he has no idea which of his students were not admitted
   b. *Bill knows which of his students have ever cheated, but he doesn’t know which of his students haven’t

• Guerzoni & Sharvit 2007 find that all embedded *polar* questions license weak NPIs, and this is consistent with their generalization because polar questions have only strong readings (e.g. knowing the true answer to a polar question is the same as knowing that the true answer is the only true answer)

• Additionally, verbs that select weakly-exhaustive questions cannot embed polar questions

(20) *It surprised Bill [whether John was admitted to the grad program]*

• In examining the distribution of scalar NPIs, I focus on polar questions, as these are predicted to be the most robust NPI-licensors and allow us to sidestep the issue of question exhaustivity

2.1 Guerzoni and Sharvit’s (2014) proposal

• Following Karttunen 1977, Guerzoni and Sharvit assume that the extension of a question in a world *w* is the set of answers to the question that are true in *w*

• All strongly-exhaustive questions, including polar questions, have LFs that involve a disjunction of *p* and \(\neg p\); the negation in the second disjunct licenses NPIs

• The polar question in (21) may be realized as *did Bill read one article?* after undergoing ellipsis; in general, questions license NPIs because they contain a DE function, which is optionally elided

(21) Did Bill read one article?
   a. LF: [whether [4 [? [([Bill read one article] or 4 [not [Bill read one article]])]]]]
   b. \([(21a)]^{g,w} = \{p : p = ‘that Bill read one article’ ∨ p = ‘that Bill didn’t read one article’\} \& p(w) = 1\}
• Guerzoni proposes that one possible LF for a matrix polar question with a scalar NPI has *even* scoping above negation in the negative answer to the question, as in (22)

• The possible members of the question’s extension have different presuppositions; the positive answer has an unsatisfiable presupposition but the negative answer has a satisfiable one

\[\text{(22)}\]

```
whether
  4
    ?
  even_7
  Bill read ONE article
```

\[\text{or}_4\]

```
even_8
not
Bill read ONE article
```

a. \[(22)]^{g,w} \text{ is defined only if } \forall q \in g(7) [q \neq \text{`that Bill read one article'} \rightarrow \text{`that Bill read one article'} <_{w} q], \text{ where } g(7) \subseteq \{\text{`that Bill read n articles': } n \in \mathbb{N}_{>0} \} \lor \forall q' \in g(8) [q' \neq \text{`that Bill didn’t read one article'} \rightarrow \text{`that Bill didn’t read one article'} <_{w} q'], \text{ where } g(8) \subseteq \{\text{`that Bill didn’t read n articles': } n \in \mathbb{N}_{>0}\}\]

b. Presupposition (in prose): Either it’s less likely for Bill to read one article than for Bill to read two or more (unsatisfiable), or it’s less likely for Bill not to read one article than for Bill not to read two or more (true)

• The unsatisfiable presupposition of the positive answer is hypothesized to be the source of bias; the speaker proffers what is effectively a one-membered question extension

3 Returning to the puzzles

3.1 Puzzle 1: not all embedded polar questions license scalar NPIs

• (23) shows that scalar NPIs can appear in the *whether*-complements of *wonder*, *ask*, and *investigate* (`rogative verbs,’ under Lahiri’s (2002: 287) categorization of question-embedders); as in matrix questions, such constructions come with both a likelihood inference and a negative-bias inference

Rogative verbs can embed scalar NPIs

(23) Evidently, people around here have a very low opinion of Bill. . .

a. Sue *wondered* whether he read *even ONE* article
b. Sue *asked* whether he read *even ONE* article
c. Sue investigated whether he read even ONE article

• In contrast, (24) shows that scalar NPIs cannot appear in the whether-complements of *know, tell, and be certain about*, which belong to Lahiri’s ‘responsive class’

**Responsive verbs cannot embed scalar NPIs directly**

(24) Evidently, people around here have a very low opinion of Bill. . .
   a. #Sue knew whether he read even ONE article
   b. #Sue told Mary whether he read even ONE article
   c. #Sue was certain about whether he read even ONE article

• Embedding the responsive verbs under a desire verb such as *want* improves the embedding of scalar NPIs, as in (25)

**Responsive verbs under *want* can embed scalar NPIs**

(25) Evidently, people around here have a very low opinion of Bill. . .
   a. Sue wanted to know whether he read even ONE article
   b. Mary wanted Sue to tell her whether he read even ONE article
   c. Sue wanted to be certain about whether he read even ONE article

**Habitual responsive verbs can embed scalar NPIs**

(26) In those days, people monitored Bill’s reading habits closely. . .
   a. Sue always knew whether he read even ONE article
   b. Sue always told Mary whether he read even ONE article
   c. Sue was always certain about whether he read even ONE article

**Future responsive verbs can embed scalar NPIs**

(27) Next month, people will monitor Bill’s reading habits very closely. . .
   a. Sue will know whether he read even ONE article
   b. Sue will tell Mary whether he read even ONE article
   c. Sue will be certain about whether he read even ONE article

**Special ‘correlated expectation’ context**

(28) Every time Mary sees Bill, she finds out whether he’s read the number of articles corresponding to the number of days since they last met up. Mary and Bill usually meet up once a year, so Mary usually knows whether Bill has read 365 articles. Recently, however, they’ve been meeting up more frequently. This morning. . .
   a. Mary knew whether Bill had read even ONE article
3.2 Puzzle 1: the problem

- If question LFs where \textit{even} introduces distinct presuppositions into each answer are possible, as proposed by Guerzoni, then all embedded polar questions should license scalar NPIs

\[(29) \text{For any world } w, \text{ question intension } Q_{\langle s, (s,t) \rangle}, \text{ and individual } x_e: \]

\begin{itemize}
  \item \textit{[know]}^{g,w}(Q)(x) is defined only if \( w \in \text{dom}(Q) \) & \( \text{DOX}(x,w) \subseteq \text{dom}(Q) \).
  \begin{itemize}
    \item If defined, \( \text{[know]}^{g,w}(Q)(x) = 1 \) iff \( \text{DOX}(x,w) \subseteq \bigcap Q(w) \)
  \end{itemize}
  \text{where } \text{DOX}(x,w) \text{ is the set of worlds compatible with } x \text{'s beliefs in } w
  
  \item \textit{[be-certain-about]}^{g,w}(Q)(x) is defined only if \( \text{DOX}(x,w) \subseteq \text{dom}(Q) \).
  \begin{itemize}
    \item If defined, \( \text{[be-certain-about]}^{g,w}(Q)(x) = 1 \) iff \( \exists w'[\text{DOX}(x,w) \subseteq \bigcap Q(w')] \]
  \end{itemize}
\end{itemize}

\[(30) \#\text{Sue was certain about whether Bill read even ONE article} \]

\begin{itemize}
  \item \textit{[know]}^{g,w}(Q)(x) is defined only if \( \text{DOX(Sue,w)} \subseteq \{w' : \forall q \in g(7) [q \neq \text{'that Bill read one article'}] \rightarrow \text{'that Bill read one article'} \prec_w q\}, \text{ where } g(7) \subseteq \{\text{'that Bill read } n \text{ articles'} : n \in \mathbb{N}_{>0}\} \cup \forall q' \in g(8) [q' \neq \text{'that Bill didn’t read one article'}] \rightarrow \text{'that Bill didn’t read one article'} \prec_w q'\}, \text{ where } g(8) \subseteq \{\text{'that Bill didn’t read } n \text{ articles'} : n \in \mathbb{N}_{>0}\}\}
  
  \item In prose: \( \text{[know]}^{g,w}(Q)(x) \) is defined only if Sue believes that either it’s less likely for Bill to read one article vs. more or it’s less likely for Bill not to read one article vs. not to read more
\end{itemize}

- Sue can’t fail to believe the presupposition of the question because every world, including all of her belief worlds, assigns a smaller likelihood to ‘that Bill didn’t read one’ than to ‘that Bill didn’t read two, three, etc.’

- Additionally, because of the unsatisfiable presupposition of the positive answer, the extension of the question will always be a one-membered set consisting of the negative answer; (30) is predicted to be tantamount to \textit{Sue was certain that Bill didn’t read even ONE article}
3.3 Puzzle 2: Hebrew *afilu*-NPIs are not licensed in matrix polar questions

- Typological studies on *even*-like particles (e.g. Gast & Auwera 2011) indicate that some scalar particles have stricter distributional restrictions than English *even*

- Some (e.g. German *sogar*) associate with strong elements in UE environments but cannot associate with weak elements in DE environments

\[(31)\]
\[
a. \text{Hans hat } *sogar \text{ SIEBEN Bücher gelesen}
\]
\[
\text{Hans has not even seven books read}
\]
\[
\text{‘Hans didn’t read even ONE book’}
\]

\[(32)\]
\[
a. \text{Hans hat } *einmal \text{ SIEBEN Bücher gelesen}
\]
\[
\text{Hans has not even seven books read}
\]
\[
\text{‘Hans didn’t read even ONE book’}
\]

\[(33)\]
\[
a. \text{Hans didn’t read so much as ONE book}
\]
\[
b. \#\text{Hans read so much as SEVEN books}
\]

- Others (e.g. German *einmal*, English *so much as*) occur only in DE environments

- If these restrictions are analyzed as constraints on scope taking (e.g. Crnič 2011: §5), one might expect that *sogar*-type *even* particles would not induce a negative-bias reading on questions

- It’s clear that Hebrew *afilu* is not a *sogar*-type scalar particle, however

\[(34)\]
\[
a. \text{Dani ana } *afilu \text{ al ha-she’ela haxi kasha}
\]
\[
\text{Dani answer.PST even on the-question most difficult}
\]
\[
\text{‘Dani answered even the hardest question’}
\]
\[
b. \text{Dani lo ana } *afilu \text{ al ha-she’ela haxi kala}
\]
\[
\text{Dani NEG answer.PST even on the-question most easy}
\]
\[
\text{‘Dani didn’t answer even the easiest question’}
\]

- Its behaviour in declarative clauses suggests *afilu* is in principle able to scope over negation (e.g. to generate the reading in (34b) where answering the easiest question in most expected)

4 Towards a resolution of puzzle 1

- The effect on acceptability of changing the matrix verb suggests that the meaning of the matrix clause factors into the calculation of *even*’s presupposition; the scope theory predicts that *even* can trigger a presupposition from a position in the matrix clause
(35) Sue wondered whether Bill read even ONE article
   a. \([\text{even}_7 [\text{Sue [wondered [whether [2 [? [Bill read ONE article [or}_2 [\text{not Bill read ONE article]]]]]]]]]]

- Even’s sister at LF is not DE with respect to the associate; rather, it’s non-monotonic (no inferences from supersets to subsets, nor from subsets to supersets)

(36) a. \([\text{Mary wondered whether Bill read one article]}
\[\uparrow \downarrow\]
   b. \([\text{Mary wondered whether Bill read two articles]}

(37) a. \([\text{Mary knew whether Bill read one article]}
\[\uparrow \downarrow\]
   b. \([\text{Mary knew whether Bill read two articles]}

- Crnič 2011, 2014 emphasizes that when the sister of a scalar NPI-even is non-monotonic with respect to the position of the focus, even’s presupposition is satisfiable
- He explains the variable licensing of NPIs in the scope of non-monotonic quantifiers (Linebarger 1987)

(38) Sue is deeply disappointed in the 12 students in her seminar. She assigned five articles as summer reading. None of them had read all five and...
   a. Exactly one of them had read even ONE article from the list
   LF: \([\text{even}_7 [\text{exactly one of them [1 [t}_1 \text{ had read ONE article from the list]]]]]
   Presupposition from even: it’s less likely for exactly one student to have read one article than for exactly one student to have read two or more articles

   b. *Exactly 11 of them had read even ONE articles from the reading
   LF: \([\text{even}_7 [\text{exactly 11 of them [1 [t}_1 \text{ had read ONE article from the list]]]]]
   Presupposition from even: it’s less likely for exactly 11 students to have read one article than for exactly 11 students to have read two or more articles

- In a context where it’s expected that all 12 will read at least one article, 6 will read two articles, and only 2 will read all five, the presupposition of (38a), but not of (38b), is satisfied (example based on Crnič 2014: 182-185)
- In (38a), The disparity between the actual number of 1-book readers and the expected number of 1-book readers is greater than the disparity between the the actual number of 1-book readers and the expected number of 2+-book readers
- The disparity between the actual number of 1-book readers and the expected number of 1-book readers is not greater than the disparity between the the actual number of 1-book readers and the expected number of 2-book readers (11 is closer to 12 than 6 is); hence, it’s not more surprising for exactly 11 students to have read one article than for exactly 11 students to have read two or more articles
- In both examples, even’s prejacent is non-monotonic; the contrast is due to additional, contextually-supplied expectations

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4: The scalar presupposition triggered by even that associates with a weak element in the scope of a non-monotone quantifier
• Perhaps a similar effect is at play with the licensing of weak *even* in embedded questions; *even* takes scope in the matrix clause and its sister is non-monotonic.

• On such an analysis, we attempt to explain the unacceptability of (39a) by attributing to it an implausible presupposition.

(39)  
\begin{enumerate}
\item #Mary knew whether Bill read even ONE article from the list
\item LF: [\textit{even}_7 [Mary knew whether Bill read ONE article from the list]]
\end{enumerate}

• The presupposition contributed by *even* in (39) can be expressed as in (40).

(40)  
\[\text{\textit{even}_{(39a)}}^{g,w}\] is defined only if \(\forall n \in \mathbb{N}_{n>1}\) that are contextually relevant:

\begin{quote}
‘that Bill read \(n\) articles and Sue knew that Bill read \(n\) articles or Bill didn’t read \(n\) articles and Sue knew that Bill didn’t read \(n\) articles’
\end{quote}

\(\triangleright_w\)

\begin{quote}
‘that Bill read one article and Sue knew that Bill read one article or Bill didn’t read one article and Sue knew that Bill didn’t read one article’
\end{quote}

• The following likelihood relations between individual disjuncts follow from entailment:

(41)  
\begin{enumerate}
\item ‘that Bill read one article and Sue knew that Bill read one article’
\(\triangleright_w\)

‘that Bill read \(n\) articles and Sue knew that Bill read \(n\) articles’
\item ‘that Bill didn’t read \(n\) articles and Sue knew that Bill didn’t read \(n\) articles’
\(\triangleright_w\)

‘that Bill didn’t read one article and Sue knew that Bill didn’t read one article’
\end{enumerate}

• Perhaps likelihood decreases for the positive disjuncts as the number gets higher by the same proportion that it increases for the negative disjuncts as the number gets lower; this is equivalent to saying that the extent to which ‘that Bill read one article’ is \textit{more} likely than ‘that Bill read two articles’ is the same as the extent to which ‘that Bill didn’t read one article’ is \textit{less} likely than ‘that Bill didn’t read two articles’.

• If this is so, then *even*’s presupposition is false because likelihood of the alternatives would not change from number to number — for every alternative with a higher number, the increasingly smaller likelihood of the positive disjunct and the increasingly larger likelihood of the negative disjunct sum to the same number.

\[\text{\textit{exactly \(n\) \textit{NP}}\] is satisfied only if the numeral in the non-monotone quantifier is (i) appropriately lower than the expected number of individuals that are both in the domain of the quantifier and in the denotation of the main predicate e.g., [the expected number 1-book readers] and (ii) appropriately close to the expected number of individuals that are in the domain of the non-monotone quantifier and in the relevant stronger alternatives to the main predicate e.g., [the expected number 2+-book readers]” (Crnič 2014: 184)
5 Towards a resolution of puzzle 2

- Scalar NPIs formed with Hebrew bixlal are licensed in polar questions

\[(42) \quad \text{Dani bixlal ana al ha-sh‘ela ha-xi kala?} \]
\[
\text{Dani even answer.PST on the-question most easy} \\
\text{Intended: ‘Did Dani answer even the easiest question?’} \\
\]

- Greenberg 2016 shows that bixlal is also used in what has been analyzed (by Iatridou & Tatevosov 2016) as a distinct use of even in questions

\[(43) \quad \text{bo nipagesh be-Oleana’s le-aruxat erev} \\
\text{come 1PL.FUT.meet at-Oleana’s for-dinner} \\
\text{‘Let’s meet at Oleana’s for dinner’} \\
\]

\[(44) \quad \text{a. ma hem bixlal megishim?} \\
\text{what they even PRES.serve} \\
\text{‘What do they even serve there?’} \\
\text{b. hem bixlal petuxim?} \\
\text{they even PRES.open} \\
\text{‘Are they even open?’} \\
\]

- Iatridou and Tatevosov 2016 propose that ‘their’ even (usually detectable by an inference of extreme ignorance in WH-questions) scopes outside of the question, unlike the even associated with scalar NPIs, which they take to be licensed by an implicit negation within the question (following Guerzoni)

- The Hebrew facts potentially suggest a closer connection between the two types of questions; maybe the even associated with scalar NPIs also scopes outside the question, as suggested for the embedded examples in the preceding section

- Afilu would be an instance of a new type of scalar particle – those able to scope over negation but not outside questions

6 Conclusion

- I have presented new puzzles based on the distribution of scalar NPIs in embedded questions in English and on the licensing of scalar NPIs in matrix questions in Hebrew

- I speculated that the variable licensing of scalar NPIs may be due to the non-monotonicity of the matrix clause with respect to the position of even’s focus in the embedded clause; as shown by Crnič 2011, 2014, scalar NPIs have non-trivial contextual requirements in non-monotonic environments

- Contrasts between sentences with different embedding verb may be due to differences in the plausibility of the presuppositions triggered by even

- This is consistent with the speculative explanation of the Hebrew facts, which is that also in matrix clauses, even is licensed by taking scope outside the question

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7 Appendix: composition of questions

(45) Did Bill read one article?
   a. LF: [whether [4 [? [Bill read one article] [or,4 [not [Bill read one article]]]]]]
   b. \[[\text{(45a)}]\]_{g,w} = \{ p : \text{p = “that Bill read one article” } \lor \text{p = “that Bill didn’t read one article”}
                     \} \land p(w) = 1 \}

- *Bill read one article or Bill read one article* denotes an assignment-dependent disjunctive proposition, derived with the meaning for *or*, below (Rooth & Partee 1982)

(46) \[[\text{or,4}]\]_{g,w} = \lambda p_{st}, \lambda q_{st} \colon w \in \text{dom}(p) \lor w \in \text{dom}(q). \ [g(4) = p \lor g(4) = q] \land g(4)(w) = 1

- This disjunctive proposition is then taken as the argument of the function denoted by the set-creating morpheme, ? (Karttunen 1977)

(47) \[[?]\]_{g,w} = \lambda p_{st}, \lambda q_{st} \colon w \in \text{dom}(q). q = p

- PA occurs above the set-creating morpheme, binding *or*, resulting in a function from propositions to a function from propositions to truth values (i.e. a relation between propositions)

- This function is the input to the function denoted by whether, given in (48) (proposed by Guerzoni & Sharvit 2014, inspired by Larson 1985)

(48) \[[\text{whether}]\]_{g,w} = \lambda Q_{(st,(st,t))}, \lambda q_{st} \colon \text{there is an r_{st} such that } Q(r)(q) = 1 \land q(w) = 1

- *Whether* denotes a function from relations between propositions to functions from propositions to truth values; after combining with the relation between propositions denoted by the abstracted predicate, it maps to 1 those propositions which (i) stand in the relation denoted by the abstracted predicate to some proposition and (ii) are true in the world of evaluation

- In other words, it maps to 1 whichever is true of ‘that Bill read one article’ and ‘that Bill didn’t read one article’

References


Rooth, Mats & Barbara Partee. 1982. Conjunction, type ambiguity and wide scope *or*. In *Proceedings of WCCFL*, vol. 1, Department of Linguistics, Stanford University.


