Simple *even* hypothesis: NPIs and differences in question bias[1]

David KRASSNIG — *University of Konstanz*

Abstract. The *even*-based approach to NPI licensing arose as a competitor to the traditional idea that NPIs are licensed by some monotone environments. The approach itself equates NPIs with *even* + existential quantification. As such, distributional differences between NPIs and the expression *even ONE* are undesirable. There are, however, a small number of known differences: (i) They behave differently in the restrictor of a universal quantifier, and (ii) questions containing *even ONE* are negatively biased, whereas questions with an NPI are not. Under our proposal, we decompose weak EVEN into two focus particles. One is identical to the original EVEN, whereas the other particle has a directly opposite scalar presupposition and an additional presupposition of exclusivity. In doing so, we can derive both problematic cases for the *even*-based approach in a straightforward fashion.

Keywords: negative polarity item, NPI, *even*, question bias, local accommodation, projection

1. Introduction

Accounting for the entire distribution of negative polarity items (NPI) has been an ongoing issue for linguists for nigh a century: Formally starting with the work of Jespersen (1917) and Klima (1964), we have yet to discover a model that is capable of accounting for the entire set of known empirical data. Traditionally, NPIs are analysed as being licensed by certain monotone environments (cf. Fauconnier, 1975; Ladusaw, 1979): Namely, NPIs are generally considered to be licensed by (Strawson) downward-monotone environments.

However, alternative models to NPI licensing have recently been on the rise (e.g. Krifka, 1995; Chierchia, 2013: and others). One of the major alternative NPI models would be the *even*-based approach to NPI licensing (cf. Lee and Horn, 1994; Lahiri, 1998; Crnič, 2011a). Essentially, this approach states that any NPI is covertly licensed by the focus particle *even* at logical form (LF). The NPI itself is equivalent to weak existential quantification (i.e. *any* would be equivalent to *even ONE*). With most of the objections to this approach (cf. Heim, 1984) having been defused by Crnič (2014a, b), only a few major obstacles remain: One of them is the difference in polar question bias between questions containing the expression *even ONE* (hereafter referred to as *even*-questions) and questions containing the unstressed NPI *any* (hereafter referred to as NPI-questions). Whereas the former type appears to be negatively biased (i.e. rhetorical by nature), the latter question type corresponds to normal information-seeking questions. A dissimilarity that is not predicted by equating both expressions, as is done in the *even*-based approach. Another difference in distribution is that *even ONE* and *any* behave differently within the restrictor of a universal quantifier.

This paper explores how the *even*-based approach may be reconciled with this set of empirical data. To achieve this, we propose (i) that EVEN be decomposed into the two focus parti-

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cles $\textsc{even}_{\textsc{min}}$ and $\textsc{even}_{\textsc{max}}$ (cf. Crnič, 2012; Lahiri, 2010), (ii) that *any* is only licensed by $\textsc{even}_{\textsc{min}}$, (iii) that overt *even* is licensed by the combination of $\textsc{even}_{\textsc{min}}$ and $\textsc{even}_{\textsc{max}}$, (iv) that, crucially, $\textsc{even}_{\textsc{max}}$ carries an additional presupposition of exclusivity, (v) that the difference in the universal quantifier's restrictor is derivable via local accommodation of $\textsc{even}_{\textsc{max}}$'s aforementioned presupposition, and (vi) that the difference in question bias is the result of the same projected presupposition of exclusivity from $\textsc{even}_{\textsc{max}}$.

(1) a. LF for *any*
$[\ \text{even}_{\text{MIN}}\ [_{\not\uparrow} \ldots [_{\uparrow} \ldots \text{one}_F \ldots]\,]\,]$
b. LF for *even ONE*
$[\ \text{even}_{\text{MIN}}\ [_{\not\uparrow} \ldots [\ \text{even}_{\text{MAX}}\ [_{\uparrow} \ldots \text{one}_F \ldots]\,]\,]\,]$

In §2 we go into how NPIs are traditionally viewed and how they are modelled under the *even*-based approach to NPIs (see §2.1). In §3 we go into how rhetorical questions can be derived (see §3.1), how polar questions are analysed according to Guerzoni and Sharvit's (2014) question model (see §3.2), and how these question models fail to handle the difference in question bias with a non-decomposed $\textsc{even}$. In §4 we then decompose the NPI-licensing $\textsc{even}$ into the two focus sub-particles $\textsc{even}_{\textsc{min}}$ and $\textsc{even}_{\textsc{max}}$. We then show in §4.2 how the difference in question bias is obtained with this decomposed model of weak $\textsc{even}$.

2. NPI licensing

Accounting for NPIs is a complex issue in formal semantics. Any model that seeks to license them needs to have a unified analysis for a wide range of different licensing environments. See below for a (non-exhaustive) list of NPI-licensing and non-licensing constructions.

(2) a. #John read any book.
b. John didn't read any book.
c. Exactly two students read any book.
d. Every student who read any book passed the exam.
e. Did John read any of the relevant books?

NPIs are not licensed within simple affirmative declarative sentences. They are licensed under negation, within the restrictor of universal quantification, under *only*, within the antecedent of a conditional, within questions, and within the scope of some non-monotone quantifiers.

The first workable model that covered a wide range of the known empirical data was put forth by Fauconnier (1975) and Ladusaw (1979). Their model of licensing was based upon the monotonicity of the environment containing the NPI in question: According to their model, an NPI is licensed iff it occurs within a downward-monotone environment. Later on, their model was improved upon by von Fintel (1999, 2001), who extended their account to cover more empirical data, by lessening the restrictions to Strawson downward-monotone environments (environments that are shown to be downward-monotone given the right circumstances). Together, they form the traditional mainstream line of thought concerning how NPIs are licensed. We refer to their model, and other models like them, as the monotonicity-based approach to NPI licensing (or, alternatively, the Fauconnier-Ladusaw-Fintel approach).

Naturally, over the years, other models developed that diverged from these monotonicity-based models: Krifka (1995) and Chierchia (2013), to name two of the more substantive ones. However, recently one particular line of thought rose to greater prominence: the *even*-based approach to NPI licensing. Originally ruled out as a viable candidate by Heim (1984), the idea that NPIs are to be licensed by a (covert) EVEN at LF was nevertheless picked up by a number of authors over the years. Amongst them are Lee and Horn (1994), Lahiri (1998), and Crnič (2014a, b).

2.1. *Even*-based approach to NPI licensing

An alternative approach to NPI licensing is based upon the focus particle *even*. The essential idea behind this approach is that every NPI is covertly licensed by EVEN at LF. This notion was first considered by Heim (1984) as she noted the similarity in distribution between the expression *even ONE* and the NPI *any*. See below for the *even ONE* counterparts to (2).

(3) a. #John read even ONE book.
b. John didn't read even ONE book.
c. Exactly two students read even ONE book.
d. Every student who read even ONE book passed the exam.
e. Did John read even ONE book?

As we can see, there is an exact match between the felicity distribution of *even ONE* and the NPI *any* (at least for this limited range of data). However, this approach was initially ruled out by Heim (1984) herself, after she encountered some differences that are not easily accounted for: First, that the felicity of *even ONE* in (3d) is context-dependent, as can be seen below, whereas its NPI counterpart is felicitous, regardless from contextual influences.

(4) a. Every student who read any book wore blue jeans.
b. #Every student who read even ONE book wore blue jeans.

Second, it was noted that questions containing the expression *even ONE* are negatively biased (i.e. the positive answer is strictly unexpected), whereas their NPI counterparts are not.

(5) a. Did John read any book?
(i) Yes, he did.
(ii) No, he didn't.
b. Did John read even ONE book?
(i) #Yes, he did.
(ii) No, he didn't.

As mentioned before, the *even*-based approach was nevertheless picked up by a number of authors. Prominent examples would be Lee and Horn (1994), who first proposed that NPIs are always composed of a covert EVEN and an existential quantifier; Lahiri (1998), who has shown that this approach is a natural selection for Hindi (its NPIs are transparently consist of an *even*-like particle and existential quantification); and Crnič (2014a, b), who has shown that this approach is able to account for the distributional difference in (4) and the licensing of NPIs in non-monotone environments such as in (2c). The approach also accounts for the infelicity of NPIs in upward-monotone environments and the felicity in downward-monotone ones.

Now that we have an overview over the empirical data, the history of the *even*-based approach, and what the approach is currently able to account for, we must consider *how* it accounts for them. To do this, we first list a number of assumptions most adherents to this approach typically make: (i) EVEN may move freely at LF (Karttunen and Peters, 1979); (ii) focus generates a set of possible alternatives to the focused element (Rooth, 1992); (iii) EVEN has no assertive contribution, but presupposes that its prejacent proposition is the least likely member of its set of focus alternatives (Karttunen and Peters, 1979; Kay, 1990); (iv) NPIs are semantically equivalent to indefinites (Lee and Horn, 1994; Lahiri, 1998); (v) NPIs also induce alternatives that are utilized by some alternative-sensitive operators (Krifka, 1995; Chierchia, 2013); (vi) NPI-licensing EVEN only associates with weak predicates (therefore also referred to as weak EVEN) (Crnič, 2011a, 2014a, b); and (viii) predicates are considered weak, iff they are the most probable member of their focus set (Crnič, 2011a, 2014a, b). See below for the formal definition of weak EVEN, where $\lhd_c$ represents the function *less likely than*:

(6) $[\![\text{even}]\!](C)(p)(w) = p(w)$ is defined iff $\forall q \in C[p \neq q \rightarrow p \lhd_c q]$

Another important piece of formal machinery is Kolmogorov's (1933) third axiom of probability that says that any proposition ϕ that entails any proposition ψ is at most as likely ψ:

(7) *Kolmogorov's (1933) third axiom of probability*
If $\phi \Rightarrow \psi$, then $\phi \unlhd_c \psi$.

Equipped with these assumptions we may now review the current state of the literature on how the (in-)felicity of the different environments are derived. We review how the *even*-based approach handles upward-, downward-, and non-monotone environments. We furthermore review how the Crnič (2014a) accounts for the differences in the universal restrictor and how the difference in question bias can not be accounted for with the current model. We refer to the aforementioned literature on *even* and the *even*-based approach for details on those environments which we do not expand upon.

UPWARD-MONOTONE ENVIRONMENTS and their infelicity are easily accounted for under the *even*-based approach. For the sentence (8), we would derive the following presupposition:

(8) #John read any/even ONE book.
  a. even [John read one$_F$ book]
  b. For $n > 1$: $\exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

In an upward-monotone environments, entailing relations are preserved. Ergo, the original prejacent entails all of its focus alternatives, as can be seen below.

(9) John read at least *n* books $\Rightarrow$ John read at least one book

Thereby, according to the axiom of probability in (7), it must be the most probable alternative. This is diametrically opposed to EVEN's felicity requirements, causing the sentence to crash.

DOWNWARD-MONOTONE ENVIRONMENTS, on the other hand, reverse entailing relations:

(10) John didn't read at least one book $\Rightarrow$ John didn't read at least *n* books

Therefore, the same principle of probability now enforces that *not at least one* is the least likely member of its focus set. Thus, there can never be a downward-monotone environment in which *even ONE* (and thereby NPIs) are infelicitous, explaining the NPIs perceived link to them.

(11) John didn't read any/even ONE book.
  a. even [not [John read one$_F$ book]]
  b. For all $n > 1$: $\neg\exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

NON-MONOTONE ENVIRONMENTS suspend all entailing relations. As such, Kolmogorov's (1933) third axiom of probability holds no influence over the felicity of such sentences. Therefore, it comes as no surprise that not all non-monotone environments license NPIs. Critically, Crnič (2011a, 2014b) noted that for sentences containing the expression *exactly n*, it appears that the varying number *n* is the most decisive factor for felicity. Consider this scenario:

(12) Context: There is a lecture with 500 enrolled students. The professor announced ten relevant books before the start of the semester. The first class is now over. The professor relates her experience to one of her colleagues.
  a. Exactly two students read any/even ONE book.
    (i) even [exactly two students read one$_F$ book]
    (ii) For all $n > 1$: $\exists!_2 x[\text{STUDENT}(x) \wedge \exists_1 y[\text{BOOK}(y) \wedge \text{READ}(x,y)]]$
    $\lhd_c \exists!_2 x[\text{STUDENT}(x) \wedge \exists_n y[\text{BOOK}(y) \wedge \text{READ}(x,y)]]$
  b. #Exactly 250 students read any/even ONE book.
    (i) even [exactly 250 students read one$_F$ book]
    (ii) For all $n > 1$: $\exists!_{250} x[\text{STUDENT}(x) \wedge \exists_1 y[\text{BOOK}(y) \wedge \text{READ}(x,y)]]$
    $\lhd_c \exists!_{250} x[\text{STUDENT}(x) \wedge \exists_n y[\text{BOOK}(y) \wedge \text{READ}(x,y)]]$

It appears that the sentence is only felicitous, if *n* refers to a contextually low quantity. Crnič (2014b) advocates that the fulfillment of the scalar presupposition is determined by our expectations and general world knowledge, as there are no axioms of probability to guide us. In our example, our general expectations would have been (i) that most students read at least one book, (ii) some students read more than one book, and (iii) that very few students read all ten books. The further the number of students having read *n* books deviates from these assumptions, the more unexpected the respective proposition becomes. See figure 1 for a graph that represents our general expectations for this scenario.

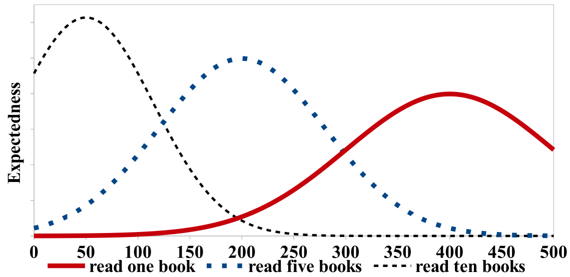

Figure 1: Expectedness graph of (12) and its alternatives. The x-axis represents the number of students having read *n* books. The y-axis to the expectedness of the assertion.

By converting our expectations of the world into probabilities, we can see that the original assertion of (12a) scores the lowest available probability for its value of *n* (fulfilling the scalar presupposition of EVEN). The infelicitous sentence in (12b), however, does not.

IN THE RESTRICTOR OF UNIVERSAL QUANTIFICATION, we have a seeming difference in distribution between weak *even* and NPIs. Whilst NPIs are universally felicitous, its counterpart *even ONE* is not. Below is the expected LF and presupposition for the NPI sentence:

(13) Every student who read any book passed the exam.
 a. [even [Every student who read one$_F$ book passed the exam]]
 b. For all $n > 1$: $\forall x[\text{STUDENT}(x) \wedge \exists_1 y[\text{BOOK}(y) \wedge \text{READ}(x,y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$ $\lhd_c \forall x[\text{STUDENT}(x) \wedge \exists_n y[\text{BOOK}(y) \wedge \text{READ}(x,y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$

Being (Strawson) downward-monotone, one can easily see that this scalar presupposition is fulfilled, regardless of any correlation between the restrictor of the quantifier and its verb phrase. As such, the general felicity of NPIs in this environment is derived. But how do we account for the context-sensitivity of *even ONE*? According to Crnič (2014a), the focus particle in (16) violates Crnič's (2011b) principle of non-vacuity (see his paper for details on how):

(14) *Principle of Non-Vacuity*
"The meaning of a lexical item used in the discourse must affect the meaning of its host sentence (either its truth-conditions or its presuppositions)" (Crnič, 2011b) or its presence must be required on structural grounds (Crnič, 2014a: p. 133).

As a means to rescue the use of *even*, he proposes that there is a covert exhaustifying operator EXH that asserts that all alternatives that are not entailed by the original are false. This operator is obligatorily used to ensure that the contribution of EVEN is non-vacuous.

(15) $[\![\text{Exh}]\!] = \forall q \in C[p \not\Rightarrow q \rightarrow q(w) = 0]$

(16) Every student who read any book passed the exam.

a. [even [Every student wh$_x$ [exh(C) x read one$_F$ book] passed the exam]]

b. For all $n > 1$: $\forall x[\text{STUDENT}(x) \wedge \exists!_1 y[\text{BOOK}(y) \wedge \text{READ}(x,y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$
$\lhd_c \forall x[\text{STUDENT}(x) \wedge \exists!_n y[\text{BOOK}(y) \wedge \text{READ}(x,y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$

It accomplishes this purpose by changing the weak existential existential *at least one* into *exactly one*, since all higher-numbered alternatives are negated. This suspends the entailing relations that enforce the felicity of *even*. Since the axiom of probability in (7) no longer affects our judgment, we have to rate the asserted proposition against its alternatives based upon our world knowledge and expectations. As there is a correlation between reading (relevant) books and passing the exam, we would expect that the more books you read, the more likely you are to pass it. As such, our presupposition would be fulfilled. If we exchange our VP with *wore blue jeans* (see (4)), however, our world-knowledge should dictate an expected correlation between wearing blue jeans and the number of books read.

3. The issue of questions

Before we go on to see how the *even*-based approach has problems with deriving the (non-)bias of questions, we first give a sketch on how bias/rhetoricity is derivable. This is followed by an overview of Guerzoni and Sharvit's (2014) question model and the problems contemporary question models have with a non-decomposed version of EVEN (with respect to the *even*-based approach to NPI licensing).

3.1. Rhetoricity

There are multiple theories concerning how rhetorical questions derive their rhetoricity. Not all of them are mutually exclusive. In this paper, we present two known ways to derive rhetoricity. The first was proposed by Guerzoni (2003), whereas the second theory was first proposed by van Rooy (2003) and Rohde (2006). Guerzoni (2003) proposes that a question must be considered rhetorical, if only one felicitous answer to the question is derived by the LF of the question form. The second approach is based upon the average informativity of the question (or rather, the lack thereof) and requires some general explanations.

The first approach to rhetoricity was designed by Guerzoni (2003), who focused entirely on the distribution of *even* in questions and how it can be used to derive its negative bias. In her semantics, there are two possible structures for questions containing a focus particle such as *even*. In either structure, however, the focus particle would scope above both answers to the polar question. The only possible difference is whether or not the particle scopes above or below the negation in the negative answer. For *even*, this would result in the following possible structures:

(17) Did John read even ONE book?

a. $\{\#[\![\text{even}]\!](C)([\![\text{John read one}_F \text{ book}]\!]), \#[\![\text{not}]\!]([\![\text{even C [John read one}_F \text{ book]}]\!])\}$

b. $\{\#[\![\text{even}]\!](C)([\![\text{John read one}_F \text{ book}]\!]), [\![\text{even}]\!](C)([\![\text{not [John read one}_F \text{ book]}]\!])\}$

In (17a), EVEN always associates with an upward-monotone environment. As such, as detailed in §2.1, both answers would be considered infelicitous, since the scalar presupposition is unfulfillable. In (17b) the affirmative answer is still infelicitous. However, the negative answer has EVEN associated with a downward-monotone environment, thereby fulfilling its scalar presupposition (as detailed before). Therefore, the only possible answer that fulfills the scalar presupposition would be the negative answer of the second LF. This renders the question itself rhetorical, as reasoned by Guerzoni (2003), since there is but one possible felicitous answer.

The second approach is based upon the informativity of a question and was mostly characterised by van Rooy (2003). The essential idea is, that you seek to gain the most information possible to the question you ask. Starting with very general questions, the more knowledge you already possess about the respective state of the world, the more specific your questions become. In his paper, he explains how we can derive the rhetoricity of minimizer questions:

(18) Did John (even) LIFT A FINGER to help?

The minimizer, which is licensed by EVEN, invokes a presuppositional scale of helpful contributions. It also presupposes that the value is known for all units of help except for two: one and zero. In essence, according to van Rooy (2003), the minimizer restricts the range of helpful contributions to the lowest part of the contextually relevant scale. The question whether he did the minimal amount of work or no work at all still remains uncertain. The rhetorical effect is then achieved, according to van Rooy (2003), as follows: Whilst either answer is equally probable, due to the fact that either answer reflects very negatively on John, the actual answer itself does not really matter. As such, the informativity of the question can be judged to be considerably lower than its minimizer-less alternative which does not restrict John's helpfulness to such a degree.

3.2. Environments in questions approach

The approach to polar questions by Guerzoni and Sharvit (2014) contrasts with traditional question models (cf. Karttunen, 1977) in that they encode all possible answers to the question within the syntax of the question's LF. They do this by arguing that polar questions are alternative yes-or-no questions containing an optionally silent *whether (or not)*. Instead of assuming that a question operator derives both answers from a single LF, they assume that both answers are present within the LF and linked via disjunction. One of them is pragmatically omitted, however, via ellipsis. They would argue that a question like *Did John kiss Mary(, or not)?* would have the following LF:

(19) [whether^L] [7 ? [[John kissed Mary] (or$_7$ [not) [~~John kissed Mary~~]]]]

Within this structure, one of the options is elided by pragmatical omission. This can only be done when both answers share an identical structure, which is a necessity of any polar question (under the assumption that negation scopes over a proposition and is not analysed *in situ*).

The definitions for the relevant lexical items, $[\![\text{whether}^L]\!]$, $[\![?]\!]$, and $[\![\text{or}_7]\!]$, are provided below. Note that the *or* has a co-indexation to the trace left by the movement of *whether*, deviating from its standard form insofar that it is considered to be a Heimian indefinite.[2] This assumption was adopted from Rooth and Partee (1982).

(20) a. $[\![\text{whether}^L]\!] = [\lambda Q_{\langle\langle s,t\rangle,\langle\langle s,t\rangle,t\rangle\rangle}.[\lambda q_{\langle s,t\rangle}.\exists! r_{\langle s,t\rangle}[Q(r)(q) = 1 \wedge q(w) = 1]]]$
b. $[\![\text{or}_7]\!] = [\lambda P_{\langle\sigma,t\rangle}.[\lambda Q_{\langle\sigma,t\rangle}.[\lambda z_\sigma.(g(7) = P \vee g(7) = Q) \wedge g(7)(z) = 1]]]$
c. $[\![?]\!] = [\lambda p_{\langle s,t\rangle}.[\lambda p_{\langle s,t\rangle}.p = q]]$

Using these definitions, the sentence structure in (19) derives the following Hamblin set in (21) as its meaning. Compare this meaning to the LF structure in (19).

(21) $[\![\text{Did John kiss Mary?}]\!] = \{[\![\text{John kissed Mary}]\!], [\![\text{not [John kissed Mary]}]\!]\}$

Notice the exact correspondence of the individual answers to how the LF was structured. One of the major reason's for Guerzoni and Sharvit (2014)'s approach's perceived elegance is this exact one-to-one correspondence. As such, we do not go into details concerning exactly how the final Hamblin set is derived. We refer to Guerzoni and Sharvit (2014: p. 212ff.) for details.

The major difference to Guerzoni (2003) in relation to NPIs also lies with the expanded alternative structure of polar questions: If the negative clause is directly represented at LF, then the EVEN need not be applied to both sides simultaneously (cf. Guerzoni, 2003). In Crnič (2014a, b)'s adaptation of Guerzoni and Sharvit (2014)'s question model, we assume that NPI-licensing EVEN is only generated in the downward-monotone environment underneath the negation. The EVEN is then raised above the negating element, leaving the substructures of the affirmative and negative answer identical:

(22) [whether^L] [7 ? [[~~John kissed one girl~~] (or$_7$ [even C [not) [John kissed one$_F$ girl]]]]]

Since the constituents are equal to one another, the elision of the affirmative answer is licensed as a pragmatic omission. As such, we arrive at the following generalized structure for sentences containing an NPI-licensing *even*:

(23) [whether^L] [7 ? [~~CP~~ (or$_7$ [even [not) CP]]]]

Which, in turn, derives the following Hamblin sets:

(24) a. $[\![\text{Did John kiss even one}_F \text{ girl?}]\!] = \{[\![\text{John kissed one girl}]\!],$
$[\![\text{even}]\!](C)(\neg[\![\text{John kissed one}_F \text{ girl}]\!])\}$
b. $[\![\text{Did even CP?}]\!] = \{[\![\text{CP}]\!], [\![\text{even}]\!](C)(\neg[\![\text{CP}]\!])\}$

Accordingly, under this question model, any questions containing an NPI-licensing EVEN are predicted not to exhibit any kind of bias, since either answer is considered to be felicitous.

[2] A Heimian indefinite is a restricted variable bound by another operator further up in the LF. See Heim (1982) for further details on this topic.

Under the assumption of the simple *even* hypothesis, this would correctly predict the non-bias of questions containing NPIs. Therein also lies the problem: Since we do not make a distinction between *even ONE* and *any*, questions containing an overt *even ONE* are incorrectly predicted to be unbiased. So far, two attempts have been made to rectify this erroneous prediction: The first correction was attempted by Guerzoni and Sharvit (2014: p. 216, footnote 18) themselves. They proposed the following LF to derive negative bias for such questions:

(25) [whether^L] [7 ? ~~[[*even C*] *CP*]~~ (or$_7$ [[even C] [not) CP]]]]

This structure would correctly assign an infelicitous reading to the affirmative question. However, Crnič (2014a) correctly pointed out that such structures violate the constraint on ellipsis:

(26) *Constraint on Ellipsis*
A constituent α may be elided if it is contained in a constituent β that contrasts with an antecedent constituent β' (where β contrasts with β' if and only if the meaning of β' is in the focus value of β).

The second attempt to correct the erroneous prediction was carried out by Crnič (2014b). He had drawn parallels to the conundrum he faced with Strawson downward-monotone environments and suggested that the use of covert exhaustification might improve matters. As such, he considered the following LF structure:

(27) [whether^L] [7 ? [John kissed one girl (or$_7$ [[even C] [not) Exh John kissed one$_F$ girl]]]]

Crnič (2014b: p. 206) reasons that the sentence's scalar presupposition entails that John is less likely to have kissed a high number of girls in contrast to having kissed fewer girls.

(28) $[\![\text{even}]\!](C)(\neg[\![\text{Exh C [John kissed one}_F\text{ girl]}]\!])$ is defined iff for all $n > 1$:
That *John did not kiss exactly one girl* $\lhd_c$ that *John did not kiss exactly n girls*.

Crnič (2014b) himself states that this presupposition is not an exact match to the negative bias observed. It might, however, be an additional presupposition that accompanies NPI questions anyway. But that is beside the point. So far, no solution has been found regarding the difference in bias between *even ONE* and unstressed NPI questions.

4. Decomposing weak *even*

This still leaves us, however, with the problem of how to derive the presuppositions that induce the questions' rhetoricity. Having exhausted all possible configurations with Guerzoni and Sharvit's (2014 question model, we need to innovate to find an LF that might derive the question's negative bias. In line with Lahiri (2010) and Crnič's (2012) analyses of weak scalar particles, we therefore propose that *even* is morphologically complex. That is to say, EVEN decomposes into two separate focus particles. In Crnič's (2012) analysis, he proposes that some scalar particles decompose into $[\![\text{even}]\!]$ and its antonym $[\![\neg\text{even}]\!]$.

(29) a. $[\![\text{even}]\!](C)(p)(w) = p(w)$ is defined iff $\forall q \in C[p \neq q \rightarrow p \lhd_c q]$
b. $[\![\neg\text{even}]\!](C)(p)(w) = p(w)$ is defined iff $\forall q \in C[p \neq q \rightarrow q \lhd_c p]$

We propose that EVEN decomposes into two similar focus particles: EVEN_{MIN} and EVEN_{MAX}. The former is identical to standard weak EVEN, whereas the latter has no at-issue contribution but two separate presuppositions: First, that its prejacent is the most probable alternative, and second, that all alternatives that are not entailed by its original prejacent are false. In essence, we adopt Crnič's (2012) model, with the exception of an added presupposition of exclusivity.[3]

(30) a. $[\![\text{even}_{\text{MIN}}]\!](C)(p)(w) = p(w)$ is defined iff $\forall q \in C[p \neq q \rightarrow p \lhd_c q]$
b. $[\![\text{even}_{\text{MAX}}]\!](C)(p)(w) = p(w)$ is defined iff $\forall q \in C[p \neq q \rightarrow q \lhd_c p]$, and $\forall q \in C[p \not\Rightarrow q \rightarrow q(w) = 0]$

We independently motivate this decomposition by two factors: (i) Some element is required to enforce weak EVEN's pairing with weak predicates, and (ii) to account for the presupposition of exclusivity exuded by sentences of the same type as below:

(31) a. John doesn't even know how to START a computer.
⇒ John doesn't know how to do any activity with a computer.[4]
b. Exactly two of her friends even know how to START a computer.
⇒ None of her friends know how to do anything else with a computer.

While the first sentence would be easily accounted for with an additive particle that might accompany EVEN, the latter would not be (Crnič, 2011a: p. 157). With our account, however, both of the above readings are derivable, as shown below.

(32) John doesn't even know how to START a computer.
a. [even_{MIN} [not [even_{MAX} [John knows how to start_F a computer]]]]
b. Presupposition of EVEN_{MIN}:
For all *R*: It is less likely that *John doesn't know how to start a computer* than *John doesn't know how to R a computer*.
c. Presupposition of EVEN_{MAX}:
For all $R \neq [\![\text{start}]\!]$: It is more likely that *John knows how to start a computer* than *John knows how to R a computer*, and John does not know how to *R* a computer.

The computation of the other sentence is less straightforward, as it contains an instance of presupposition projection. For the purposes of this paper, we assume that presuppositions under quantifiers project universally (cf. Heim, 1983).[5] Under this assumption, we derive the following presuppositions:

[3]It should be noted that adding a presupposition of exclusivity virtually renders EVEN_{MAX} identical to Guerzoni's (2003) $only_2$ in her analysis of German scalar particle *auch nur*.

[4]Note that we intentionally do not use a predicate that is entailed by all of its alternatives. If the alternatives were entailed, then the negation itself would already result in the correct reading. Theoretically, people exist who might not know how to start a computer, but are perfectly able to use it for specific tasks (e.g. writing).

[5]This assumption, however, is not crucial, and existential projection leads to a weaker, but also tenable claim.

(33) Exactly two of her friends even know how to START a computer.

a. [even_{MIN} [exactly two of her friends [1 [even_{MAX} [t_1 knows how to start_F a computer]]]]]

b. Presupposition of EVEN_{MIN}:
For all R: It is less likely that *Exactly two of her friends know how to start a computer* than *John doesn't even know how to R a computer*.

c. Presupposition of EVEN_{MAX}:
For all $R \neq [\![\text{start}]\!]$: It is more likely for all of her friends to know how to start a computer, rather than how to R a computer (individually, not collectively), and all of her friends do not know how to R a computer.

Now that we have sufficiently motivated our decision to decompose EVEN, we proceed to show how this analysis would fare with the different kinds of environments we find it in (cf. §2). Note that this analysis simply adds additional presuppositions upon the already existing analysis. As such, any LF that was already ruled out by our previous non-decomposed approach, will also be ruled out under this approach, as their presuppositions will still remain unfulfilled. We therefore refrain from showing the presuppositions of EVEN_{MAX} under upward monotone environments. Also note that we propose that only overt *even* requires to be licensed by EVEN_{MAX}. As such, the analysis for sentences containing an NPI remains the same and is not reiterated here.

DOWNWARD-MONOTONE ENVIRONMENTS remain as straight-forward as they used to be under the original *even*-based account. In downward-monotone environments, EVEN_{MAX} moves to take scope over the upward-monotone expression, beneath the downward-monotone operator. As such, if the predicate is weak, the presupposition is an automatic success due to Kolmogorov's third axiom of probability.

(34) John didn't read even ONE book.

a. [even_{MIN} [not [even_{MAX} [John read one_F book]]]]

b. Assertion:
$[\![(34)]\!] = \neg\exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

c. Presupposition of EVEN_{MIN}:
For all $n > 1$: $\neg\exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

d. Presupposition of EVEN_{MAX}:
For all $n > 1$: $\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$, and $\neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

The presupposition of exclusivity is also successful and precludes the possibility of John having read more than one book, which is entirely compatible with the sentence's asserted content.

NON-MONOTONE ENVIRONMENTS remain as context-sensitive as they used to be. The presupposition of EVEN_{MIN} remains responsible for the context-sensitivity of the expression.

(35) Exactly three students read even ONE book.

a. [even_{MIN} [exactly three students [1 [even_{MAX} [t_1 read one_F book]]]]]

b. Assertion:
$[\![(35)]\!] = \exists!_3 x[\textsc{student}(x) \wedge \exists_1 y[\textsc{book}(y) \wedge \textsc{read}(x,y)]]$

c. Presupposition of $\textsc{even}_{\textsc{min}}$:
For all $n > 1$: $\exists!_3 x[\textsc{student}(x) \wedge \exists_1 y[\textsc{book}(y) \wedge \textsc{read}(x,y)]]$
$\lhd_c \exists!_3 x[\textsc{student}(x) \wedge \exists_n y[\textsc{book}(y) \wedge \textsc{read}(x,y)]]$

d. $\forall$-projected presuppositions of $\textsc{even}_{\textsc{max}}$:
For all $n > 1$: $\forall y[y \in \mathscr{P} \rightarrow \exists_n x[\textsc{book}(x) \wedge \textsc{read}(y,x)]$
$\lhd_c \exists_1 x[\textsc{book}(x) \wedge \textsc{read}(y,x)]]$, and
$\forall y[y \in \mathscr{P} \rightarrow \neg\exists_n x[\textsc{book}(x) \wedge \textsc{read}(y,x)]]$

The presuppositions of $\textsc{even}_{\textsc{max}}$, on the other hand, are a tad more complicated as they must be projected. The scalar presupposition remains trivial, as it still associates with an upward-monotone environment. The presupposition of exclusivity, however, projects in such a way that for all members of $\mathscr{P}$ it is true that they did not read more than one book. The set $\mathscr{P}$ represents the domain of the projection, which corresponds to the entire set of students (not only those three that have been mentioned). Coupled with the asserted content this entails that amongst all students, only the three students in question have read anything at all.

Having shown that the standard non-problematic environments are also accounted for by our extension of the original account, things are now ready to get interesting. We now go into how our account handles those cases that were considered problematic by Heim (1984). As demonstrated in the next two subsections, our account is able to explain the unwanted differences in a straightforward fashion and requires no added assumptions or mechanisms.

4.1. Restrictor of universal quantification

In the restrictor of universal quantification, things turn more complicated and, by extension, more interesting. Let us review what the LF of a relevant NPI sentence looks like. Being downward-monotone, the felicity is fulfilled and not influenced by external factors.

(36) Every student who read any book passed the exam.

a. [even [Every student who read one_F book passed the exam]]

b. For all $n > 1$: $\forall x[\textsc{student}(x) \wedge \exists_1 y[\textsc{book}(y) \wedge \textsc{read}(x,y)] \rightarrow \textsc{pass}(x, \iota v[\textsc{exam}(v)])]$
$\lhd_c \forall x[\textsc{student}(x) \wedge \exists_n y[\textsc{book}(y) \wedge \textsc{read}(x,y)] \rightarrow \textsc{pass}(x, \iota v[\textsc{exam}(v)])]$

For the LF of the corresponding *even*-counterpart, we first need to decide what happens with the presupposition under quantification. Let us consider the following possible projections:

(37) Every student who read even ONE book passed the exam.

a. [even$_{\text{MIN}}$[[every[student that[1[even$_{\text{MAX}}$[t_1 read one$_F$ book]]]]] [passed the exam]]]

b. Unprojected presuppositions of EVEN_{MAX}:
For all $n > 1$: $\exists_n x[\text{BOOK}(x) \wedge \text{READ}(g(1), x)] \lhd_c \exists_1 x[\text{BOOK}(x) \wedge \text{READ}(g(1), x)]$, and $\neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(g(1), x)]$

c. $\forall$-projected presuppositions of EVEN_{MAX}:
For all $n > 1$: $\forall y[y \in \mathscr{P} \rightarrow \exists_n x[\text{BOOK}(x) \wedge \text{READ}(y, x)] \lhd_c \exists_1 x[\text{BOOK}(x) \wedge \text{READ}(y, x)]]$, and $\forall y[y \in \mathscr{P} \rightarrow \neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(y, x)]]$

d. $\exists$-projected presuppositions of EVEN_{MAX}:
For all $n > 1$: $\exists y[y \in \mathscr{P} \wedge \exists_n x[\text{BOOK}(x) \wedge \text{READ}(y, x)] \lhd_c \exists_1 x[\text{BOOK}(x) \wedge \text{READ}(y, x)]]$, and $\exists y[y \in \mathscr{P} \wedge \neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(y, x)]]$

For the universally projected presupposition of exclusivity, the reading we get would be far too strong for our intuitions. The sentence (37) does not give rise to the intuition that no student at all read more than one book. The existentially projected presupposition, too, does not match the intuitions that arise from this sentence: In this case, the exclusivity presupposition would presuppose that there is some student who has not read more than one book. Since the sentence is perfectly fine in a scenario where all students have read all the required books and it is taken to be a general statement, this also excludes the existentially projected presupposition. This leaves us with a third option: Shifting the presupposed content to the assertive level via local accommodation. And indeed, under the assumption that the presuppositions of EVEN_{MAX} are locally accommodated in the restrictor of the universal quantifier, we would derive the following assertion and presuppositions:[6]

(38) Every student who read even ONE book passed the exam.

a. [even$_{\text{MIN}}$[[every[student that[1[even$_{\text{MAX}}$[t_1 read one$_F$ book]]]]] [passed the exam]]]

b. Assertion with local accommodation of EVEN_{MAX}:
$[\![(37)]\!] = \forall x[\text{STUDENT}(x) \wedge \exists!_1 y[\text{BOOK}(y) \wedge \text{READ}(x, y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$

c. Presupposition of EVEN_{MIN} with local accommodation of EVEN_{MAX}:
For all $n > 1$: $\forall x[\text{STUDENT}(x) \wedge \exists!_1 y[\text{BOOK}(y) \wedge \text{READ}(x, y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])] \lhd_c \forall x[\text{STUDENT}(x) \wedge \exists!_n y[\text{BOOK}(y) \wedge \text{READ}(x, y)] \rightarrow \text{PASS}(x, \iota v[\text{EXAM}(v)])]$

These assertive and presuppositional levels are nigh-equivalent to the ones derived by Crnič (2014a) in (16). As such, under the assumption of local accommodation, we derive the required context-sensitivity of *even* without resorting to the introduction of additional rescue operators (i.e. *Exh*). Under the assumption that NPIs were licensed by weak EVEN (i.e. by both of its sub-particles), we would also introduce context-sensitivity to (37)'s NPI counterpart. This is undesirable. To circumvent this problem, we proposed the following alteration to the original

[6]Note that we make no assertion on what happens to the scalarity presupposition of EVEN_{MAX}. There are two possible options. (i) The presupposition projects as usually, or (ii) the presupposition is also locally accommodated. However, this would lead to infelicitous propositions, and, as such, should be avoided as an option. Further research is required for how a presupposition trigger with multiple presuppositions projects with regard to its individual presuppositions.

even-based approach: Weak NPIs are licensed by covert EVEN_{MIN} at LF. Overt instances of weak *even* and strong NPIs (e.g. minimizers), on the other hand, are licensed by the combination of EVEN_{MIN} and EVEN_{MAX}. This means that we leave the existing analysis of weak NPIs under this approach entirely untouched: We only change the semantics of overt *even* and strong NPIs.

(39) *Summary of our proposal so far*
  a. Weak NPIs are licensed by EVEN_{MIN}
  b. Strong NPIs and overt weak *even* are licensed by EVEN_{MIN} and EVEN_{MAX}
  c. EVEN_{MAX} is locally accommodated in the restrictor of universal quantification, and thereby introduces the required context-sensitivity of weak *even*

Now that we have covered the environments that the *even*-based approach already accounted for, let us turn our eye to how questions are affected by our proposal.

4.2. Decomposed *even* and English polar questions

Given that we now assume that NPIs are licensed only by EVEN_{MIN}, the analysis for NPI questions remains the same as presented in §3.2. That is, they do not derive any kind of question bias or feeling of rhetoricity. Concerning the LF of *even*-questions, on the other hand, we would derive the following structure and Hamblin set:

(40) Did John read even ONE book?
  a. [whether^L] [7 ? [[~~John read one$_F$ book~~] (or$_7$ [even$_{\text{MIN}}$ [not) even$_{\text{MAX}}$ [John read one$_F$ book]]]]]
  b. $[\![$Did John read any book?$]\!] = \{[\![$John read one$_F$ book$]\!]$, $[\![\text{even}_{\text{MIN}}]\!](C')([\![$not [even$_{\text{MAX}}$ C [John read focus$_F$ book]]$]\!])\}$

The negative answer would have the following presuppositions:

(41) John didn't read even ONE book.
  a. [even$_{\text{MIN}}$ [not [even$_{\text{MAX}}$ [John read one$_F$ book]]]]
  b. Presupposition of EVEN_{MIN}:
  For all $n > 1$: $\neg\exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$
  c. Presupposition of EVEN_{MAX}:
  For all $n > 1$: $\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)] \lhd_c \exists_1 x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$, and $\neg\exists_n x[\text{BOOK}(x) \wedge \text{READ}(j,x)]$

Under the assumption that questions inherit the presuppositions of all of their possible answers (cf. Abrusán, 2014: p. 40, amongst others), this would entail that the question itself is only defined if we already preclude the possibility that John has read more than one book.[7] This

[7] Note that we can arrive at the same requirements, even if we do not assume that questions inherit all of their answer's presupposition. Under the assumption that questions only inherit presuppositions shared by all of their answers, we can simply maximize the ellipsis to ensure that EVEN_{MAX} is also contained by the affirmative answer:

would mean that the speaker has already settled for herself that John will not have read any great amount of books. In fact, she assumes that he could have read at most one book, if any, which she also communicates to the addressee via the question form itself. This situation is identical to van Rooy's (2003) analysis of minimizer questions. We simply derive the necessary conditions for his derivation of rhetoricity in a different fashion. In fact, under our assumptions, minimizer-questions would derive their rhetoricity through the very same process as above, since we assume that strong NPIs are also licensed by the combination of both types of EVEN.[8] One caveat, however: Since overt *even* does not always associate with ludicrously minimal amounts (in comparison to lifting a finger), the derivation of rhetoricity is dependent upon the judgment of the speaker/addressee. Is the difference between nothing and one relevant to the situation? If so, the question would still be information-seeking. If not, the question would be considered rhetorical. As such, our proposal makes the following prediction: Not all instances of *even*-questions are rhetorical in nature. This difference would be determined by context.

5. Conclusion

The aim of this paper was to consider how the *even*-based approach NPI licensing can be reconciled with the differences in distribution between NPIs and the expression *even ONE* with the general assumption that NPIs are also licensed by EVEN. We have achieved this in §4, §4.1 and §4.2, where we have altered the semantics of overt *even*, whilst we left the analysis of NPIs untouched. Under our account, the impression that *even ONE* and *any* are licensed by the same factors was fabricated due to the fact that they share one important licensing factor: EVEN_{MIN}. In our account, however, overt *even* requires a second licensing EVEN_{MAX} that is solely responsible for all of the distributional differences pointed out by Heim (1984).

We are aware that our approach may have problems with accounting for the correct reading of some sentences such as the ones below.

(42) a. John regrets opening even ONE book.
b. John knows that asking out even ONE girl is a difficult task.
c. If John opens even ONE book, he will learn something new.

More precisely, our account is likely to make some predictions of exclusivity that are too strong to match our general intuitions for such sentences. A point for future research would be to examine how our account interacts with these environments and whether the presupposition of exclusivity might be dealt with in a similar fashion to the solution we provided for the universal quantifier's restrictor (or an entirely different approach for that matter). Another potential point for future research would be the empirical examination of our prediction concerning the

(i) Did John read even ONE book?
a. [whether^L] [7 ? [[~~even$_{\text{MAX}}$ John read one$_F$ book~~] (or$_7$
[even$_{\text{MIN}}$ [not) even$_{\text{MAX}}$ [John read one$_F$ book]]]]]

[8] It is interesting to note that minimizers and other strong NPIs are often considered to bear obligatory stress. The indefinite in *even ONE* also bears stress. A possibility for future research might be, whether an interaction with the stress itself somehow derives EVEN_{MAX}, possibly explaining why *any* turns into a strong NPI once stressed.

contextually-determined rhetoricity of *even*-questions. Another important point for future research is to analyse the projection of multiple presuppositions triggered by the same focus particle and empirically test whether all of them obligatorily project in the same manner.

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