Even and Negative Bias in Polar Questions

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Contents

Abstract

The English word *even* has interesting scalar and focus properties, including a reversal of meaning that takes place under downward-entailing operators. *Even* can take as its antecedent either the least likely of a set of contextually-generated options, as in sentence (1), or the most likely of the set, as in sentence (2):

(1) Do even billionaires worry about money?

(2) Does even the professor know what she's talking about?

This thesis presents an analysis of *even*'s variable scale choice in English polar questions in a covert movement framework, identifying how *even* can vary its scale in these contexts by looking at the connection between the most likely interpretation of *even* and negative bias in English, Latin and Atayal. I propose that the presence of covert negative bias licenses the covert movement of *even* to take high scope over an operator that triggers its scale reversal, while the presence of an overt negative bias marker blocks this movement, forcing *even* to have a least likely interpretation.

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1 Introduction

The particle *even* has been the subject of great semantic interest for decades, thanks to its scalar and focus properties. Following the alternative semantics proposed by Rooth (1985), *even* takes a focus-marked associate that generates a set of related alternatives from context, which are ordered along a scale of likelihood. Each alternative corresponds to a proposition, *even* asserts that its prejacent is the least likely of all these possible alternative propositions to be true with the additional inference that the prejacent is in fact true (Horn 1969).

That is, traditionally *even* can only have as its prejacent a proposition which is the least likely of a set of contextually-generated alternative propositions to be true, but which is still true. The use of *even* is only appropriate when the fact that its prejacent is true is surprising or informative, due to the low likelihood of that being the case (Horn 1969). I will refer to this meaning as 'least likely' (LL) *even*. This meaning is shown in the following sentence [1]:

(1) I think even [snakes]$_F$ make good pets.

   (a) Prejacent: snakes make good pets
   (b) Associate: snakes
   (c) Alternatives: dogs, cats, rabbits, ferrets
   (d) Alternative propositions: dogs make good pets, cats make good pets, etc.
   (e) Interpretation of prejacent + *even*: Snakes make good pets, and this is less likely than that other animals would make good pets.

However, under downward-entailing operators, the meaning of *even* appears to reverse: it now takes a prejacent that is the most likely of the contextually-generated alternative propositions to be true (Karttunen & Peters 1979; Rooth 1985). I will refer to this meaning as 'most likely' (ML) *even*. An example of ML *even* is shown in the following example:

(2) I don't think even [dogs]$_F$ make good pets.

   (a) Prejacent: dogs make good pets
   (b) Associate: dogs
   (c) Alternatives: cats, rabbits, ferrets, snakes
   (d) Alternative propositions: cats make good pets, rabbits make good pets, etc.
   (e) Interpretation of prejacent + *even*: Dogs make good pets, and this is more likely than that other animals would make good pets.

In both environments, *even* takes as its prejacent the lowest item on a scale of contextually-generated alternatives. However, the scales are ordered with the least likely option at the bottom in non-downward-entailing environments, and with the most likely option at the bottom in

[1] All examples are my own unless otherwise noted.

downward-entailing environments. This reversal of *even*'s meaning is thus often referred to as a scale reversal, since the scale of alternatives appears to reverse its poles.

In most environments, only one meaning of *even* is felicitous, but in polar questions, both the least likely and most likely interpretations of *even* are available:

(3) Does even [Bill Gates]$_F$ have to worry about money? (least likely)

(4) Does even [the professor]$_F$ know what she's talking about? (most likely)

The acceptability of both meanings in a single grammatical context raises questions about how the scale reversal of *even* occurs and is licensed.

In the following section (§2), I will discuss two existing theories of how *even*'s scale reversal occurs and two possible licensing conditions for this scale reversal. I will then examine the distribution of *even*'s two meanings in polar questions, which are unique in that both meanings of *even* can appear (§3). Next, I will show that existing analyses of *even*'s scale reversal fail to account for the polar question data (§4). I will then propose a new analysis which uses the presence of negative bias to explain the distribution of *even*'s meanings. Finally, I will lay out the implications of this proposal and discuss some questions which remain unanswered (§6).

2 Existing theories of *even*'s scale reversal and its licensing

2.1 Theories of *even*'s scale reversal

There are two major approaches to the scale reversal of *even*, one which proposes that *even*'s meaning change is the result of covert movement at LF, and another that proposes that each meaning is associated with a different lexical item.

2.1.1 Movement theory

Introduced in Karttunen & Peters (1979), this theory explains the scale reversal of *even* in certain contexts by having *even* covertly move at LF so that it can take scope over the class of operators that induces scale reversal. This class of operators is generally believed to include at least NPI licensers (Rullmann 1997:43), and all non-upward-entailing operators have also been argued to be included (Crnič 2013).

This theory is illustrated by an example from Crnič (2013) following Lahiri (1998).

(5) John didn't even make [one]$_F$ video. (Crnič 2013:3)

(a) Proposed LF: [even C_1] [not ~~[even C_1]~~ [John make one$_F$ video]]

In this sentence, *even*'s prejacent is clearly the most likely of the set of alternatives (make two videos, make three videos) since in order to make two or more videos, you must make one

video. This sentence therefore demonstrates *even*'s scale reversal. In the proposed LF, *even* moves covertly from its position below the negative operator *not* to a position above it, where it can scope over it and therefore include the negation in its prejacent. This neatly explains how *even* gets a most likely interpretation, since in this case *even*'s prejacent is now [not [John make one video] instead of [make one video]. This is shown by the following interpretation of sentence (3)'s LF:

(6) [even C_1] [not ~~[even C_1]~~ [John make one$_F$ video]]

(a) Prejacent: not (John make one video)

(b) Associate: one

(c) Alternatives: two, three, four

(d) Alternative propositions: not make two videos, not make three videos, etc.

(e) Interpretation: Although it is unlikely that John did not make one video, he did in fact not make one video

In sum, when *even* takes scope above negation or another non-upward-entailing operator, it is interpreted as most likely *even*. When it takes scope below the operator (or there is no operator), it is interpreted as least likely *even*.

Despite this pleasing solution to the scale reversal problem, there are a number of unresolved issues with the movement theory. The deepest concern with this theory is that it involves 'invisible' traceless movement, which is unusual and therefore suspicious.

The movement theory also makes a number of strange or even incorrect predictions. First is the question of which operators permit *even* to move past them covertly. In order to explain the distribution of *even*, it is necessary to assume that it can move past and scope over even some operators that are traditionally thought to be upward-entailing, like desire modals and imperatives (Crnič 2013) among many others (Rullmann 1997:47), a phenomenon that has yet to be satisfactorily explained. As well, Rullmann (1997:48) observes that the scope theory allows *even* to move or scope more freely than other focus particles like *only*. In this theory, *even* also appears to violate island restrictions on movement, for example by moving out of relative clauses, which cannot even be done by "elements which are known to favor wide scope, such as *each*" (Rullmann 1997:49). Erlewine (2014:155) also observes that the movement theory fails to predict an observed contrast between raising and control predicates.

2.1.2 Lexical theory

The traditional lexical or NPI theory of *even*'s scale reversal draws on the observation that other languages such as Greek, Dutch, German, Finnish and Swedish, among others (Rullmann 1997:51) have two lexical items that correspond in meaning to standard *even* and scale-reversed/NPI *even*. Rooth (1985) therefore proposed that English also has both a standard *even* with a least likely interpretation, and an *even*$_{NPI}$ with a most likely interpretation. These two

distinct lexical items have the same pronunciation in English, though not necessarily in other languages. This proposal has been taken up by others including Rullmann (1997), Giannakidou (2007) and Wagner (2013). Since $even_{NPI}$ is, of course, an NPI, it must be licensed by an NPI licenser. This proposal therefore resolves the issue of restrictions against scoping or movement that plagued the movement theory, and requires the operators under which the most likely interpretation of *even* occurs only to be NPI licensers rather than mandating that they are non-upward-entailing.

Arguments against the lexical theory of *even* have generally proceeded on the grounds that it is inferior to the movement theory in terms of its ability to predict the distribution and behaviour of *even*. For example, Wilkinson (1996:199-201) observes that under predicates like *be glad* and *be sorry*, the only reading available is one where *even* is scoping over the predicate – the narrow scope reading where *even* does not move at LF is inaccessible. Therefore, in this case, the lexical theory of *even* makes incorrect predictions.

A more fundamental objection to the lexical theory is that it seems unlikely that two lexical items with such similar meanings would just happen to have the same phonological realization. Furthermore, leaving aside any historical developments which could have caused this situation to arise, the lexical theory seems implausible from an acquisition standpoint – how could children acquire the two distinct meanings of *even* when they are pronounced identically and can occur in similar or even identical contexts?

2.1.3 Conclusion

Clearly, both theories of *even*'s scale reversal are compelling, but both make incorrect predictions in at least some contexts or fail to fully explain *even*'s distribution. Unfortunately, as Rullmann (1997:41) observes, "it is hard to construct any clear empirical arguments for either theory, in large part because the precise presupposition of *even* is difficult to pin down.[2]"

However, the most likely interpretation of *even* can be blocked in certain kinds of polar questions, as will be shown in §5. This blocking is characteristic of movement, which I argue is evidence in favour of the movement analysis and against the lexical theory.

2.2 Theories of scale reversal licensing

Both theories of *even*'s scale reversal involve licensing of the most likely interpretation by a limited set of operators, similar (for the movement theory) or identical (for the lexical theory) to the set of operators that license negative polarity items. Since the limited distribution of NPIs was described in Klima (1964), the appearance of an NPI in a sentence has been thought to be "conditional on the presence of a licensing negative element elsewhere in the sentence"

[2]See Rullmann (1997:44-48) for an overview of the major proposals for the definition of *even*'s presupposition, and Greenberg (2015, 2016) for a more recent proposal.

(Ladusaw 1980:457). Today, the nature of this licensing negative element is defined by two contrasting theories: downward entailment and non-veridicality.

2.2.1 Downward entailment

Downward entailment was first introduced as the licenser for NPIs in Ladusaw (1980). Ladusaw observed, following the data from Klima (1964), that these licensing items ranged far outside the category of simple negation, and that syntactically parallel lexical items could differ in their ability to license NPIs. Klima (1964) proposed that NPI licensers had the feature 'affective,' and Ladusaw (1980) drew on the work of Fauconnier (1975) and others to refine that concept into the notion of downward entailment.

An operator is said to be downward entailing if it creates a context in which "superset values entail subset values" (Ladusaw 1980:461). This is illustrated by the following contrast, adapted from Ladusaw (1980:461).

(7) John is a father $\vdash$ John is a man

(8) John isn't a man $\vdash$ John isn't a father

In the positive context of (7), there is an upward-entailment relation: the subset entails the superset, since the set of fathers is contained within the set of men and if John is a father, he must be a man. However, the negation in (8) is downward-entailing: the superset entails the subset, since if John is not a man then he cannot be a father.

Ladusaw (1980) proposes that NPIs are licensed when they are interpreted in the scope of a downward-entailing operator. These operators include certain determiners such as *no x*, *at least x* and *few x*; quantification adverbs like *never* and *rarely*; and modal verbs like *doubt*, *deny* and *be unlikely*, among others. The following examples demonstrate the contrast in NPI acceptability between downward-entailing and non-downward-entailing environments. Downward-entailing operators are indicated by bold text, and NPIs by italics:

(9) (a) I have**n't** talked to *anyone*.

(b) *I have talked to *anyone*

(10) (a) I **doubt** *anyone* will show up.

(b) *I think *anyone* will show up.

Downward entailment does not predict that NPIs should be licensed in questions, since there is no explicit downward-entailing operator present and questions do not seem to have a downward-entailment set relation of any kind (Mayr 2013:345). However, NPIs do appear in questions, as shown by the following examples:

(11) Has *anyone* finished their homework *yet*?

(12) Is there a gas station *anywhere* near here?

The failure of downward entailment to predict the licensing of NPIs in questions also predicts that the most-likely interpretation of *even*, $even_{NPI}$, should not be able to appear in questions. As will be seen in §4, this prediction is not borne out by the data.

2.2.2 Non-veridicality

In response to the failure of downward entailment to predict the licensing of NPIs in questions (as well as in imperatives, the future tense and habituals, among other environments), Giannakidou (2002) proposes the notion of veridicality, a licensing condition that is also based on an entailment relation:

(13) "A propositional operator F is veridical iff Fp entails p: $Fp \vdash p$; otherwise F is nonveridical." (Giannakidou 2002:5)

Giannakidou (2002) says that such nonveridical operators, which include modal verbs, the future tense, and imperatives, as well as other traditional downward-entailing operators, license NPIs in their scope.

Unlike downward entailment, nonveridicality predicts that NPIs will be licensed in questions. This is because polar questions are nonveridical, since their two possible answers represent a disjunction (Giannakidou 2002:8):

(14) Did Anne talk to John?
(Anne talked to John $\vee$ Anne didn't talk to John)

Since $p \vee q$ does not entail the truth of both p and q, polar questions are nonveridical and license NPIs.

In conclusion, non-veridicality licenses NPIs – including $even_{NPI}$ and its most likely interpretation – in questions, while downward entailment does not. As the following section will show, the ML interpretation of *even* can indeed appear in questions.

3 The distributions of least likely and most likely *even*

3.1 Distribution of *even* in English questions

The two meanings of *even* generally appear in complementary distribution: if there is no suitable operator present to license the most likely interpretation, only the least likely interpretation

can appear, and when such a licenser is present, only the most likely interpretation is available[3]. However, in polar questions, both ML and LL *even* can appear. In fact, the meaning of *even* appears to vary based only on context, with ML and LL *even* both appearing in similarly structured polar questions:

(15) Do even [first-graders]$_F$ understand calculus?

  (a) Meaning of *even*: least likely

  (b) Context: children are the least likely (compared to teenagers, adults, etc.) to understand calculus

(16) Does even [the math teacher]$_F$ understand calculus?

  (a) Meaning of *even*: most likely

  (b) Context: a math teacher is the most likely (compared to an English teacher, a chef, a historian, etc.) to understand it

3.1.1 Inter-speaker variation

Some native speakers of English do not accept polar questions like (16), where context forces a most likely interpretation of *even*. Regan (2018) included two polar questions with ML *even* among the control sentences in a larger experiment, and collected acceptability judgments using a five-point Likert scale, where 1 is completely unacceptable and 5 is completely acceptable. Both polar questions had prejacents which were unambigously the most likely of their alternatives:

(17) Does even [the professor]$_F$ know what she's talking about?

(18) Does even [Mark Zuckerberg]$_F$ know what Facebook is? (Read 2017)

The following graph shows the percentage of the 80 native English speaker respondents who rated the sentences as either unacceptable (giving a rating of 1 or 2) or acceptable (a rating of either 4 of 5).

[3] I have yet to find an explanation of why, with the exception of polar questions and the protasis of conditionals, environments that allow ML *even* allow only that meaning. However, the data does bear this out, as shown in 3.2.1, where the downward-entailing environments do not permit LL *even*.

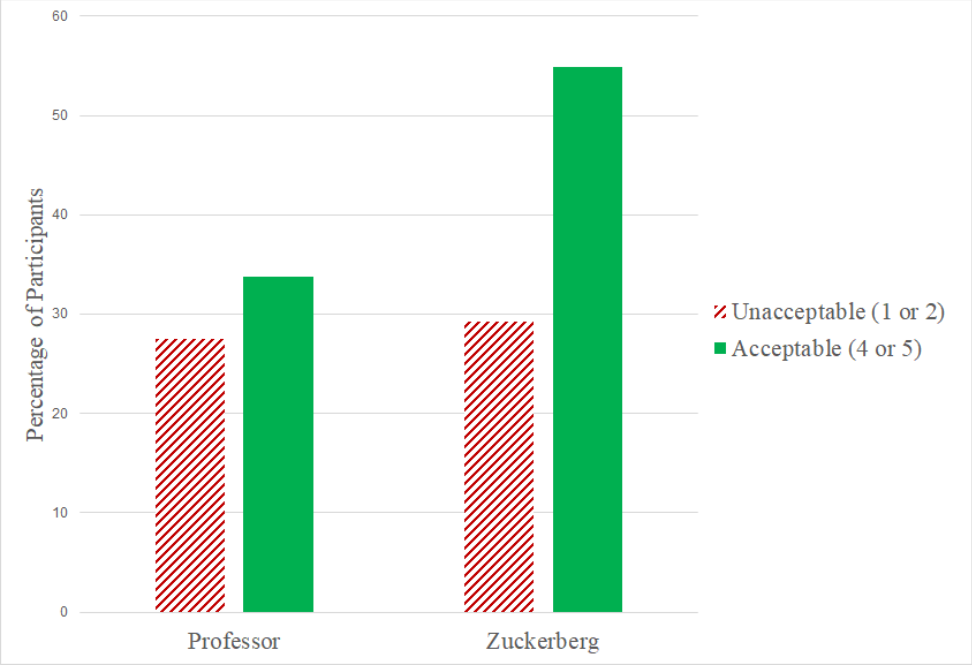


Figure 1: Acceptability of ML *even* in polar questions

Although more people found the sentences acceptable than found them unacceptable, the large percentage (almost 30% in both cases) of respondents who found these sentences unacceptable is remarkable.

I propose that the group of native English speakers for whom these sentences are unacceptable either do not license $even_{NPI}$ in polar questions (under the lexical theory), or do not allow it to take scope over a scale-reversing operator (under the movement theory). Since they only have access to the least likely interpretation of *even*, their knowledge about the high likelihood of the prejacents in these questions conflicts with their semantics for *even*, causing these polar questions to be semantically infelicitous.

Although this variation is certainly interesting and worthy of further study, I set it aside for the purposes of this analysis and treat polar questions with ML *even* as felicitous, since they are accepted by a significant proportion of speakers.

3.2 In non-question environments

Although the focus of this proposal is the behaviour of *even* in polar questions, it is worth considering the distribution of ML and LL *even* in other environments in order to determine under what circumstances ML *even* – which either is or has similar licensing conditions to an NPI – can be licensed.

3.2.1 Environments that are both downward-entailing and non-veridical

As demonstrated by the following examples Giannakidou (2002)'s prediction that the most likely interpretation of *even* is an NPI that is licensed in non-veridical environments is borne

out in English when the environment is also downward-entailing. In fact, in these environments, only the most likely interpretation of *even* is acceptable – LL *even* is infelicitous. As before, non-veridical and downward-entailing operators are indicated by bold text, and (a) sentences have ML *even* while (b) sentences have LL *even*.

(19) (a) I did**n't** think even [my best friend]$_F$ would come to my birthday party.

(b) #I did**n't** think even [my worst enemy]$_F$ would come to my birthday party.

(20) (a) **Every** person who's even [opened a tabloid]$_F$ has heard about Brad Pitt's new girlfriend.

(b) **#Every** person who's even [worked as a celebrity gossip columnist]$_F$ has heard about Brad Pitt's new girlfriend.

(21) (a) **Few** people have read even [the first page]$_F$ of that book.

(b) **#Few** people have read even [the entirety]$_F$ of that book.

(22) (a) **No** doctor would recommend eating even [one]$_F$ foraged mushroom.

(b) **#No** doctor would recommend eating even [twenty]$_F$ foraged mushrooms.

(23) (a) **Hardly** any student has turned in even [the first draft]$_F$ of their thesis.

(b) **#Hardly** any student has turned in even [the final copy]$_F$ of their thesis.

Interestingly, as shown by the following examples, both the most and least likely meanings of *even* are available in the protasis of conditionals, an environment that is non-veridical and "limited DE" (Heim 1984). This suggests that polar questions and the protasis of conditionals must share some characteristic that allows contextually-mediated variation between meanings.

(24) (a) If you get in even [one]$_F$ fight, you'll have to go back to jail.

(b) If even [Democrats]$_F$ have started supporting Donald Trump, you know we have a problem.

In sum, the lexical theory's prediction that ML *even* is an NPI licensed by either downward-entailment or non-veridicality has so far been borne out.

3.2.2 Environments that are only non-veridical

However, environments that are non-veridical but not downward-entailing, as in the following examples, admit only least likely (i.e. non-NPI) *even*, which suggests that either *even* is not in fact an NPI, or that non-veridicality alone cannot license *even*$_{NPI}$. Environments are indicated and (a) sentences contain ML *even* while (b) sentences contain LL *even*.

(25) Future:

(a) #I will invite even [my best friend]$_F$ to the party.

(b) I will invite even [my worst enemy]$_F$ to the party.

(26) Habituals:

(a) #I usually hear even [the loudest person]$_F$ talk at least once in seminar.

(b) I usually hear even [the quietest person]$_F$ talk at least once in seminar.

(27) Generics:

(a) #Aardvarks can fend off even [the weakest predators]$_F$.

(b) Aardvarks can fend off even [the strongest predators]$_F$.

(28) Modals:

(a) #Even [elementary school students]$_F$ need permission from their parents to go on this field trip.

(b) Even [high school seniors]$_F$ need permission from their parents to go on this field trip.

(29) Imperatives[4]

(a) #Love even [your mother]$_F$.

(b) Love even [your worst enemy]$_F$.

(30) Directives:

(a) #Our professor wants us to answer even [the easiest questions]$_F$.

(b) Our professor wants us to answer even [the hardest questions]$_F$.

Since Giannakidou (2002) demonstrates that NPIs such as *any* in English, *ook mar iets* in Dutch and *tipota* in Greek are licensed in non-veridical, non-downward-entailing environments, I will assume that under the lexical theory of *even* it must be that *even*$_{NPI}$ is a special kind of NPI that has more stringent licensing requirements than *any*-type NPIs. Since NPIs have been previously shown to be divisible into subclasses which may have more or less stringent licensing requirements (Zwarts 1998), this is not implausible – however, it does demonstrate a need for a theory of NPI-licensing that accounts for the presence of NPIs that are not licensed by non-veridicality, such as *even*$_{NPI}$, in the non-downward-entailing environment of polar questions.

[4]It is difficult to find natural-sounding imperatives containing either meaning of *even*. The reason for this is unknown and outside the scope of this paper, but is certainly worth further exploration.

3.3 With negative bias

There is a clear contrast in interpretation of *even* between questions with negative bias and those without it. Polar questions with least likely *even* do not demonstrate any negative bias – both "yes" and "no" are acceptable answers. Consider the following polar questions and possible answers:

(31) A: You can make a pie out of any fruit.
B: Really? Even [durian]$_F$?
A: Yes, durian pie is popular in the Philippines. / No, durian's smell and flavour are too strong.

(32) A: Have you even [run a marathon]$_F$?
B: Yes, I ran the Boston Marathon last year. / No, I'm training to run one next year.

In contrast, polar questions with ML *even* are negatively biased – the only acceptable answer is "no" (Ladusaw 1979; Heim 1984):

(33) A: Does even [the professor]$_F$ know what she's talking about?
B: #Yes, she's teaching the class. / No, this topic is way too confusing.

(34) A: Does even [Mark Zuckerberg]$_F$ know what Facebook is?
B: # Yes, he is the founder of Facebook. / No, it's now so massive that not even its founder truly understands it.

This makes pragmatic sense – there is nothing surprising or informative about the most likely proposition to be true being true, so if the answer to the question is "yes" there is no good pragmatic reason to ask the question. Therefore, the question is only worth asking if the expected answer is "no."

4 Problems with current analyses of *even* in polar questions

4.1 Using the lexical theory of *even*

Although the lexical theory of *even* has not, as far as I know, been explicitly extended to polar questions, Giannakidou (2002) observes that non-veridical environments, including questions, license NPIs. Assuming under a lexical theory that ML *even* is an NPI, polar questions, as non-veridical environments, should license ML *even* – and ML *even* does indeed felicitously appear in polar questions.

However, as observed in §3.2, ML *even* is not in fact licensed by non-veridical environments that are not also downward-entailing. That is to say that ML *even* is only grammatical in

downward-entailing environments. Since questions are not believed to be downward-entailing (Mayr 2013:345), questions should not license ML *even*, and yet they do.

There are two possible solutions to this problem under the lexical theory of *even*: First, there may be some (perhaps silent) downward-entailing operator in polar questions that licenses ML *even*. Alternatively, ML *even* may be a type of NPI that is licensed not by downward entailment or non-veridicality, but by some third type of environment that includes downward-entailing environments, questions and the protasis of conditionals.

Whichever solution is adopted must also account for the fact that both meanings of *even* can only in polar questions and the protasis of conditionals, whereas in all other environments only one of the meanings is permitted.

4.2 Using the movement theory of *even*

4.2.1 Guerzoni's proposal

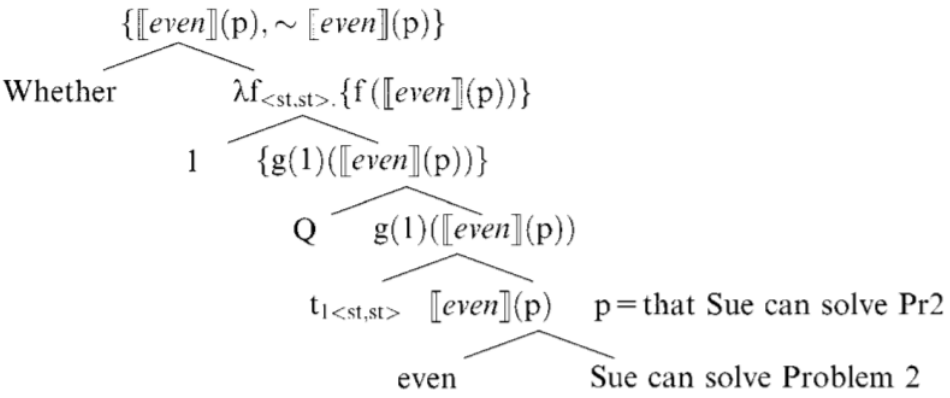
Guerzoni (2004a,b) extends the movement theory of *even* to polar and wh- questions. Guerzoni proposes that questions include a silent *whether* that introduces the negations of all the propositions in the answer set. In the case of polar questions, this generates the standard set of two answers, "yes" and "no." *Even* has a least likely interpretation when it scopes over the trace of this silent *whether*, as shown by the following LF and derivation from Guerzoni (2004b:332):

(35) Can Sue even solve [Problem 2]$_F$?

(a) Interpretation of *even*: least likely – Problem 2 is the most difficult problem to solve

(b) LF: [Whether$_1$ [Q [t$_1$ [even [Sue solved [Problem 2]$_F$]]]]]

(c) Semantic composition:



(d) Presuppositions of answers:

i. No: ¬[even](‘that Sue can solve Problem 2’)
‘That Sue can solve Problem 2’ is the least likely proposition

ii. Yes: [even](‘that Sue can solve Problem 2’)
‘That Sue can solve Problem 2’ is the least likely proposition

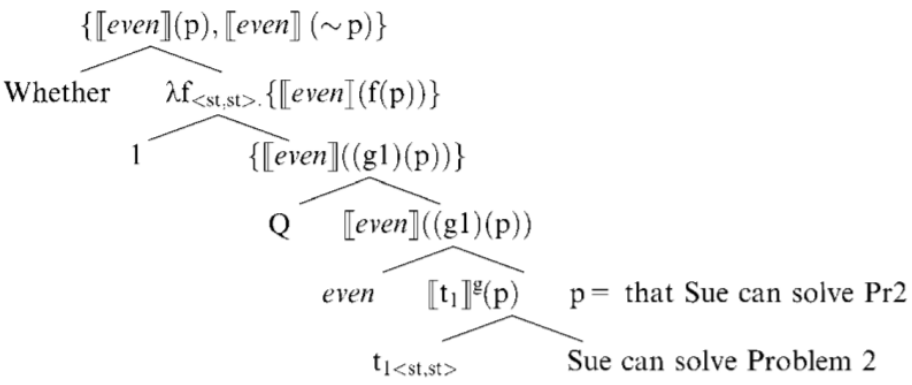
However, when *even* scopes over the trace of *whether*, it has a most likely interpretation (Guerzoni 2004b:333):

(36) Can Sue even solve [Problem 2]$_F$?

(a) Interpretation of *even*: most likely – Problem 2 is the easiest problem to solve

(b) LF: [Whether$_1$ [Q [even [t$_1$ [Sue solved [Problem 2]$_F$]]]]]

(c) Semantic composition:



(d) Presuppositions of answers:

i. No: [even](¬(‘that Sue can solve Problem 2’))
‘That Sue can’t solve Problem 2’ is the least likely proposition = ‘that Sue can solve Problem 2’ is the most likely proposition

ii. Yes: [even](‘that Sue can solve Problem 2’)
‘That Sue can solve Problem 2’ is the least likely proposition

Negative bias is derived when (ML) *even* scopes over the *whether* trace because the positive answers for each prejacent presuppose that the prejacent is the least likely of its alternatives to be true, as shown in (35d) and (36d). Since this conflicts with the most-likely interpretation derived from *even*’s scope, these positive answers are "pragmatically excluded" Guerzoni (2004a:8), leaving only the negative answer as a pragmatically acceptable response.

Guerzoni is able to avoid the covert movement traditional in the analysis of these kinds of scopal ambiguities by having *even* be located either above or below a silent trace. There is therefore no difference in pronunciation between (30) and (31), which allow *even* to be base-generated in its final scopal position:

(37) Could you solve even $t_{whether}$ Problem 2 (the hardest question)?

(38) Could you solve $t_{whether}$ even Problem 2 (the easiest question)?

In conclusion, Guerzoni's proposal neatly explains both the variation in *even*'s meaning in English polar questions, as well as the strong link between the presence of ML *even* and negative bias.

4.2.2 Languages with overt negative bias marking

However, this proposal fails to explain the behaviour of *even* in languages with overt negative bias marking. In Latin, negative bias is indicated by the use of a particle *num* (Pinkster 2015:317):

(39) Num dubium est?
NEG.BIAS doubt is?
'There is no doubt, is there? (expected answer: no)' (Allen 1903)

The Austronesian language Atayal, which is spoken in Taiwan, also has an overt negative bias marker, *pi* (Sihwei Chen, personal communication, February 24, 2018).

Guerzoni's proposal predicts that negative bias in polar questions should only occur when ML *even*, or another minimizer such as 'lift a finger' or 'the faintest idea' (Guerzoni 2004b:319), is present. Since the positive answers are only pragmatically excluded when *even* scopes above the trace of *whether*, negative bias should only arise when *even* takes high scope and therefore also has a most likely interpretation.

One would therefore expect that *even* should always have a most likely interpretation when an overt negative bias marker is present, and a least likely interpretation when there is no negative bias marker.

However, this is not the case. The following Latin example has *num* and *even*, and *even* has a clear LL meaning, since it is unlikely that Cicero could successfully take wing and fly over the enemy-occupied Alps before the invention of airplanes (compared to crossing the Alps on foot, not crossing the Alps at all, etc.):

(40) Aut si cetera transissem, **num** **etiam** Alpis poteram transvolare, quae
or if remainder pass-over **NEG.BIAS even** Alps be-able-to fly-over which
praesidio illius tenentur?
that defense held
'Or if I had effected the rest of the journey, could I even take wings and fly over the Alps, which are occupied by his force?' (Shuckburgh 1908)

Another example from Latin where LL *even* appears with *num* is the following, where the most recent wrong is the least likely of all possible wrongs to be forgotten (compared to wrongs that took place a longer time ago and are therefore more likely to be forgotten):

(41) Quod si veteris contumeliae oblivisci vellet, **num** **etiam** recentium
how if-ever prohibit abuse forget want **NEG.BIAS** **even** recent
iniuriarum ... memoriam deponere posse?
injustice ... memory lay-down be-able-to
'But even if he were willing to forget their former outrage, could he also lay aside the remembrance of the late wrongs...?' (McDevitte & Bohn 1869)

The following example from Atayal also contains the negative bias marker *pi* and *even* with a least likely interpretation. It is less likely that every single strand of hair would not tangle than that a few strands of hair would tangle:

(42) swa' hyuci' iyal snonux su ru ini' pcket **ana** qutux **pi**?
why smooth very hair you CONJ NEG tangle **even** one **NEG.BIAS**?
'Why is it that your hair is very smooth/silky and every single one/even one does not tangle?' (Sihwei Chen, personal communication, February 24, 2018)

In fact, it seems that the negative bias markers *pi* in Atayal and *num* in Latin appear only with LL *even*. This presents a puzzle for Guerzoni's theory, which would predict the opposite of what the data suggests.

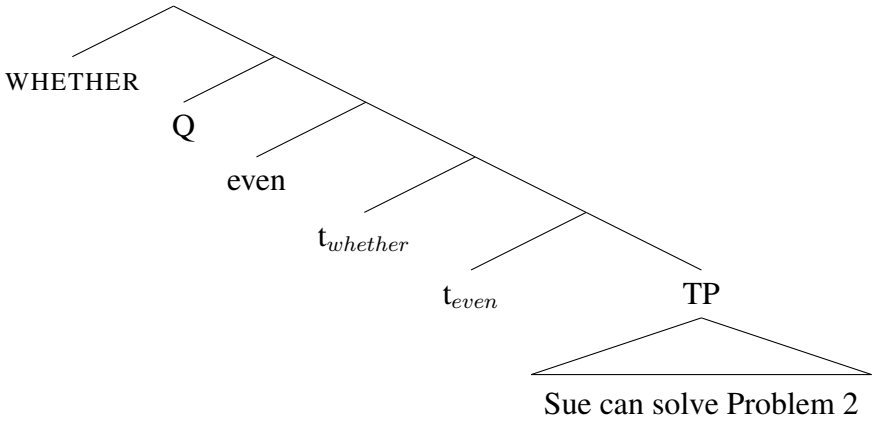
5 A new analysis of *even*'s movement and its blocking

In the previous section, a notable contrast was observed: in languages without overt negative bias marking, polar questions with negative bias allow only a most likely interpretation of *even*. However, in languages with overt negative bias marking, polar questions with negative bias allow only a least likely interpretation of *even*.

I propose that this seemingly contradictory pattern arises because the overt negative bias marker in languages like Latin and Atayal occupies the position to which *even* moves to take the high scope which is required for it to have a most likely interpretation.

Rather than having *even* base-generate above or below the trace of *whether*, as in Guerzoni (2004b), it is always base-generated below the trace. In covert negative bias languages like English, the position above the trace is empty, and *even* can move there, scope over the trace and get a most-likely interpretation. Consider the following structure, adapted from Guerzoni (2004b:332-333):

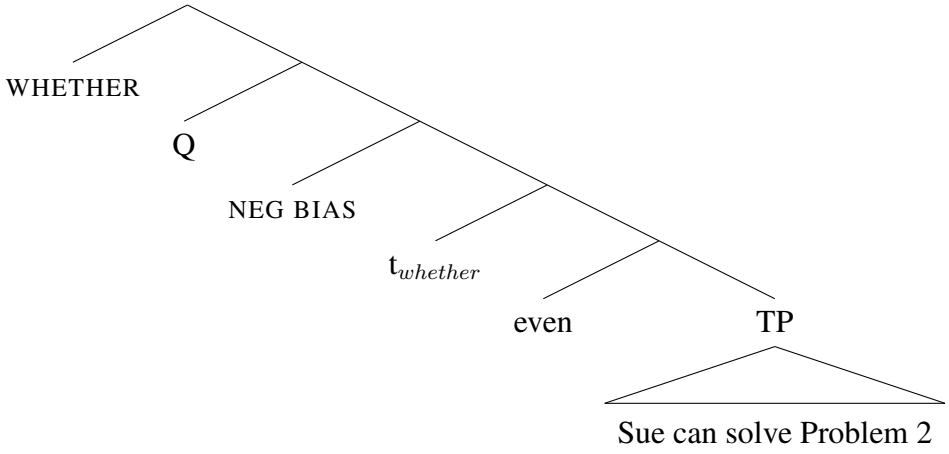
(43)



In this structure, which represents the behaviour of *even* in negative bias contexts in English, *even* is base-generated below the trace of *whether* but moves above it to take high scope and get a most likely interpretation.

However, in languages like Atayal and Latin, the negative bias particle occupies the position to which *even* moves in English. Consider the following structure, which shows how English would behave if it had an overt negative bias marker as Atayal and Latin do:

(44)



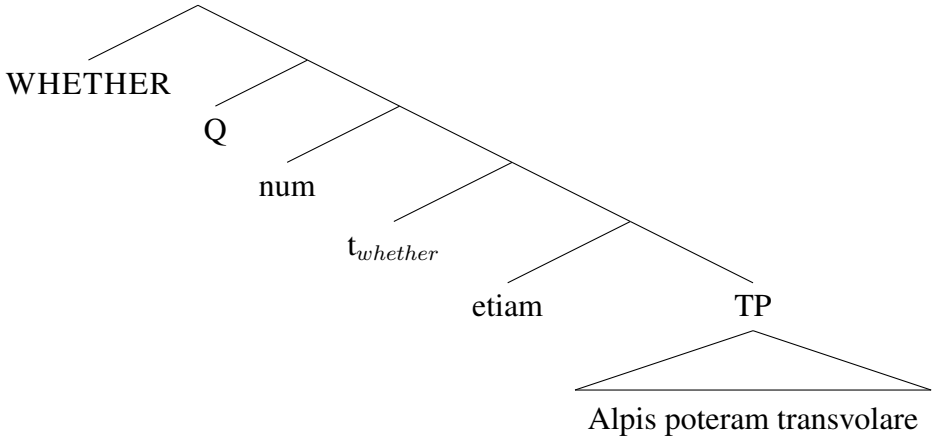
Here, *even* cannot move to the position above the trace of *whether* where it moved in the previous example, since that position is occupied by the negative bias marker. Therefore, it must scope below the trace, causing it to have a least likely interpretation.

Unlike Guerzoni's proposal, this analysis explicitly involves movement – however, it does not require the words to be interpreted in a different order than they are pronounced, since the trace of *whether* is silent.

Although I am not sufficiently familiar with Atayal syntax to observe whether this proposal makes correct predictions for Atayal, Latin word order does appear to match what would be predicted by this proposal. Consider the following structure for the relevant section of (40), which is repeated here as (45):

(45) **num** **etiam** Alpis poteram transvolare ...?
NEG.BIAS even Alps be-able-to fly-over
'...could I even take wings and fly over the Alps...?' (Shuckburgh 1908)

(46)



Of course, it is unclear what the specific semantic contribution of these overt negative bias markers might be, and how these operators combine with *whether*. Under this analysis, *whether*'s interaction with *even* is not the source of the negative bias via pragmatic exclusion of positive responses, since the negative bias is being contributed by the negative bias marker. It is therefore an open question why *whether* is needed to create negative bias in languages like English, which do not overtly mark negative bias, but not in languages like Atayal and Latin.

One might imagine that, since their distribution is limited (or almost limited, in the case of Atayal, as will be seen in §6.2.2), these negative bias markers are semantically contentless reflexes of the *whether* operator which serve only the syntactic function of blocking *even*'s movement and do not contribute to the meaning of the sentence. However, if that were the case, there would be nothing causing negative bias in polar questions with overt negative bias marking, since *even* would be below the trace of *whether* and the negative bias marker would not be semantically contentful. Therefore, these negative bias markers must have some semantic role to play.

Despite this unanswered question, this proposal does neatly explain the difference in the distributions of *even*'s meanings between overt and covert negative bias-marking languages.

6 Implications and lasting questions

6.1 Implications for other theories

6.1.1 Movement vs. lexical

The distribution of *even*'s two meanings in polar questions is troubling for the lexical theory, since that theory would now require children learning English to acquire two similar yet distinct lexical items which are pronounced identically and can appear in identical grammatical contexts.

Previously, the ability of children to acquire these two different meanings despite the identical pronunciation could have been explained by the fact that the two meanings appeared in complementary distribution. However, since LL and ML *even* can both appear in polar questions (and the protasis of conditionals), the distribution is no longer complementary. This would presumably make the difference between the two *even*s much more difficult to acquire.

The proposed analysis of *even* also presents an argument for the movement theory of *even*'s scale reversal and against the lexical theory. There is no reason why, under the lexical theory, the presence of an overt negative bias marker would block the licensing of ML *even* – in fact, it seems more likely that the marker would serve as a downward-entailing NPI-licenser which would allow $even_{NPI}$ and its ML interpretation to appear.

However, the overt negative bias marker's presence means that only LL *even* may appear, which I have provided an account for under the movement theory.

6.1.2 Licensing

As previously discussed, the presence of most likely *even* in polar questions is surprising under both the movement and lexical theories. Under the movement theory, there is no obvious operator (although Guerzoni (2004b) proposes a silent *whether*) over which *even* can move to take high scope, and under the lexical theory there is no overt licensing element.

Thus, ML *even*'s presence must be explained either by rejecting the lexical theory and accepting Guerzoni's *whether* proposal or positing another silent operator over which *even* can move; by proposing that there is a silent downward-entailing element that licenses $even_{NPI}$ under the lexical theory; or by developing a new theory of licensing that allows NPIs of the ML *even*-type to appear in polar questions and the protasis of conditionals as well as traditional downward-entailing environments.

In sum, unless Guerzoni's *whether* proposal is adopted, some new element or licensing condition is needed to explain the presence of ML *even* in polar questions. Besides, since Latin's negative bias marker cannot appear in the protasis of conditionals (Paul Eberwine, personal communication, April 22, 2018), neither Guerzoni's proposal nor my own is sufficient to explain the presence of both LL and ML *even* in that environment.

6.2 Remaining questions

6.2.1 Extension to wh-questions

Most likely *even* can also appear in wh-questions[5], as in the following example, where thinking about the War of 1812 is more likely than memorializing it, researching it, and so forth:

(47) Who even [thinks]$_F$ about the War of 1812 anymore?

The previous example also seems negatively biased, although the expected answer is not "no" – this questions seems to expect an answer of "nobody/no one." Therefore, any proposal that discusses the distribution of *even*'s meanings in polar questions should also be able to handle *even*'s behaviour in wh-questions.

Guerzoni (2004a) extends the proposal in Guerzoni (2004b) to wh-questions. However, Guerzoni herself admits that although the existence of a *whether* operator in polar questions is reasonable, the presence of such an operator in wh-questions is both non-obvious and non-standard. As my proposal also relies on the existence of *whether*, it would have similar difficulties plausibly explaining wh-questions.

6.2.2 Negative bias marking in Atayal

Another issue for this proposal is that Atayal's negative bias marker *pi* may also appear outside of questions, as in the following example:

(48) ana Sinkina ga, tkryun su uzi l-pi!
even Sinkina top get.lost.PV 2S.ERG also PRT-NEG.BIAS
'Even Sinkina (which is a very small town), you also got lost in there!'
(Sihwei Chen, personal communication, February 24, 2018)

This is very surprising if *pi* is marking negative bias in the traditional sense, since it should only appear in questions. This data suggests that *pi* is either some other kind of negation marker, or that it serves a dual purpose as a negative bias marker and some other kind of marker (perhaps negation or surprise, based on its usage in the example above).

However, although it appears from its distribution that *pi* could be the downward-entailing operator which licenses the use of ML *even*$_{NPI}$ in polar questions, this cannot be the case. If *pi* were an NPI-licenser, that would predict that only ML *even*, an NPI, would appear in sentences with *pi*. However, in both questions and declaratives, the opposite is the case – only least likely *even* may appear.

[5]However, it seems as though traditional *even* can only take a VP associate in wh-questions – trying to force *even* to take the wh-word as its associate, as in the following example, seems to cause *even* to be interpreted as the Question-Focusing (QF) "extreme ignorance" *even* from Iatridou & Tatevosov (2016).

(1) Where even is that restaurant?

This form of *even* takes the entire question as its associate and says that the question being uttered is the least likely of the contextually-generated alternative questions to be asked.

6.3 Conclusion

Although unresolved issues with this proposal still remain, it neatly explains the data. In languages with an overt negative bias marker, only the least likely *even* is available because the movement of *even* to take high scope is blocked. In languages with no overt negative bias marker, the absence of the overt marker allows *even* to move, take high scope, and be interpreted as most likely *even*.

This proposal also provides evidence for the movement theory of *even*'s scale reversal and the polar question data laid out in this paper shows that if the lexical theory is to remain plausible, a new licensing condition for *even*-type NPIs must be proposed.

References

Allen, Joseph Henry. 1903. *Allen and Greenough's new Latin grammar for schools and colleges: founded on comparative grammar*. Ginn.

Crnič, Luka. 2013. How to get even with desires and imperatives. In Eva Csipak (ed.), *New explorations in negative polarity sensitivity*, vol. 262, 127–154.

Erlewine, Michael Yoshitaka. 2014. *Movement out of focus*. Cambridge, MA: Massachusetts Institute of Technology dissertation.

Fauconnier, Gilles. 1975. Polarity and the scale principle. In *Chicago Linguistic Society*, vol. 11, .

Giannakidou, Anastasia. 2002. Licensing and sensitivity in polarity items: from downward entailment to nonveridicality. *CLS* 38. 29–53.

Giannakidou, Anastasia. 2007. The landscape of even. *Natural Language & Linguistic Theory* 25(1). 39–81.

Greenberg, Yael. 2015. Even, comparative likelihood and gradability. In *Proceedings of the 20th amsterdam colloquium*, 147–156.

Greenberg, Yael. 2016. A novel problem for the likelihood-based semantics of even. *Semantics and Pragmatics* 9. 2–1.

Guerzoni, Elena. 2004a. Even and minimizer NPIs in wh-questions. *WECOL 2002* .

Guerzoni, Elena. 2004b. Even-NPIs in yes/no questions. *Natural Language Semantics* 12(4). 319–343.

Heim, Irene. 1984. A note on negative polarity and downward entailingness. In *Proceedings of NELS*, vol. 14 1983, 98–107.

Horn, Laurence. 1969. A presuppositional analysis of only and even. *Chicago Linguistic Society* 5. 98–107.

Iatridou, Sabine & Sergei Tatevosov. 2016. Our even. *Linguistics and philosophy* 39(4). 295–331.

Karttunen, Lauri & Stanley Peters. 1979. Conventional implicature. *Syntax and Semantics* 11. 1–56.

Klima, Edward S. 1964. Negation in English. In J.A. Fodor & J. Katz (eds.), *The structure of language*, 246–323. Prentice-Hall.

Ladusaw, William. 1979. Negative polarity items as inherent scope relations. *Unpublished Ph. D. Dissertation, University of Texas at Austin* .

Ladusaw, William A. 1980. On the notion affective in the analysis of negative-polarity items. *Formal Semantics: The Essential Readings* 457–470.

Lahiri, Utpal. 1998. Focus and negative polarity in Hindi. *Natural language semantics* 6(1). 57–123.

Mayr, Clemens. 2013. Downward monotonicity in questions. In *Proceedings of sinn und bedeutung*, vol. 17, 345–362.

McDevitte, William Alexander & W.S. Bohn. 1869. Julius Caesar: De bello Gallico (Gallic wars).

Pinkster, Harm. 2015. *The Oxford Latin syntax*, vol. 1. Oxford University Press, USA.

Read, Max. 2017. Does even Mark Zuckerberg know what Facebook is? *New York Magazine* .

Regan, Rachel Martinez. 2018. Here's you a thesis: an examination of methodology for research in micro-comparative syntax. Yale University. B.A. thesis.

Rooth, Mats. 1985. *Association with focus*. Amherst, MA: GLSA, Dept. of Linguistics, University of Massachusetts, Amherst dissertation.

Rullmann, Hotze. 1997. Even, polarity, and scope. *Papers in experimental and theoretical linguistics* 4(40-64).

Shuckburgh, Evelyn S. 1908. The letters of Cicero: the whole extant correspondence in chronological order, in four volumes.

Wagner, Michael. 2013. Additivity and the syntax of even. Manuscript.

Wilkinson, Karina. 1996. The scope of even. *Natural language semantics* 4(3). 193–215.

Zwarts, Frans. 1998. Three types of polarity. In *Plurality and quantification*, 177–238. Springer.