

Epistemic bias anti-licenses NPIs in polar questions*

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Abstract There is general agreement that the distribution of *any* is unrestricted in polar questions. I argue that this is not the case: in contexts where there is epistemic bias in favor of the prejacent of a polar question, the question exhibits the same behavior as a declarative with respect to the licensing of *any*. I provide an account for this observation in terms of intervention: epistemic bias forces polar questions to be parsed as having a silent modal *E* which intervenes between *any* and the question operator *whether* that otherwise licenses *any*.

Keywords: NPIs, polar questions, epistemic bias, anti-licensing

1 Introduction

There is general agreement that the distribution of *any* is restricted in declaratives, as evidenced by the contrast between (1a) and (1b), but unrestricted in polar questions, as evidenced by the lack of contrast between (2a) and (2b).

- (1) a. John is reading a book by Chomsky.
b. #John is reading any book by Chomsky.
- (2) a. Is John reading a book by Chomsky?
b. Is John reading any book by Chomsky?

This paper starts from an observation which challenges this consensus. The observation, as far as I know, is novel. It is that in epistemically biased contexts the same contrast observed for (1) emerges for (2) as well. Specifically, these contexts militate against *any* in favor of *a* in polar questions, so that (2a) sounds natural while (2b) sounds odd in them.

Here is an example. Suppose John sent A and B, who are linguists, an email which contains the following sentences: “I am reading a very intriguing book. The author conjectures that language could be like a snowflake.” Both A and B take this

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to indicate that the book's author is Chomsky. The next day, A and B are having the following conversation.

- (3) John's email from yesterday: "...I am reading a very intriguing book. The author conjectures that language could be like a snowflake..."
- A: Did you read the email John sent yesterday?
- B: (i) I did. Is he reading a book by Chomsky?
 (ii) #I did. Is he reading any book by Chomsky?

In this context, B's question sounds natural with *a* but deviant with *any*.

Here is another example. Suppose I am talking with my friend on the phone and hear what sounds like chewing. I take this to be indication that my friend is eating while talking.

- (4) I am talking with my friend on the phone and hear chewing sounds
- (i) Are you eating something?
 (ii) #Are you eating anything?

The question sounds natural with *some* and deviant with *any* in this context as well.

What is common to both of these conversations is that they allude to information which supports the prejacent of the question. In (3), it is inferred from what John said in the email that Chomsky wrote the book he is reading. In (4), it is inferred from what is audible on the phone that my friend is eating while talking. The generalization, then, seems to be that epistemic bias for *S* disrupts the ability of *whether* to license *any* in the polar question *whether(S)*.

- (5) Epistemic bias anti-licenses NPIs in polar questions

My aim is to give an account for (5). The gist of the account is that epistemically biased polar questions contain a covert modal *E* whose semantics is akin to that of the overt modal *must*. The intuition I capitalize on is that (3)-B-(i) and (4)-(i) convey more or less what the sequences in (6a) and (6b) convey, respectively.

- (6) a. John must be reading something by Chomsky. Is he?
 b. You must be eating something. Are you?

It is *E* that intervenes between *whether* and the NPI which *whether* otherwise licenses. I will propose an analysis which predicts that the structure in (7a) is felicitous but the structure in (7b) is a presupposition failure.

- (7) a. whether [... any ...]
 b. *whether [E [... any ...]]

The analysis will involve claims about how NPIs are licensed in general. This is the topic of the next section.

2 NPI licensing

For the purpose of this discussion I will adopt a simple approach to NPI licensing which is based on insights from a family of well-known proposals (Heim 1984; Kadmon & Landman 1993; Lee & Horn 1994; Krifka 1995; Lahiri 1998; Crnič 2014, 2019). These proposals share two basic ideas.

The first is that *any* has the same basic meaning as *some* (Kadmon & Landman 1993; Gajewski 2008; Chierchia 2013). In other words, DPs headed by *any* denote existential quantifiers, as shown in (8), where D is the covert resource domain of the determiner (von Stechow 1994).

$$(8) \quad \text{any}_D(P)(Q) \Leftrightarrow \exists x \in D : P(x) \wedge Q(x)$$

The second idea is that the limited distribution of *any* is to be explained in terms of (i) the alternatives it invokes and (ii) the condition it imposes on these. Specifically, *any* invokes “subdomain” alternatives, which are derived by replacing the resource domain D with subsets of D .¹ Subdomain alternatives of constituents containing any_D are derived by point-wise composition in the familiar way.

$$(9) \quad \begin{array}{l} \text{a. } \text{Alt}(\text{any}_D) = \{\text{any}_{D'} \mid D' \subseteq D\} \\ \text{b. } \text{Alt}(\text{John read any}_{D'} \text{ book}) = \{\text{John read any}_{D'} \text{ book} \mid D' \subseteq D\} \end{array}$$

The condition imposed by *any* on its alternatives will be implemented by way of a covert operator, *MAX*, which co-occurs and associates with *any*.² *MAX* introduces the presupposition that its prejacent be “maximally strong” among the alternatives invoked by *any* (cf. Heim 1984; Lee & Horn 1994; Krifka 1995; Lahiri 1998; Crnič 2014, 2019).

$$(10) \quad \begin{array}{l} \text{MAX}(S) \\ \text{a. } \text{presupposes } \forall S' \in \text{Alt}(S) : S \leq S' \\ \text{b. } \text{asserts } S \end{array}$$

The relation $X \leq Y$, i.e. X is at least as strong as Y , is defined for both propositions and questions, which are sets of propositions (van Rooij 2003; Schwarz 2017; Roelofsen 2018; Roelofsen & Jeong 2022). If X and Y are propositions, $X \leq Y$ iff X

¹ Alternatively, one can assume a less stipulative theory of alternatives for *any* and get the same results by way of a theory of “pruning” (cf. Katzir 2014; Trinh 2019; Crnič 2022). I do not want to discuss pruning in this paper.

² I borrowed “*MAX*” from Crnič (2021). A more familiar term is “*EVEN*”.

entails Y , and if X and Y are questions, $X \leq Y$ iff the disjunction of all propositions in X entails the disjunction of all propositions in Y . The definition is given in (11).

- (11) $X \leq Y$ iff either (i) or (ii) holds
- (i) $X \Rightarrow Y$
 - (ii) $\bigvee X \Rightarrow \bigvee Y$

This simple theory suffices to distinguish negated sentences and polar questions, which license *any*, from non-negated sentences, which do not. Consider (12a) whose logical form, by hypothesis, is (12b). From (10) it follows that (12a) has the presupposition in (12c).

- (12) a. #John read any book
 b. $MAX(\text{John read any}_D \text{ book})$
 c. $\forall D' \subseteq D : \text{John read a book in } D \Rightarrow \text{John read a book in } D'$

The presupposition in (12c) is unsatisfiable. Suppose that John read a book. It does not follow that John read a book published after 2010, for example. Due to this inconsistent presupposition, (12a) is deviant.

Now consider (13a), which has the logical form in (13b). From (10) it follows that this sentence has the presupposition in (13c).

- (13) a. John did not read any book
 b. $MAX(\neg \text{John read any}_D \text{ book})$
 c. $\forall D' \subseteq D : \neg \text{John read a book in } D \Rightarrow \neg \text{John read a book in } D'$

The presupposition in (13c) is trivially satisfied. If John did not read a book, then he did not read a book published after 2010, for example. Since the presupposition is trivial, (13a) is felicitous.

Finally, consider the polar question in (14a), whose logical form is (14b).

- (14) a. Did John read any book?
 b. $MAX(\text{whether}(\text{John read any}_D \text{ book}))$

Given that $\text{whether}(S)$ is the set $\{S, \neg S\}$, the interpretation of (14b) is (15a), and the presupposition of this question is (15b), which is equivalent to (15c).

- (15) a. $\{\text{John read any}_D \text{ book}, \neg \text{John read any}_D \text{ book}\}$
 b. $\forall D' \subseteq D : \text{John read a book in } D \vee \neg \text{John read a book in } D$
 $\Rightarrow \text{John read a book in } D' \vee \neg \text{John read a book in } D'$
 c. $\forall D' \subseteq D : \top \Rightarrow \top$

The presupposition in (15c) is also trivially satisfied. Thus, (14a) is felicitous.³

Note that we introduced (14a) without any context. This means the question is to be understood as non-biased. Its logical form exemplifies (7a). We have just seen how *any* is licensed in this case. Let us now turn to biased questions which do not license *any* and whose logical form exemplifies (7b).

3 NPI anti-licensing

The logical forms of biased questions contains a silent evidential marker *E* which intervenes between *whether* and the prejacent proposition and results in NPIs being anti-licensed. My hypothesis is that the interpretation of *E* is akin to that of epistemic *must*. Specifically, *E* presupposes what *must* asserts. The analysis of *must* which I assume is essentially that proposed by von Fintel & Gillies (2010), henceforth F&G. Let me briefly present it.

3.1 The overt epistemic modal *must*

In a somewhat confusing terminology, F&G distinguish between what is “directly known” (the “kernel”) and what is “known” (the “modal base”).

- (16) a. The kernel, *K*, is a non-closed set of propositions
 b. The modal base is $\bigwedge K$

The interpretation of epistemic *must* is indexed to *K*, which varies from context to context. Specifically, $must_K(S)$ asserts that *S* follows from $\bigwedge K$ and presupposes that *S* itself is not a member of *K*.⁴

³ One may, at this point, ask why (ia) and (ib) are deviant.

- (i) a. #John saw any unicorn
 b. #John read any book or he didn't read any book

Since there are no unicorns, it is trivially true that if John saw an unicorn in *D* then he saw an unicorn in *D'*. And (ib) is tautological in the same way a polar question is. So why is *any* not licensed in these sentences? The answer would be, for (ia), that *MAX* is “blind” to such facts about the world as that there are no unicorns. For (ib), we would have to say that each disjunct comes with its own *MAX*. These claims will have to be derived from a more complete theory of NPI licensing, the discussion of which would take us far beyond the scope of this paper.

⁴ See also von Fintel & Gillies (2021). The presupposition which F&G assigns to $must_K(S)$ is actually not that *S* is not a proposition in *K*, but that *S* is not settled, i.e. entailed or contradicted, by any proposition in *K*. The distinction would make a difference if we include the existential epistemic modal *might* in our discussion. However, I limit the discussion to *must*, as it is *must*, not *might*, which is the overt counterpart of *E*.

- (17) $must_K(S)$
- (i) presupposes that $S \notin K$
 - (ii) asserts that $\wedge K \Rightarrow S$

Knowledge, then, is organized into two levels. On the “structured” level, it is comparable to a text document: a set of sentences which is not closed under logical entailment. It is information “packaged” into linguistic units, i.e. propositions. On the “unstructured” level, knowledge is just information. Epistemic modality is the grammatical means to talk about knowledge from both angles at once. In other words, $must_K(S)$ alludes to K as structured and unstructured information. What it tells us about K as unstructured information is that S can be concluded from it. What it tells us about K as structured information is that S is not one of the units into which K is packaged. This is how F&G’s analysis captures the intuition that $must_K(S)$ presents S as “inferred”: S follows from what is known but only “indirectly”. This indirectness is what F&G calls the “evidential signal” of epistemic *must*.

When the K that $must_K(S)$ alludes to is pathological, the sentence sounds odd. In other words, $must_K(S)$ is deviant to the extent that it is hard to accommodate K . To illustrate, consider the three way contrast in (18).

- (18) John is seen writing with his left hand
- a. John must be left-handed
 $K = \{\text{John is writing with his left hand, people who write with their left hand are left-handed, ...}\}$
 - b. #John must be writing with his left hand
 $K = \{\text{John is writing with his left hand, I see John writing with his left hand, I am not hallucinating, ...}\}$
 - c. ##John must be right-handed
 $K = \{\text{John is writing with his left hand, people who write with their left hand are right-handed, ...}\}$

The context, as indicated, is that John is seen writing with his left hand. In this context, the three different sentences (18a), (18b), and (18c) require different K ’s to be accommodated. For (18a), K contains a proposition which describes what is seen and another proposition which is common knowledge. Thus, K is “normal” in this case. For (18b), the proposition which describes what is seen must be taken out of K . Apparently, this makes K a bit weird, as what is seen is not considered known. The sentence, in fact, seems to suggest that the speaker is a Cartesian sceptic who does not take the trustworthiness of visual perception for granted. Finally, for (18c), K contains a proposition, i.e. the underlined one, which contradicts common knowledge. This makes K really weird. The sentence, in fact, seems to suggest that

the speaker lives in an alternate reality where writing with the left hand is indicative of right-handedness.

Again, the function of epistemic *must* is to allude to a set of propositions. The allusion may, but does not have to, be prompted by some visible feature of the context. Examples such as (18), where the prejacent of *must* describes what is seen, might mislead readers into thinking that the “evidential signal” of *must* is about what is seen, i.e. about “evidence”. It is not. The evidential signal is about indirectness: $must_K(S)$ tells us that S follows from K , but only indirectly, in the sense that it is not in K but has to be true if the propositions in K are true. Consider (19).

- (19) John’s email from yesterday: “...I started smoking again...”
- A: Did you read the email John sent yesterday?
- B: (i) I did. He must be under stress.
 $K = \{ \text{John smokes, John smokes only if he’s under stress, } \underline{\text{John is under stress, ...}} \}$
- (ii) I did. #He must be feeling happy.
 $K = \{ \text{John smokes, } \underline{\text{John smokes only if he’s feeling happy, John is feeling happy, ...}} \}$
- (iii) I did. ##He must have started smoking again.
 $K = \{ \underline{\text{John started smoking again, ...}} \}$

The context is one where A and B are talking about John’s email which was sent to both of them the day before and which contains the proposition that John started smoking again. Thus, A and B are not talking about anything visible in the context. The conversation could very well take place in a sound-proof, windowless room. Now, assuming that K , in this context, contains every proposition from John’s email, we can infer, from each of B’s responses, what is not in that email. If B’s response is (19-i), we infer that the email does not say John is under stress. If it is (19-ii), we infer that the email does not say John is feeling happy. This response is a bit strange, presumably because it requires the accommodation of something like the underlined proposition, which is a bit unusual. If B’s response is (19-iii), we would have to infer that the email does not say John started smoking again. As this inference contradicts what we know about the email, (19-iii) comes across as extremely odd.

3.2 The covert epistemic modal *E*

Let us now turn to *E*, which I hypothesize to be the covert counterpart of the epistemic modal *must* (cf. Trinh 2014). The interpretation of *E* is quite simple: *E*

presupposes what *must* asserts. Thus, *E* presupposes that its prejacent follows from what is known, and says that the prejacent is true.⁵

- (20) $E_K(S)$
 (i) presupposes $\wedge K \Rightarrow S$
 (ii) asserts S

As we can see, *E* has no “evidential signal”: it does not require indirectness.⁶ This means that *E* has a wider distribution than *must*: whereas *must* requires that its prejacent follow indirectly from what is known, *E* only requires that its prejacent follow from what is known. Thus, whenever $must_K(S)$ is felicitous, $E_K(S)$ is too, but not vice versa. Consider (21).

- (21) John is seen writing with his left hand
 a. (i) John $must_K$ be left-handed.
 (ii) #John $must_K$ be writing with his left hand.
 b. (i) E_K John is left-handed.
 (ii) E_K John is writing with his left hand.

In this context, there is pressure for K to contain the proposition that John is writing with his left hand, which describes what is seen. This means it follows from K directly that John is writing with his left hand, and indirectly that John is left-handed. We thus predict, correctly, the contrast in (21a): *must* allows the first but not the second proposition to be its prejacent. Now, given that *E* has no indirectness requirement, we predict, again correctly, the absence of a contrast in (21b): both propositions, i.e. one which follows directly and one which follows indirectly from K , can be the prejacent of E_K .

Note that $E_K(S)$ sounds the same as S , because *E* has no phonology. This lexical fact gives rise to the illusion that whenever $must_K(S)$ can be asserted, the “plain” S can be asserted as well (von Fintel & Gillies 2010). Given the interpretation of *E*, we would now have to say that what looks like the plain S in these contexts is actually $E_K(S)$. This parse is forced by Maximize Presupposition (Heim 1991).

- (22) Maximize Presupposition (MP)
 Presuppose as much as possible!

Finally, recall that epistemic *must* is not about what is seen. This holds for *E* as well.

⁵ The relationship between overt *must* and its covert counterpart *E* is thus similar to that between overt *only* and its covert counterpart *PEX*. See Bassi, Del Pinal & Sauerland (2021, 2023) for arguments that there is a covert exhaustification operator which presupposes what *only* asserts.

⁶ Note that *E* is meant to be mnemonic for “epistemic”, not for “evidential”.

Just like *must*, *E* alludes to a set of propositions, none of which has to describe what is seen. Let us consider the email scenario again.

- (23) John's email from yesterday: "...I started smoking again..."
 A: Did you read the email John sent yesterday?
 B: (i) I did. E_K He is under stress.
 (ii) I did. E_K He started smoking again.

Both responses in (23B) alludes to *K*, conveying to us, in each case, what follows from *K*. None of the responses describes anything that can be seen in the context. The conversation may take place in sound-proof, windowless room.

3.3 Intervention by *E*

Let us come back to the generalization we set out to derive: epistemic bias anti-licenses NPIs. Here is the example again.

- (24) John's email: "...I am reading a very intriguing book. The author conjectures that language could be like a snowflake..."
 A: Did you read John's email?
 B: (i) I did. Is he reading a book by Chomsky?
 (ii) #I did. Is he reading any book by Chomsky?

In what follows I will adopt the abbreviations in (25).

- (25) a. John is reading a_D book by Chomsky = A_D
 b. John is reading any_D book by Chomsky = ANY_D

It is natural to assume that *K*, in this context, contains propositions which together entail that the book John is reading is written by Chomsky. Due to MP, the question in (24)-B-(i), reproduced in (26), would have the logical form in (26a), where E_K is inserted below *whether*. The set of answers is (26b). Since negation is a hole (Karttunen 1973; Heim 1990), both answers presuppose (26c), which ends up as the presupposition of the question (Guerzoni 2003; Nicolae 2013).

- (26) Is John reading a book by Chomsky?
 a. logical form: $whether(E_K(A_D))$
 b. set of answers: $\{E_K(A_D), \neg E_K(A_D)\}$
 c. presupposition introduced by E_K : $\bigwedge K \Rightarrow A_D$

There is no problem. The question is predicted to be felicitous, and it is.

Let us turn to the infelicitous question in (24)-B-(ii), reproduced in (27). Again,

MP forces E_K to be inserted below *whether*. Recall that *any* requires the presence of *MAX*. Thus, the logical form of (27) would have to be (27a), and the set of answers is (27b). Now, (27) should inherit both the presupposition introduced by E_K , given in (27c), and the presupposition introduced by *MAX*, given in (27d).

- (27) Is John reading any book by Chomsky?
- $MAX(\text{whether}(E_K(ANY_D)))$
 - set of answers: $\{E_K(ANY_D), \neg E_K(ANY_D)\}$
 - presupposition introduced by E_K : $\bigwedge K \Rightarrow ANY_D$
 - presupposition introduced by *MAX*:
 $\forall D' \subseteq D : \text{whether}(E_K(ANY_D)) \leq \text{whether}(E_K(ANY_{D'}))$

Given the definition of the \leq relation, (27d) is equivalent to (28a), which in turn is equivalent to (28b).

- (28) a. $\forall D' \subseteq D : \forall (\text{whether}(E_K(ANY_D))) \Rightarrow \forall (\text{whether}(E_K(ANY_{D'})))$
 b. $\forall D' \subseteq D : (E_K(ANY_D) \vee \neg E_K(ANY_D)) \Rightarrow (E_K(ANY_{D'}) \vee \neg E_K(ANY_{D'}))$

As the disjunction of S and $\neg S$ is equivalent to the presupposition of S , (28b) is equivalent to (29).

- (29) $\forall D' \subseteq D : (\bigwedge K \Rightarrow ANY_D) \Rightarrow (\bigwedge K \Rightarrow ANY_{D'})$

But note that (29) is unsatisfiable. Suppose that it follows from what is known that John is reading a book by Chomsky, we cannot conclude that it follows from what is known that John is reading a book by Chomsky which is published after 2010, for example. This is why (24)-B-(ii) is infelicitous: it has an inconsistent presupposition. The same holds for other cases of epistemically biased questions.

We have thus derived the generalization in (5), reproduced here in (30).

- (30) Epistemic bias anti-licenses NPIs in polar questions

4 Predictions

We predict a number of facts beyond the generalization in (30). I discuss them in turn in this section.

4.1 Partial overlap in distribution of biased questions and modal statements

Both the biased question $\text{whether}(E_K(S))$ and the modal statement $\text{must}_K(S)$ require that S follow from K . In addition, $\text{must}_K(S)$ requires that S follow from K indirectly. We predict the following.

NPIs in biased questions

- (31) a. When S follow from K directly, $whether(E_K(S))$ is felicitous but $must_K(S)$ is not
b. When S follow from K indirectly, both $whether(E_K(S))$ and $must_K(S)$ are felicitous
c. When S does not follow from K , neither $whether(E_K(S))$ nor $must_K(S)$ is felicitous

All three predictions turn out be true. Suppose John sent an email yesterday to A and B which contains the following sentence: “I could not take the written test because I injured my left hand”. In this scenario, it follows directly from K that John injured his left hand. As expected, (32-i) is felicitous but (32-ii) is not.

- (32) John’s email from yesterday: “...I could not take the written test because I injured my left hand...”
A: Did you read the email John sent yesterday?
B: (i) I did. Did he injure his left hand?
(ii) #I did. He must have injured his left hand.

What follows indirectly from K is that John is left-handed. As expected, both (33-i) and (33-ii) are felicitous.

- (33) John’s email from yesterday: “...I could not take the written test because I injured my left hand...”
A: Did you read the email John sent yesterday?
B: (i) I did. Is he left-handed?
(ii) I did. He must be left-handed.

What does not follow from K is that John is right-handed. As expected, neither (34-i) nor (34-ii) is felicitous.

- (34) John’s email from yesterday: “...I could not take the written test because I injured my left hand...”
A: Did you read the email John sent yesterday?
B: (i) #I did. Is he right-handed?
(ii) #I did. He must be right-handed.

4.2 Neutralization of E by negation

It can be observed that negation inside the prejacent of a biased question neutralizes the intervention effect of E_K . Thus, *any* is licensed in (35)-B.

- (35) A: John said he had read a lot of books in linguistics but had never found a good argument for Universal Grammar.
 B: Has he not read any book by Chomsky?

It turns out we predict this. Let us see how. Again, I will let ANY_D stand for the sentence in (36).

- (36) John has read any_D book by Chomsky = ANY_D

In (35), there is epistemic bias towards the negation of (36). In other words, it should follow from K , in this context, that John has not read any book by Chomsky. The logical form of (35)-B, reproduced in (37), would then be (37a). The two presuppositions of (37) are (37b), which is introduced by E_K , and (37c), which is introduced by MAX .

- (37) Has he not read any book by Chomsky?
 a. logical form: $MAX(\textit{whether}(E_K(\neg ANY_D)))$
 b. presupposition introduced by E_K : $\bigwedge K \Rightarrow ANY_D$
 c. presupposition introduced by MAX :
 $\forall D' \subseteq D : (\bigwedge K \Rightarrow \neg ANY_D) \Rightarrow (\bigwedge K \Rightarrow \neg ANY_{D'})$

Both presuppositions are satisfiable. Note, in particular, that $\bigwedge K \Rightarrow \neg ANY_D$ is a stronger condition than $\bigwedge K \Rightarrow \neg ANY_{D'}$. If it follows from what is known that John did not read any book by Chomsky, then it follows from what is known that he did not read any book by Chomsky which is published after 2010, for example. Thus, we predict (37) to be felicitous, as observed.

4.3 Default bias of negation

We can now make sense of another well-known observation about polar questions. It has been noted that the presence of negation in the prejacet of a polar question forces the question to be biased (cf. Quirk & Greenbaum 1973; Han & Romero 2002; Romero & Han 2004; Krifka 2012; Trinh 2014). Compare (38a) and (38b).

- (38) a. Is John single?
 b. Is John not married?

Intuitively, (38a) can be asked “out of the blue”, with the speaker having no prior belief about John’s marital status. The question in (38b), however, strongly suggests that there are reasons for the speaker to think that John is single, i.e. not married. It would sound natural if, for example, the speaker sees John browsing some dating website, which is indicative of him being single. Assuming that being single is

equivalent to not being married, this is a puzzling fact. It is difficult to see how changing the predicate from *single* to *married* and adding the word *not*, thus keeping to the same meaning, would result in such bias as we have just described. Given our analysis of biased questions as having the logical form $whether(E_K(S))$, we can formulate the puzzle as (39).

- (39) The presence of negation in the prejacent of a polar question forces the question to be parsed with E

The logical form of (38b), then, cannot be (40a) but must be (40b).

- (40) a. $\#whether(not(John\ is\ single))$ = incorrect parse of (38b)
 b. $whether(E_K(not(John\ is\ single)))$ = correct parse of (38b)

Under the parse in (40b), the question in (38b) has to presuppose that there is information which supports the proposition that John is not single. Thus, (39) delivers the right result. But how do we derive the generalization in (39)? Well, here is a tentative answer which I proposed in Trinh (2014). Suppose we say that the following rule obtains as a consequence of the Maxim of Manner (Grice 1967).

- (41) Neg-Deletion Rule
 If negation can be deleted without changing the interpretation of the sentence, it must be!

Now, it is a fact that $whether(S)$ is equivalent to $whether(not(S))$. Both denote the set $\{S, \neg S\}$, and there is no other aspect of meaning in which they differ. This means negation in the prejacent of a polar question is semantically idle.

The situation changes, however, when E_K is inserted under *whether*.

- (42) $whether(E_K(S)) \neq whether(E_K(not(S)))$
 a. $whether(E_K(S))$ presupposes $\bigwedge K \Rightarrow S$
 b. $whether(E_K(not(S)))$ presupposes $\bigwedge K \Rightarrow \neg S$

As we can see, $whether(E_K(S))$ has a different presupposition as compared to $whether(E_K(not(S)))$. Thus, negation is not semantically idle when E_K is inserted under *whether*. Given (41), then, the presence of negation forces the question to be parsed with E , which means it forces it to be biased. This is just what is observed.

4.4 Anti-licensing effect of declarative word order

Our examples of polar questions have been sentences which show subject auxiliary inversion, as exemplified in (43)-B-(i). Note, however, that polar questions can also have declarative word order, as exemplified in (43)-B-(ii).

- (43) A: John is looking for a vegetarian restaurant for dinner.
 B: (i) Is he vegetarian?
 (ii) He is vegetarian?
 A: No. But his wife is.

Let us borrow a term from [Gunlogson \(2002\)](#) and call the latter kind of polar questions “declarative questions”. Now, two observations have been made about declarative questions. The first is that they are, by default, biased: they suggest that there is information supporting the prejacent proposition ([Gunlogson 2002](#); [Safarova 2005](#); [Trinh 2014](#); [Goodhue 2022](#)). In (43), A’s initial statement can be taken as indication that John is vegetarian, which is what the prejacent of (43)-B-(ii) says. Thus, (43) shows that a declarative question can be biased. However, it does not show that a declarative question has to be biased. Here is an example that does.

- (44) A: What do you want to know about John?
 B: (i) Is he vegetarian?
 (ii) #He’s vegetarian?

We see that in a “neutral”, non-biased context where there is no information regarding the prejacent proposition, the polar question is felicitous with subject auxiliary inversion, but infelicitous in declarative word order. In light of our analysis of biased questions, we can formulate the generalization as (45).

- (45) Declarative word order forces a polar question to be parsed with *E*

Recall our crucial claim about *E*: just like *must*, *E* alludes to a set of propositions which may, but do not have to, relate to any physical feature of the context. The following example shows that the bias of declarative question is not about “contextual evidence”.

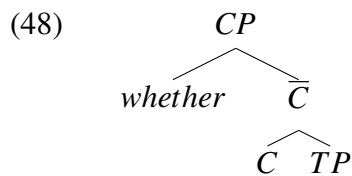
- (46) John’s email from yesterday: “...I injured my left hand so I couldn’t take the written test...”
 A: Did you read the email John sent yesterday?
 B: I did. He’s left-handed?

As *E* anti-licenses *any*, we predict, given (45), that *any* is deviant in declarative

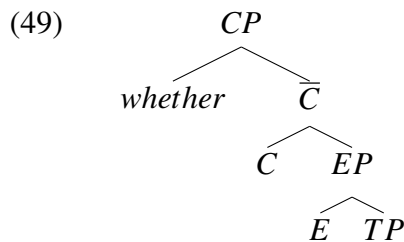
questions. This prediction is correct, as has been noted in the literature (Hirst 1983; Huddleston 1994; Gunlogson 2002). For illustration, consider the contrast in (47).

- (47) a. Is John reading any book by Chomsky?
 b. #John is reading any book by Chomsky?

But how do we derive (45)? Well, here is a tentative answer which I proposed in Trinh 2014. Suppose we adopt the standard syntactic analysis of polar questions according to which *whether* is the specifier of *CP*. The prejacent proposition is expressed by *TP*.

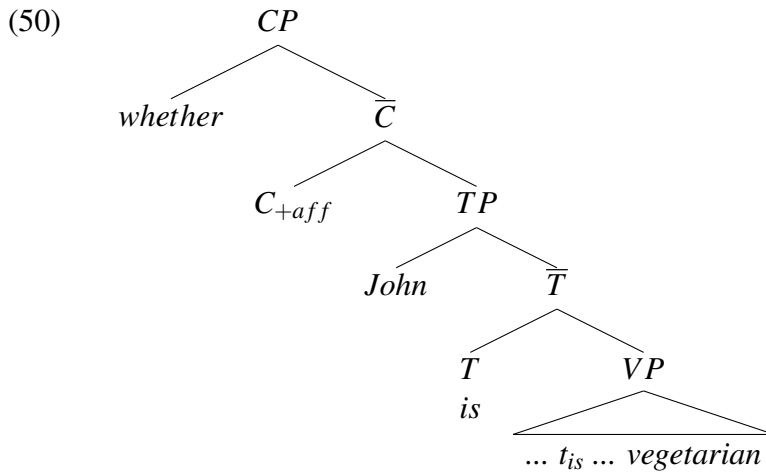


When *E* is inserted, we have the structure in (49). I will assume that *E* heads its own projection.

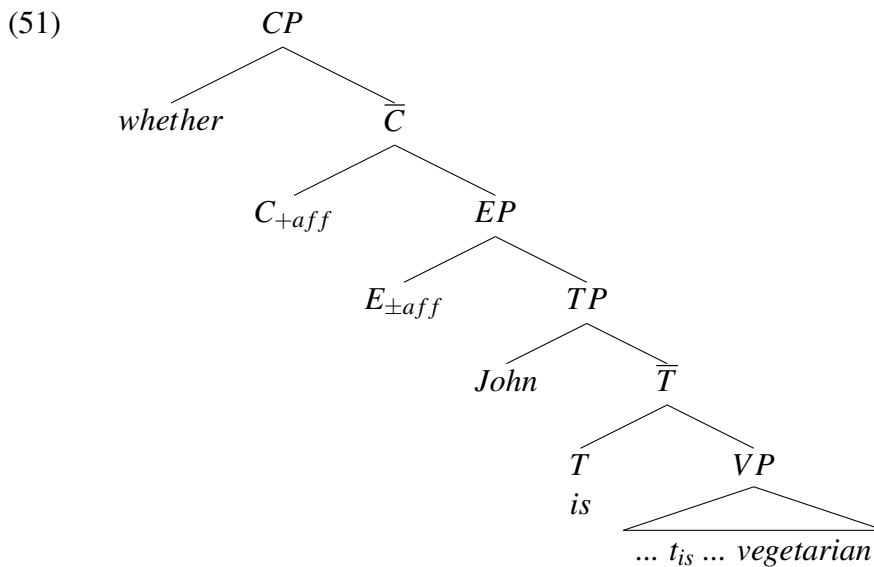


Now, let us say that a head can be obligatorily affixal ($[+af]$), meaning it has to trigger head-movement from its complement, or optionally affixal ($[\pm af]$), meaning it can but does not have to trigger head-movement from its complement.⁷ More concretely, let us say that *C* is $[+af]$ and *E* is $[\pm af]$. Given this picture, consider a polar question whose prejacent is the sentence *John is vegetarian*. If *E* is not present, the analysis would be (50).

⁷ This claim is not outrageous. It, or something similar, has been made in the literature. See Lasnik, Depiante & Stepanov (2000) with respect to English, Trinh (2005) with respect to Vietnamese, for example.



Because C is $[+aff]$, movement from T to C must take place, which means the question will have to exhibit subject auxiliary. Now consider the case where E is present.



Because E is $[\pm aff]$, i.e. can be either $[+aff]$ or $[-aff]$, two possible word orders may result from (51). If E is $[+aff]$, there would have to be movement of T to E to satisfy $[+aff]$ on E , and then movement of the now complex head $[T + E]$ to C to satisfy $[+aff]$ on C . The question will therefore exhibit subject auxiliary inversion. Now, if E is $[-aff]$, there cannot be any movement from T to E , and given the Head Movement Constraint Travis (1984), there cannot be any movement from T to C either. The only head movement that takes place in this case is that of E to

C. This will satisfy [+*af*] on *C*.⁸ However, because *E* is silent, this operation has no phonological consequence. The overt auxiliary remains in *T*, which means the question exhibits declarative word order.

We see that the absence of *E* forces subject auxiliary inversion, and the presence of *E* allows both subject auxiliary inversion and declarative word order. This means that when the question exhibit declarative word order, it has to be parsed with *E*. This is just what (45) says.

5 The issue of factivity

We have talked about *K* as “knowledge”. Knowledge is factive, which means to say that something follows from what is known is to presuppose that it is true. And since a presupposition of a presupposition is just a presupposition, to presuppose that something follows from what is known is to presuppose that it is true. Thus, both $must_K(S)$, which says that *S* follows from *K*, and $E_K(S)$, which presupposes that *S* follows from *K*, presuppose that *S* is true. Now, one criticism that can be raised against the analysis of biased questions proposed here is the following. The analysis takes the logical form of a biased question to be $whether(E_K(S))$. This means the question presupposes that *S* follows from *K*. Since *K* is factive, the question would presuppose that *S* is true. But then the question should be pragmatically odd. Why would one ask whether *S* is true when one presupposes that it is true?

The only response I can give, at this point, is that the same problem arises for F&G’s analysis of epistemic *must*, which I adopt, as well. Consider (52).⁹

(52) John’s email from yesterday: “...I could not take the written test because I injured my left hand...”

A: Did you read the email John sent yesterday?

B: I did. He must be left-handed. Is he?

According to F&G, *must* says that its prejacent follows from what is known, which means, given the factivity of knowledge, that *must* presupposes that its prejacent is true. But as we can see from (52), it seems quite natural for the same speaker who has asserted that John must be left-handed to subsequently ask whether he is. The reader is invited to confirm this intuition for other cases of *must* which we have discussed.

⁸ Note, importantly, that [+*af*] and [–*af*] are syntactic, not phonological, requirements. Syntax does not know, or care, how/whether an expression is pronounced. Thus, a head does not have to be overt to satisfy [+*af*] on some other head. For arguments that head movement is syntactic and not a “PF phenomenon” see Matushansky (2006); Hartman (2011).

⁹ Also, recall the sequences in (6).

Now, my claim about *E* is that it presupposes what *must* asserts. This claim is independent of the claim that *must* is factive. My account of the facts depend on the former, not the latter.¹⁰ In fact, to the extent that the account is convincing, we have reasons to think that *must* is not factive, and thus, that F&G’s arguments to the contrary should be re-evaluated. However, I will have to leave this task to future work.

References

- Bassi, Itai, Guillermo Del Pinal & Uli Sauerland. 2021. Presuppositional exhaustification. *Semantics and Pragmatics* 14(11). 1–48. doi:10.3765/sp.14.11.
- Bassi, Itai, Guillermo Del Pinal & Uli Sauerland. 2023. Free choice and presuppositional exhaustification. *Accepted for publication in Semantics and Pragmatics*.
- Bricker, Adam Michael. 2022. Knowing falsely: the non-factive project. *Acta Analytica* 37(2). 263–282. doi:10.1007/s12136-021-00471-3.
- Buckwater, Wesley & John Turri. 2020a. Knowledge, adequacy, and approximate truth. *Consciousness and Cognition* 83. 10295. doi:10.1016/j.concog.2020.102950
- Buckwater, Wesley & John Turri. 2020b. Knowledge and truth: A sceptical challenge. *Pacific Philosophical Quarterly* 101(1). 93–101.
- Chierchia, Gennaro. 2013. *Logic in Grammar*. Oxford: Oxford University Press.
- Crnič, Luka. 2021. Remarks on two approaches to NPI licensing. *Proceedings of Sinn und Bedeutung* 28. 223–237.
- Crnič, Luka. 2022. Number in NPI licensing. *Natural Language Semantics* 30. 1–46. doi:10.1007/s11050-022-09186-6
- Crnič, Luka. 2014. Against a dogma on NPI licensing. *MIT Working Papers in Linguistics* 71. 117–145.
- Crnič, Luka. 2019. Any: Logic, likelihood, and context. *Language and Linguistic Compass* 13. 1–20. doi:10.1111/lnc3.12353
- von Fintel, Kai. 1994. *Restrictions on Quantifier Domains*: University of Massachusetts at Amherst PhD dissertation.
- von Fintel, Kai & Anthony Gillies. 2021. Still going strong. *Natural Language Semantics* 29. 91–113. doi:10.1007/s11050-020-09171-x
- von Fintel, Kai & Anthony S. Gillies. 2010. Must ... stay ... strong! *Natural Language Semantics* 18. 351–383. doi:10.1007/s11050-010-9058-2
- Gajewski, Jon. 2008. NPI *any* and connected exceptive phrases. *Natural Language Semantics* 16(1). 69–110. doi:10.1007/s11050-007-9025-8

¹⁰ The account is thus consistent with *K*, the domain of *must* and *E*, being a set of propositions that are known in the same way scientific hypotheses are considered “known”, namely as truths that allow questioning (cf. Buckwater & Turri 2020b; Bricker 2022).

- Goodhue, Daniel. 2022. Isn't there more than one way to bias a polar question. *Natural Language Semantics* 30. 379–413. doi:10.1007/s11050-022-09198-2
- Grice, Paul. 1967. Logic and Conversation. In Paul Grice (ed.), *Studies in the Way of Words*, 41–58. Cambridge: Harvard University Press.
- Guerzoni, Elena. 2003. *Why even ask? On the pragmatics of questions and the semantics of answers*: Massachusetts Institute of Technology PhD dissertation.
- Gunlogson, Christine. 2002. Declarative questions. *Proceedings of SALT* 12. 144–163. doi:10.3765/salt.v0i0.2860
- Han, Chung-Hye & Maribel Romero. 2002. Verum focus in negative yes/no questions and Ladd's p/¬p ambiguity. *Proceedings of SALT* 12. 204–224. doi:10.3765/salt.v0i0.2874
- Hartman, Jeremy. 2011. The semantic uniformity of traces: Evidence from Ellipsis Parallelism. *Linguistic Inquiry* 42(3). 367–388. doi:10.1162/ling_a_00050
- Heim, Irene. 1984. A note on negative polarity and downward entailment. *Proceedings of NELS* 14. 98–107.
- Heim, Irene. 1990. Presupposition projection. In Rob van der Sandt (ed.), *Presupposition, Lexical Meaning and Discourse Processes: Workshop Reader*, University of Nijmegen.
- Heim, Irene. 1991. Artikel und Definitheit. In Arnim von Stechow & Dieter Wunderlich (eds.), *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, 487–535. Berlin: De Gruyter.
- Hirst, Daniel. 1983. Interpreting intonation: A modular approach. *Journal of Semantics* 2. 171–182. doi:10.1007/978-1-349-11098-8_7
- Huddleston, Rodney. 1994. The contrast between interrogatives and questions. *Journal of Linguistics* 30. 411–439. doi:10.1017/s0022226700016704
- Kadmon, Nirit & Fred Landman. 1993. *Any*. *Linguistics and Philosophy* 16(4). 353–422. doi:10.1007/bf00985272
- Karttunen, Lauri. 1973. Presupposition of compound sentences. *Linguistic Inquiry* 4(3). 169–193.
- Katzir, Roni. 2014. On the roles of markedness and contradiction in the use of alternatives. In S Pistoia-Reda (ed.), *Semantics, Pragmatics and the Case of Scalar Implicatures*, 40–71. Palgrave.
- Krifka, Manfred. 1995. The semantics and pragmatics of polarity items. *Linguistic Analysis* 25(3-4). 209–257.
- Krifka, Manfred. 2012. Negated polarity questions as speech act denegations. Talk at SALT 22.
- Lahiri, Utpal. 1998. Focus and negative polarity in Hindi. *Natural Language Semantics* 6(1). 57–123.
- Lasnik, Howard, Marcela A. Depiante & Arthur Stepanov. 2000. *Syntactic Structures Revisited*. MIT Press.

- Lee, Young-Suk & Laurence R. Horn. 1994. *Any* as indefinite + *even*. Manuscript Yale University.
- Matushansky, Ora. 2006. Head movement in linguistic theory. *Linguistic Inquiry* 37. 69–109. doi:10.1162/002438906775321184
- Nicolae, Andreea. 2013. *Any Questions? Polarity as a Window into the Structure of Questions*: Harvard University PhD dissertation.
- Quirk, Randolph & Sidney Greenbaum. 1973. *A Concise Grammar of Contemporary English*. Harcourt, Brace and Jovanovich.
- Roelofsen, Floris. 2018. NPIs in questions. Talk given at NYU Linguistics Colloquium.
- Roelofsen, Floris & Sunwoo Jeong. 2022. Focused NPIs in statements and questions. To appear in *Journal of Semantics*.
- Romero, Maribel & Chung-Hye Han. 2004. On negative yes/no questions. *Linguistics and Philosophy* 27(5). 609–658. doi:10.1023/b:ling.0000033850.15705.94
- van Rooy, Robert. 2003. Negative polarity items in questions: Strength as relevance. *Journal of Semantics* 20(3). 239–274. doi:10.1093/jos/20.3.239
- Safarova, Marie. 2005. The semantics of rising intonation in interrogatives and declaratives. *Proceedings of Sinn und Bedeutung* 9. 355–369.
- Schwarz, Bernhard. 2017. On question exhaustivity and NPI licensing. *Proceedings of Amsterdam Colloquium* 21. 405–414.
- Travis, Lisa. 1984. *Parameters and effects of word order variation*: Massachusetts Institute of Technology PhD dissertation.
- Trinh, Tue. 2005. *Aspects of Clause Structure in Vietnamese*: Humboldt-Universität zu Berlin MA thesis.
- Trinh, Tue. 2014. How to ask the obvious - A presuppositional account of evidential bias in English yes/no questions. *MIT Working Papers in Linguistics* 71. 227–249.
- Trinh, Tue. 2019. Exhaustification and contextual restriction. *Frontiers in Communication* 4. 1–7. doi:10.3389/fcomm.2019.00047

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