Epistemic bias anti-licenses NPIs in polar questions

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1 Setting the stage

2 NPI licensing

3 Intervention by E

4 Interim summary

5 Declarative & negated questions

Consensus

- NPIs are restricted in statements, unrestricted in (polar) questions

(1) a. John is reading something by Chomsky
b. #John is reading anything by Chomsky

(2) a. Is John reading something by Chomsky?
b. Is John reading anything by Chomsky?

Novel observation

- Epistemic bias anti-licenses NPIs in polar questions

(3) 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) Yeah. Is he reading something by Chomsky?
(i) #Yeah. Is he reading anything by Chomsky?

(4) I am talking with my friend on the phone and hear what sounds like chewing.

a. Are you eating something?
b. #Are you eating anything?

Gist of explanation

- Biased questions contain a covert modal *E* whose semantics is akin to that of overt *e*pistemic *must*

(5) I am talking with my friend on the phone and hear what sounds like chewing.

a. Are you eating something?
b. You must be eating something. Are you?

- *E* intervenes between *whether* and the NPI it licenses

(6) a. *whether* [... NPI ...]
b. **whether* [*E* [... NPI ...]]

Structure of talk

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2. NPI licensing
3. Intervention by E
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5. Declarative & negated questions

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Subdomain alternatives

- NPIs are existential quantifiers with covert domain restriction and subdomain alternatives

(7) a. $any_D = \lambda P.\ \lambda Q.\ \exists x \in D : Px \wedge Qx$
b. $Alt(any_D) = \{any_{D \cap C} \mid C \neq D\}$

- Alternatives of sentences containing NPIs are constructed by point-wise composition

(8) $Alt(John\ read\ any_D\ book)$
$= \{John\ read\ any_{D \cap C}\ book \mid C \neq D\}$

Kadmon and Landman (1993)

Association with *MAX*

- NPIs associate with a covert operator, *MAX*, which requires its prejacent be "maximally strong" among the alternatives (cf. Heim 1984, Lee and Horn 1994, Krifka 1995, Lahiri 1998, Crnič 2014, 2019)

(9) $MAX(p)$ is defined only if $\forall q \in Alt(p) : p \leq q$
When defined, $MAX(p) = p$

- Relative strength is defined for both statements and questions (Roelofsen 2018, Roelofsen and Jeong 2022)

(10) $X \leq Y$ iff either (i) or (ii) holds
(i) $X \subseteq Y$
(ii) $\bigcup X \subseteq \bigcup Y$

cf. also van Rooy (2003), Schwarz (2017)

NPIs in statements

- NPIs must be in the scope of a DE function

(11) $MAX(\textit{John read any}_D\ \textit{book})$ is defined only if
$\forall C \neq D : ANY_D \subseteq ANY_{D \cap C}$ = unsatisfiable

(12) $MAX(\textit{John didn't read any}_D\ \textit{book})$ is defined only if
$\forall C \neq D : \neg ANY_D \subseteq \neg ANY_{D \cap C}$

$ANY_D = \textit{John read any}_D\ \textit{book}$

NPIs in polar questions

- Polar questions are tautological

(13) $MAX(whether(John\ read\ any_D\ book))$ is defined only if
$\forall C \neq D : \underbrace{\bigcup(whether(ANY_D))}_{\top} \subseteq \underbrace{\bigcup(whether(ANY_{D \cap C})}_{\top}$

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Main ideas

- There is a covert epistemic modal E which is akin to epistemic *must*
- Biased questions are parsed as *whether*(E(p))
- E intervenes between *whether* and NPI
  - MAX(*whether*(ANY_D)) is defined
  - MAX(*whether*(E(ANY_D))) is not defined

von Fintel and Gillies' (2010) analysis of *must*

- F&G distinguish between what is **directly known** (the kernel) and what is **known** (the modal base)

(14) a. What is **directly known**, K, is a non-closed set of propositions
b. What is **known** is $\bigcap K$

(15) $must_K(p)$ is defined only if $\neg\exists q \in K : q \Rightarrow p \vee q \Rightarrow \neg p$
When defined, $must_K(p) = 1$ iff $\bigcap K \Rightarrow p$

cf. also von Fintel and Gillies (2021)

K accomodation

- $must_K(p)$ sounds odd to the extent that it is hard to accomodate K

(16) I see John writing with his left hand

a. John must be left-handed
   $K = \{$... 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
   $K = \{$... ~~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
   $K = \{$... John is writing with his left hand, people who write with their left hand are right-handed ...$\}$

K and context

- Propositions in K do not have to be known from facts about the immediate context

(17) A: Did you read John's email?
B: Yes. He must be under stress.
(i) John's email: "... I started smoking again... "
(ii) #John's email: "... I am under stress... "

Introducing E

- E presupposes what *must* asserts

(18) $must_K(p)$ is defined only if $\neg\exists q \in K : q \Rightarrow p \vee q \Rightarrow \neg p$
When defined, $must_K(p) = 1$ iff $\bigcap K \Rightarrow p$

(19) $E_K(p)$ is defined only if $\bigcap K \Rightarrow p$
When defined, $E_K(p) = p$

cf. Bassi et al. (2021, 2023) for similar relationship between **EXH** and **only**

E and indirectness

- E does not require indirectness

(20) I see John writing with his left hand

a. E_K John is left-handed.

b. E_K John is writing with his left hand.

E and biased questions

- Questions epistemically biased towards p are parsed as $whether(E_K(p))$

(21) a. $whether(p) = \{p, \neg p\}$
b. $\neg p = 1$ iff $p = 0$
c. $whether(E_K(p)) = \{E_K(p), \neg E_K(p)\}$
presupposition: $\bigcap K \Rightarrow p$

- A question is epistemically biased towards p if it gives rise to the inference $\bigcap K \Rightarrow p$

cf. Trinh (2014)

Parallels

- K accomodation works similarly for $must_K(p)$ and $whether(E_K(p))$

(22) I see John writing with his left hand

a. (i) Is John left handed?
   (ii) John must be left-handed.

b. (i) #Is John right-handed?
   (ii) #John must be right-handed.

(23) A: Did you read John's email?

B: (i) Yes. He must be under stress.
   (ii) Yes. Is he under stress?

Differences

- The difference between $must_K(p)$ and $whether(E_K(p))$ emerges in cases where some p is settled by some proposition in K

(24) I see you smoking
$K = \{$you are smoking, ... $\}$

a. #You must be smoking again. $must_K(p)$
b. Are you smoking again? $whether(E_K(p))$

Intervention by E

- E makes the polar question non-tautological

(25) $MAX(whether(John\ read\ any_D\ book))$ is defined only if
$\forall C \neq D : \underbrace{\bigcup(whether(ANY_D))}_{\top} \subseteq \underbrace{\bigcup(whether(ANY_{D \cap C}))}_{\top}$

(26) $MAX(whether(E_K(John\ read\ any_D\ book)))$ is defined only if
$\forall C \neq D : \underbrace{\bigcup(whether(E_K(ANY_D)))}_{\bigcap K \Rightarrow ANY_D} \subseteq \underbrace{\bigcup(whether(E_K(ANY_{D \cap C})))}_{\bigcap K \Rightarrow ANY_{D \cap C}}$

$\forall C \neq D : \bigcap K \Rightarrow ANY_D \subseteq \bigcap K \Rightarrow ANY_{D \cap C}$ = unsatisfiable

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Interim summary

- Biased questions do not license NPIs
  - Biased questions are parsed as $whether(E_K(p))$
  - ANY_D requires MAX
  - $MAX(whether(E_K(ANY_D)))$ has an unsatisfiable presuposition
- English has a covert counterpart of $must_K$: E
  - $must_K(p)$ asserts $\bigcap K \Rightarrow p$ and presupposes $\neg\exists q \in K : q$ settles p
  - $E_K(p)$ presupposes $\bigcap K \Rightarrow p$

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Default bias and NPI anti-licensing

- Declarative questions are biased by default (Gunlogson 2002, Safarova 2005, Trinh 2014, Goodhue 2022)

(27) I have no evidence regarding John's handedness

a. Is John left-handed?
b. #John is left-handed?

(28) John's email: "I injured my left hand so I couldn't hand-write ... "

A: Did you read John's email?
B: I did. He's left-handed?

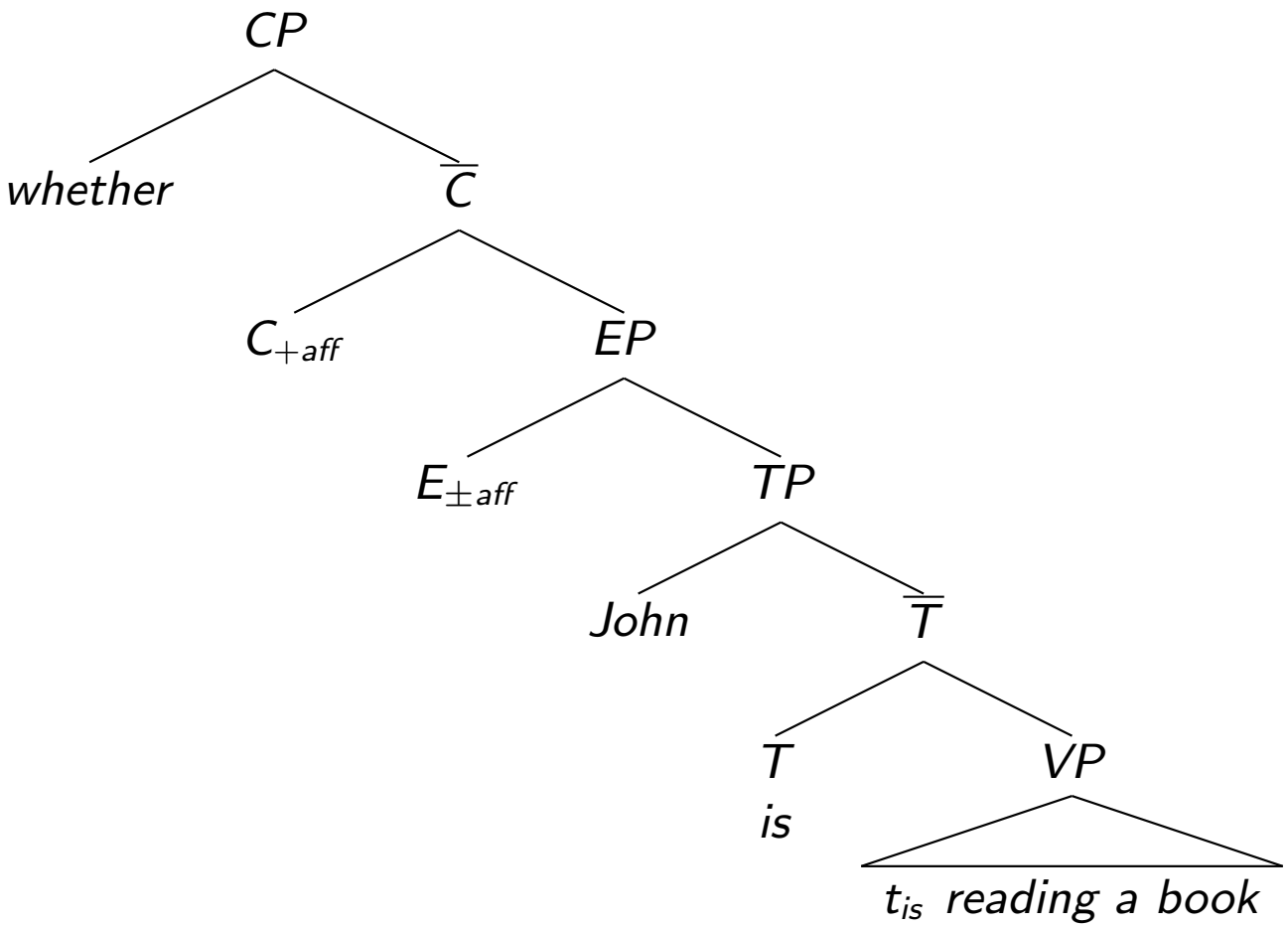
- Declarative questions do not license NPIs (Hirst 1983, Huddleston 1994, Gunlogson 2002)

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

Morphology of C and E

- C must attract, E may attract
  $\Rightarrow$ a declarative question has to be parsed as $whether(E_K(p))$

(30)



Maxim of Manner

- We predict that negation forces a question to become biased

(31) I know nothing about John's marital status

a. Is John married?
b. Is John single?
c. #Is John not married? → I see him browsing Tinder
d. #Is John not single? → I see him wearing a ring

- Maxim of Manner ⇒ do not use negation for no reason!

(32) a. $whether(p) = whether(\neg p)$
b. $whether(E_K(p)) \neq whether(E_K(\neg p))$

cf. Trinh (2014) for details

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