Epistemic bias in embedded outside negation polar questions
Hans van de Koot (UCL), Harris Constantinou (Leeds University) & Yan Zhang (UCL)

As is well-known, sentences denoting polar alternatives can be embedded under a wide range of predicates and can also appear in subject position. These environments all allow 'inside negation' polar questions (INPQs), which are typically associated with a bias towards the negative alternative and license NPIs. However, their 'outside negation' counterparts (ONPQs), which have a bias towards the positive answer and do not license NPIs (Ladd 1981), show variable acceptability.

(1) a.   John is wondering if/whether Mary doesn't like spinach (either/too).
     b.   John is asking if/whether Mary doesn't like spinach (either/too).
     c.   John knows if/whether Mary doesn't like spinach (either/*too).
     d.   John remembers if/whether Mary doesn't like spinach (either/*too).
     e.   Whether Mary doesn't like spinach (either/too) is not very clear to John.

ONPQs exhibit a further peculiarity: the outside negation must outscope a quantified subject in the same way as a subjective epistemic modal (Epistemic Containment; von Fintel & Iatridou 2003) (for discussion of the distinction between subjective and objective modality, see Lyons 1977, Papafragou 2006, Tancredi 2007 and Anand & Hacquard 2009).

(2) [Context: I had 30 students in my final year syntax class. They all passed the
     coursework, but to obtain their degree, they had to pass my exam. For about 10 of
     them, I was almost certain that they would. My TAs marked all the scripts and I ask ...]
     #Haven't fewer than half of the students managed to pass the exam(, too)?

In addition, they trigger a scope freezing effect not found with INPQs, but which has previously been observed with subjective epistemic adverbs. In particular, an instance of outside negation, just like a subjective epistemic (adverb) (see (4)), can give rise to scope freezing between two QPs even if it does not c-command either of them (Constantinou & Van de Koot 2015). We illustrate this using Dutch, where both epistemic adverbs and negation in ONPQs have very free placement. The data in (3) show acceptability and scope judgments for a yes/no question containing an indefinite and a universal, which may be either read as INPQ or an ONPQ. On the ONPQ reading, only (3a), with the very high negation not found with INPQs, allows inverse scope. When negation is sandwiched between the two quantifiers, as in (3b), scope inversion is blocked for both INPQs and ONPQs, although quite possibly for very different reasons. But interestingly, low negation (as in (3c)) does not block scope inversion in INPQs, but does do so in ONPQs.

(3) a.   Had   niet tenminste één   student ieder   artikel gelezen?
           had   not   at-least   one   student every   article read
           INPQ: *
           ONPQ: ∃>∀; ∀>∃
     b.   Had   tenminste één   student niet ieder   artikel gelezen?
           had   at-least   one   student not   every   article read
           INPQ: ∃>∀;*∀>∃
           ONPQ: ∃>∀;*∀>∃
     c.   Had   tenminste één   student ieder   artikel niet gelezen?
           had   at-least   one   student every   article not   read
           INPQ: ∃>∀; ∀>∃
           ONPQ: ∃>∀;*∀>∃

(4) a.   Waarschijnlijk heeft tenminste één   student ieder   artikel gelezen.
           probably   has   at-least   one   student every   article read
           (∃>∀;∀>∃)
     b.   Tenminste één   student heeft waarschijnlijk ieder   artikel gelezen.
           at-least   one   student has   probably   every   article read
           (∃>∀;*∀>∃)

c. Tenminste één student heeft ieder artikel waarschijnlijk gelezen.
at-least one student has every article probably read
($\exists > \forall; *\forall > \exists$)
'At least one student has probably read every article.'

Constantinou & Van de Koot account for Epistemic Containment and related scope freezing effects with subjective epistemic modals by (i) assuming that these modals must mark clausal scope (see also Lyons 1977 and much other work) and (ii) adopting a theory of scope that predicts minimality effects: if QP_2 is in the scope extension path of QP_1, then QP_2 cannot extend its scope as well (effectively the Condition on Scope Shift of Neeleman & Van De Koot 2012).

The present paper argues that the negation found in ONPQs is a special subjective epistemic modal that must mark scope over polar alternatives (as opposed to a proposition). This has a number of consequences.

First, the Condition on Scope Shift correctly predicts that negation in ONPQs should give rise to the containment effect in (2) and to the scope freezing effects observed in (3).

Second, the embedding restrictions observed in (1) can now be attributed to the very wide scope of a subjective epistemic, which triggers incompatibility with embedding predicates that force an 'objective' reading of their complements. As discussed by Anand and Hacquard (2009), certain predicates, such as *assume* or *imply*, signal a discourse move to update the common ground with the proposition in their complement. These complements can therefore not simultaneously be the target of a subjective modal attitude. We argue that the matrix predicates in (1c,d) similarly require that the polar alternatives in their complement be interpreted as 'objective' because one of them has the ability to update the common ground. We propose an implementation of these ideas that allows us to derive the embedding restrictions from the Condition on Scope Shift.

Third, it is predicted that the embedding restrictions in (1c,d) are obviated if the matrix predicate is altered in such a way as to invalidate the objective reading of the polar alternatives. This prediction is borne out, as shown in (5) below, where the objective reading is undermined through negation, epistemic downgrade, and question formation respectively:

(5) a. *John knows if/whether Mary doesn't like spinach (too).
    b. John doesn't know if/whether Mary doesn't like spinach (too).
    c. John might know if/whether Mary doesn't like spinach (too).
    d. Does John know if/whether Mary doesn't like spinach (too)?

Fourth, like subjective epistemics, outside negation is indexical in the sense that the possible worlds in the conversational background are restricted to what is known at the time of utterance. This explains why in (6) the expression of an epistemic bias is not blocked: the future 'tense' implies that the polar alternatives do not have the potential to update the common ground at speech time.

(6) John will know tomorrow if/whether Mary doesn't like spinach (too).

Finally, the scope encoding we propose may shed light on the remarkable phenomenon that the marginal status of epistemic modals in yes/no-questions can be much improved through the addition of outside negation:

(7) a. ??Must Mary be home yet?
    b. Mustn't Mary be home yet?

This could be analyzed as a kind of parasitic scope-taking phenomenon (modal concord; Zeijlstra 2008). A subjective epistemic modal is normally constrained to take scope over a proposition and therefore cannot outscope a question operator, yielding only very marginal acceptability. However, in (7b), our encoding of scope allows the scope of the subjective epistemic modal to coincide with that of the outside negation (which scopes over the polar alternatives).