Intervention effects in how-many questions and the syntax/semantics interface

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*I could not have developed the ideas presented here without benefiting from my exchanges with Danny Fox, who, together with Martin Hackl, found out that modal contexts can get rid of negative islands in how-many questions.

1. The problem

How-many questions are sometimes scopally ambiguous (Heycock 1995, Fox 1999):

(1) How many pictures has Mary decided to show?
   a) wide-scope for the numerical variable:
      For what n are there n pictures such that Mary has decided to show each of them?
   b) narrow-scope for the numerical variable:
      For what n has Mary decided to show n pictures?

French can disambiguate a sentence like (1) in favour of the b) reading by reconstructing “overtly” the restrictor of the interrogative phrase into its base-position:

(2) Combien Marie a-t-elle décidé de montrer de photos?
   How many Marie has-she decided to show of photos

An intervening negation can block the “reconstructed” reading:

(3) *Combien Pierre n’a-t-il pas d’enfants?
   How many Pierre has he not of children

Rullmann (1995) accounts for this intervention effect by stipulating that a question whose logical form is of the type ‘for what n, P(n)’ (where P is a predicate over numbers) asks for the maximal number n such that ‘P(n)’ is true. Whenever the numerical variable occurs in a downward-entailing context, there can be no such maximal number, and the question is infelicitous. Beck & Rullmann (1999), however, noted the existence of felicitous how-many questions in which the numerical variable occurs in a DE context:

(4) How many eggs does it suffice to have in order to bake a good cake?
   (4) asks for the minimal number n such that having n eggs suffices. This effect suggests that a question of the form ‘for what n, P(n)’ actually asks for the number n such that (a) ‘P(n)’ is true and (b) for any m such that ‘P(m)’ is true, ‘P(n)’ entails ‘P(m)’. But then, the intervention effect in (3) is left unaccounted for. A purely syntactic account, based for instance on “relativized minimality”, fails to predict that negation doesn’t always block the reconstructed reading; as noticed by Danny Fox and Martin Hackl (Danny Fox, p.c., Fox & Hackl, in progress), intervention effects disappear in certain modal environments:

(5) Combien es-tu sûr de ne pas vouloir d’enfants?
   How many are you sure not to want of children

(6) How many children are you sure you don’t want to have?
2. The solution

I will show that all the relevant facts follow from a) the existence of a covert operator whose semantics and syntactic distribution parallel that of the adverb *only* and b) the hypothesis that how-many questions presuppose the uniqueness of their correct answers.

Note first that not only are (5) and (6) fine, they have two distinct readings:

(7) a. For which n are you sure you don’t want to have exactly n children?
   
b. For which n are you sure you don’t want to have n or more than n children?

This ambiguity, I argue, is related to that of the following declarative sentence:

(8) I am sure I don’t want to have 4 children
   
a) I am sure I don’t want to have exactly 4 children
   
b) I am sure I want to have less than 4 children, but I do not exclude having 3

The second part of b) is arguably an implicature: (9) being a scalar alternative of (8) that a-symmetrically entails (8), the hearer infers the negation of (9):

(9) I am sure I don’t want to have 3 children

Notice that this kind of implicature does not always arise in negative contexts:

(10) Peter doesn’t have 4 children

According to standard Gricean accounts, (10) is to be compared to (11), which is strictly stronger, and (11) should be inferred to be false, i.e. (10) should end up being interpreted as conveying (12):

(11) Peter doesn’t have 3 children

(12) Peter has exactly 3 children

Yet (10) does not implicate (12), but something weaker, such as “Peter has at least one child”.

I claim that the implicature in (8)b derives from the presence of a silent operator, EXH, that asserts that the proposition within its scope is both true and the most informative one among its true scalar alternatives. EXH is semantically very similar to *only* (see also Van Rooy 2002):

(13) I am only sure that I don’t want to have 4 F children

>> I am sure I don’t want to have 4 children, but I don’t exclude having 3

The fact that (12) cannot be inferred from (10) shows that EXH cannot be inserted just above negation in (10), and is also a motivation for its existence (since if general Gricean considerations of conversational rationality were sufficient to yield the reading (8b), they should equally apply to (10)). This restriction on the distribution of EXH is expected if, as I assume, EXH has the same distribution as *only*; indeed, *only* (and French *seulement*) cannot occur just above negation if it associates with the numeral:

(14) (*Only) Peter (*only) does (*only) not (only) have (only) 4 F children

Note that (10) can also mean that Peter does not have *exactly* 4 children, which corresponds to the case where EXH is introduced below negation (which is possible, as shown in (14)).

All the facts reviewed here, and others, are then accounted for by the following assumption:

(15) A question whose logical form is ‘How many n [s……n…..]’ presupposes that it has a unique true answer, i.e. that there is a unique n such that ‘[s……n…..]’ is true.

In general, the uniqueness presupposition associated with a how-many question won’t be satisfied unless EXH is present. In (3), EXH can be inserted only below negation (given (14)), which yields the contradictory presupposition that there is a unique number n such that Peter does not have exactly n

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1 When I started to develop the present proposal, Fox and Hackl were already investigating an alternative account, based on what they call the “universal density of measurement scales”. In the most recent version of their proposal, Fox & Hackl (in progress) argue that the distribution of ‘only’ follows, at least in part, from the “universal density of measurement scales”. Though I don’t want to commit myself to the same hypothesis, the two proposals turn out to share the idea that there is a close connection between the distribution of *only*, scalar implicatures, and intervention effects in how-many questions.
children. On the other hand, in (5) and (6), EXH can be inserted in two distinct positions, since it has
the same distribution as only (and seulement in French):

(16) I am (only) sure I don’t want to have (only) four children

Therefore (5) and (6) presuppose either a) that there is a unique number n such that I am sure I
don’t want to have exactly n children or b) that there is a unique number n such that I am sure I don’t
want to have n children and I am not sure I don’t want to have n-1 children. None of these
presuppositions is a logical contradiction, so that both corresponding readings ((7a) & (7b)) can arise
in some contexts.

3. An additional prediction

(17) Combien chaque étudiant a-t-il lu de livres ?

How many each student has-he read of books

Putting aside the pair-list reading, (17) should be interpreted, on standard accounts, as asking for
the highest number n such that every student read at least n books. Suppose John read exactly 3 books,
Mary 4 books and Jack 5. Then ‘3’ should be the answer. But answering with ‘3’ actually implies that
every student read exactly 3 books, something that is not predicted by the standard account but that my
proposal does predict, since EXH, like seulement, can be inserted only below the subject, yielding the
presupposition that every student read the same number of books. On the other hand, suppose I am
sure every student read at least 3 books and some more than 4 books, and that I know nothing else.
Then I can answer ‘3’ to (18), which is expected since EXH can be inserted above sûr:

(18) Combien es-tu sûr que chaque étudiant a lu de livres ?

How many are-you sure that each student read of books

My proposal can be extended so as to explain why some potential scope-ambiguities in
comparative sentences are missing (Schwarzschild & Wilkinson 2002, Heim 2003) and deal with
previously unnoticed facts regarding comparative sentences.

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