

2

A Puzzle about Indefinites^{*}

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1 Introduction

Long distance indefinites (i.e. indefinites whose scopal properties don't seem to obey the canonical constraints associated with quantified NPs) have been analyzed in recent proposals in terms of choice functions. There is, however, disagreement as to whether such functions are subject to quantificational closure (more specifically, existential closure) and if so, at which sites. On the one hand, Winter (1997) and Reinhart (1997) argue that choice functions are subject to existential closure freely, i.e. at any admissible scope site (including "intermediate" ones). On the other hand, Kratzer (1998) proposes that choice functions are left free and their interpretation is to be obtained through contextual clues; a closely related proposal can be found in Matthewson (1999), who argues on the basis of data from a Salish language that such functions are closed existentially but only at the topmost possible level. In this paper, I address this disagreement and point to a puzzle. First, I'll argue that a certain, familiar range of contexts (roughly, the downward entailing (DE) ones) require for their interpretation *intermediate* quantificational closure of choice functions. So, Reinhart and Winter's approaches appear to be right for such contexts. Second, I'll point to a number

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of other cases where the behavior of indefinites appears to be difficult to make sense of, if one has free quantificational closure over choice functions. So an approach like Kratzer's seems to be right for such cases. This situation is puzzling. One theory seems to be right for a set of cases (approximately, the DE contexts) the other seems to be right for other cases. The empirical generalization that emerges is quite interesting and, to my knowledge, it has gone unnoticed so far. The outcome of our discussion will be the proposal of a certain constraint on existential closure, constraint that seems to be formally simple and to have a broad empirical coverage. At present, however, I have no real explanation as to how such a constraint is to be derived.

The present paper is structured as follows. In the remainder of this section, some relevant background will be provided. In section 2, we'll look at long distance indefinites in DE context and argue that without intermediate existential closure one cannot get their truth conditions right. In section 3, we'll first provide some new evidence in favor the idea that indefinites have hidden parameters and that existential closure is not freely available. Finally, we will discuss some possible ways in which the generalizations that emerge might be accounted for.

As discussed in much recent literature,¹ the scope of indefinites is not subject to island constraints. There are a number of examples, by now fairly familiar, that show this:

- (1) a. Every linguist studied every conceivable solution that some problem might have
- b. Everyone is convinced that if a friend of mine comes to the party, it will be a disaster.

Sentence (1a) is a version of Abusch's "professor" example: *every professor rewarded every student who read some book on his reading list*. Sentence (1b) is a variant of examples discussed extensively by Reinhart and Winter. The indefinites *some problem* and *a friend of mine* in (1) are inside islands. Yet they can be construed as having scope outside the islands that contain them. In particular, they can be construed as having scope either at the root (what traditionally has been called the "specific" or "referential" interpretation) or at some intermediate level within the scope of the matrix subject. The intermediate readings are those we are mostly interested in. They can be rendered in standard logical representations as follows.

¹Much of the recent work on the scopal properties of indefinites developed as a reaction to Fodor and Sag (1982). See, e.g., King (1998), Ludlow and Neale (1991), Ruys (1992). A particularly influential paper is Abusch (1993).

- (2) a. $\forall x[\text{linguist}(x) \rightarrow \exists y[\text{problem}(y) \wedge \forall z [\text{solution to } (z,y) \rightarrow \text{studied } (x,y)]]]$

For every linguist x , there is a particular problem y (possibly a different one for each linguist) such that x studied every possible solution to y .²

- b. $\forall x [\text{person}(x) \rightarrow \exists y [\text{friend of mine}(y) \wedge \text{convinced } (x, \wedge [\text{come to the party } (y) \Rightarrow \text{it will be a disaster}])]]$ ³

For every (relevant) person x , there is a certain friend of mine y (possibly, a different one for each person) such that x is convinced that if y comes to the party, it will be a disaster.

It is also known that these readings (whose informal paraphrase is given under the respective formulas) can be favored by a variety of factors. One is the insertion of modifiers like *particular* or *certain* after *some* or *a*. Another is the presence of a pronoun in the nominal complement of the determiner (as in, e.g., “every linguist considered every conceivable solution that some problem that intrigued him or her had”). Yet another is a particular intonational contour. For example, the intermediate scope reading for *some* in (1a) is favored by a raising pitch on it (similar to the one that gives rise to “scope inversion” phenomena -- see, e.g., Krifka 1998 and references therein). But even in the absence of these factors, if the relevant reading is suitably primed through relevant information in the context, it becomes readily available, as the following dialogue illustrates.⁴

²Formula (2a) can be made trivially true by choosing an unsolvable problem as value for y . Here and throughout I assume that it is a general presuppositional requirement associated with quantifiers like *every* that their restriction be non empty (i.e. non trivial). In the case at hand, this means that only solvable problems are under consideration. The issue of existential requirements of strong quantifiers is an aspect of the projection problem for presuppositions.

³I use the symbol ‘ $\Rightarrow$ ’ to represent the Stalnaker/Lewis conditional.

⁴This last statement is somewhat controversial. E.g. Matthewson (1999)’s discussion of Salish might be taken to suggest that in general the presence of something like an overt pronoun inside the restriction of an indefinite is not just a factor that favors (intermediate) long distance readings, but something which is *required* for such readings to be available. In languages like English or Italian, it doesn’t appear to be so. This seems to entail that the theory of long distance indefinites would have to countenance language particular provisos/paramaters in order for it to apply to both Salish and English.

- (3) a. You know, linguists are really systematic. Lee studied every single possible

solution to the problem of weak crossover, Kim every solution to the problem of donkey sentences,

- b. So, every linguist studied every solution that some problem has.

If these are the facts, the question then is how these readings come about. Are we to assume that standard scope shifting operations (such as, say, Q(quantifier) R(aising)) treat indefinites differently from other NPs? Or rather, might it not be the case that grammar has just one exceptionless mechanism for scope assignment, but the lexical semantics of indefinites allows interpretations equivalent to those where standard constraints on scope appear to be violated? A promising response along these second lines has been put forth in Kratzer (1998), Reinhart (1997), and Winter (1997), whose proposals we will be discussing here. What these authors suggest is that indefinites have an interpretation where they contribute choice functions (i.e. functions that select a member from a set). So, for example, *some man* or *a man* get interpreted as $f(\text{man})$, where f is a variable ranging over choice functions. Consequently, a sentence like (4a) can have an initial semantic representation as shown in (4b):

- (4) a. Some man walked in.

- b. walk in ($f(\text{man})$)

The authors mentioned above differ, however, in what happens next. According to Kratzer (1998), nothing happens and (4b) can be essentially the final semantic representation of (4a). The value of f is to be supplied by the context and should be, very roughly, something like the speaker's intended reference. To make this more perspicuous, one might parameterize the function in (4b) to the speaker as follows:

- (5) walk in ($f(\text{sp}, \text{man})$)

where $f(\text{sp}, \text{man})$ selects from the set of men the one that sp saw, or has in mind, etc.

According to Reinhart and Winter, instead, the choice function associated with *some* is eventually existentially closed and we wind up with a semantic representation of the following sort:

- (6) a. $\exists f$ [walk in ($f(\text{man})$)]

- b. $\exists x$ [$\text{man}(x) \wedge \text{walk in } (x)$]

Under suitable assumptions on the nature of choice functions⁵, (6a) says that there is a way of choosing a member x from the set of men which makes *walk in* ($f(\text{man})$) true and this is equivalent to the more familiar (6b).

How do choice functions help in predicting the relevant readings for the sentences in (1)? The answer to this question differs on the two lines of analysis just sketched. Let us consider first the Reinhart-Winter line. Since, according to them, choice functions can freely be existentially closed at any site, by applying existential closure at the level, say, of the matrix VP in (1a), we get:

- (7) $\forall x[\text{linguist}(x) \rightarrow \exists f \forall z [\text{solution to } (z, f(\text{problem})) \rightarrow \text{studied}(x, z)]]$

for every linguist x there is a way of choosing a problem f such that x studied every solution to $f(\text{problem})$.

This yields the desired interpretation, and that is the end of the story. On Kratzer's approach, where intermediate existential closure is not available, one has to resort to a different strategy, which crucially involves exploiting the option of parameterizing choice functions. The f in (5) is a function from individuals and sets into some member of the set. In the case at hand, the individual is whoever utters (5). But such individual can also be picked in different ways. In the general case, one can think of the parameter of choice functions as a null pronominal element. As for overt pronouns, such a null pronominal element can remain free (and hence its value must be contextually supplied) or be bound by some C-commanding NP. In the first case (represented by (5)), we get the referential reading. The second case yields the desired intermediate scope effect:

- (8) a. $[\text{every linguist}_i] [\text{every solution}_j \text{ that some}_i^1 \text{ problem has } t_i] t_i \text{ studied } t_j$

- b. $\forall x[\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

- c. for every linguist x $f(x, \text{problem})$ selects a problem such that x studied every solution to $f(x, \text{problem})$.

In (8a) I indicate in a schematic form the LF of the sentence under consideration. Such LF is deriving by scoping (via Quantifier Raising) the NPs out

⁵One has to worry about the case where there are no men. There are a variety of approaches one can adopt (see, e.g., Winter (1997, 434 ff.)). However, I won't discuss this issue here as it is orthogonal to our concerns.

of their spell out (i.e. surface) positions. The parameter associated with the choice function is marked as superscript on *some* (to be thought of as a null pronominal element); such element is bound by the subject NP. The function variable is marked as a subscript on *some* (but when no ambiguity arises, I will omit marking explicitly the function variable). The interpretation of (8a) is given in (8b), whose informal paraphrase is provided in (8c). *f* is a function that maps every linguist *x* into a problem (e.g. the problem that intrigues *x* the most, or something of that sort). We can leave the function *f* free as in (8c). Or, as advocated by Matthewson (1999), we can close it off existentially at the top level as shown below:

- (9) $\exists f \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

Personally, I find the representation in (9) more perspicuous. One can utter sentences like (1a) without having any clue as to which problem every linguist considered every solution to. Moreover, there might be more than one problem per linguist (so that the function is not unique).⁶ Be that as it may, I will keep treating the representations in (8b) and (9) on par, for the point to be made extends to both of them. The formulas in (8b) and (9) are equivalent to (6).⁷ This equivalence is based on a result (see Skolem 1970), which shows that, under certain conditions, narrow scope existential quantifiers can be replaced with wide scope quantification over functions from individuals into individuals (called "Skolem functions").⁸ I will call parameterized functions such as those in (9) "Skolemized choice functions". The more salient the context makes the hidden parameter, the easier it will be to get the intermediate scope reading. Obviously, the presence of an overt pronoun in the restriction of an indefinite, as in (10), will make such contextual parameter particularly salient:

- (10) a. Every linguist studied every solution that some problem that intrigued him or her might have.
 b. Every professor rewarded every student that read some book on his reading list (Abusch 1993).

⁶J. Stanley in commenting on K. Von Stechow's paper at the 1999 Cornell conference on the semantics/pragmatics interface, gave further arguments against leaving choice functions free.

⁷Strictly speaking, only (9) is. (8b) needs further pragmatic assumptions to be able to claim that it can be functionally equivalent to (6).

⁸Use of Skolem functions has been advocated in a variety of cases in linguistic semantics. Perhaps its most widespread use is in the analysis of functional questions and list readings of questions (see, e.g., Groenendijk and Stokhof 1984, Engdahl 1986, Chierchia 1993, Dayal 1996). Other interesting uses of such functions can be found in, e.g., Sharvit (1997).

These examples have been object in the literature of some discussion whose result might be worth summarizing briefly here. The presence of a pronoun as in the sentences in (10) might seem to make Skolemization (i.e. implicit parameters) superfluous. The reason for that is that the denotation of the relevant phrase will vary with the value of the pronoun. Thus, for example, the denotation of *problem that intrigued him or her* in (10) will vary with what linguist gets selected as value of *him or her*. If we translate the indefinite as $f(\text{problem that intrigued } her_n)$ we might get the reading we want, without positing a hidden parameter. However, as pointed out by P. Casalegno and K. Von Stechow, and discussed in Kratzer (1998), this is not so. To see why, consider example (10a) in a situation in which it happens to be the case that the set of problems that intrigued two linguists (say, A and B) is the same (say, weak crossover and donkey sentences); however, A studied every solution to the problem of weak crossover and B every solution to the problem of donkey sentences. In such a situation, sentence (10a) is intuitively true. But, without Skolemization, we don't get the right truth conditions. For, $f(\text{problem that intrigued } her_n)$, where her_n is A or B, would be the same as $f(\{\text{weak crossover, donkey sentences}\})$. Since f is a function, it would have to give a unique value. But whichever value f chooses, it would go wrong either for linguist A or for linguist B and the sentence would wrongly be predicted to be false. Skolemization solves this problem, for we can have:

(11) $f(A, \{\text{weak crossover, donkey sentences}\}) = \text{weak crossover}$

$f(B, \{\text{weak crossover, donkey sentences}\}) = \text{donkey sentences}$

What emerges from this discussion is that Skolemization seems to be necessary, if one wants to get rid of intermediate existential closure over choice functions. One might try to argue that hidden contextual parameters are highly restricted; for example one might say that with *some* or *a* they are available only when there is an overt pronoun in their restriction. I believe that for English (or English like languages) this would be too strong. Long distance readings of indefinites can be made salient also through other contextual clues (as illustrated by example 3)).

Summing up, we have a prima facie successful analysis of indefinites that reduces their peculiar scopal properties to plausible assumptions on their lexical meaning (enabling us to maintain that scope shifting operations apply uniformly to all quantified NPs). In fact, we have *two* prima facie successful analyses. One is based on simple choice functions plus free existential closure. The other is based on Skolemized choice functions with no (or only topmost) existential closure. The question is whether we can decide between these two strategies on empirical grounds. Below I discuss relevant

evidence which, however, patterns in ways that are surprising from the perspective of either of the approaches considered. However, before going on, I should add that there are a variety of other issues on which the two approaches we are considering differ. For example, they differ as to whether the choice function interpretation is the only one; they also differ on the treatment of *de dicto/de re* ambiguities. For all these issues there are, conceivably, empirical facts that may help in settling them. But we will only focus here on the problem of intermediate quantificational closure of indefinites.

2 Long distance indefinites in downward entailing contexts

The purpose of this section is to show that in so far as I can see, if the analysis of indefinites as choice functions is to be at all empirically viable, then it is necessary to have an interpretive procedure that licenses quantificational closure at intermediate sites. Otherwise, the truth conditions of indefinites in DE contexts simply come out wrong. The plot is as follows. We will consider sentences like (1a), repeated here as (10a) under negation and argue that the Reinhart/Winter approach makes the right predictions while the Kratzer/Matthewson one does not. We then will see that this extends to all downward entailing contexts (including embedded ones).

Even though the point applies to all sorts of sentences involving long distance construal of indefinites, we will work only with sentences like (12a) or (12b), because this has an advantage:

- (12) a. Every linguist studied every solution that some problem might have
- b. Every linguist studied every solution that some problem he or she considered might have.

The advantage is that the reading where the indefinite has narrowest scope is overly strong and hence whatever plausible reading one gets has to be one where the indefinite gets scope over *every solution*. Thus, in assessing our intuitions we don't have to worry about interference from irrelevant construals. The implausibility of the narrowest scope construals for *some problem* is perhaps evident for (12a), but it also holds of sentences like (12b). The narrowest scope interpretation for *some problem* in (12b) yields (13a), which is logically equivalent to (13b):

- (13) a. $\forall x[\text{linguist}(x) \rightarrow \forall z [[\text{solution}(z) \wedge \exists y [\text{problem}(y) \wedge \text{to}(z,y) \wedge \text{considered}(x,y)]] \rightarrow \text{studied}(x,z)]]$

- b. $\forall x \forall z \forall y [[\text{linguist}(x) \wedge \text{problem}(y) \wedge \text{considered}(x,y) \wedge \text{solution}(x) \wedge \text{to}(z,y)] \rightarrow \text{studied}(x,z)]]$
- c. every linguist studied every solution to every problem he considered

Thus, on the narrowest scope interpretation, sentence (13b) would be equivalent to (13b), which tantamount, in English, to (13c). While perhaps possible, clearly this is not the first reading that comes to mind in considering (13b).

2.1 Negation

The structure of the argument to be presented is as follows. I will provide two contexts. In one, sentences (12a) and (12b) are intuitively true (on the intermediate scope reading); in the other, they are false, and their negation true. The Reinhart-Winter approach straightforwardly captures this fact. The Kratzer one does not. In particular, the latter approach assigns to the negation of sentences (10a) and (10b) truth conditions so weak as to come out true in *both* contexts.

A natural situation in which we would regard either sentence in (12) as true is the following:

- (14) Situation 1: systematic linguists.

Linguist A (who considered many problems) studied every conceivable solution to the problem of weak crossover

Linguist B (who considered many problems) studied every conceivable solution to the problem of donkey sentences

Linguist C (who considered many problems) studied every conceivable solution to the projection problem for presuppositions

...

Now, imagine a different situation (Situation 2) in which some linguist, say, linguist C, didn't actually study every solution to some particular problem. Suppose, in other words, that there is no problem such that C really studied all its solutions.

- (15) Situation 2: the unsystematic linguist.

Linguist A studied every conceivable solution to the problem of weak crossover

Linguist B studied every conceivable solution to the problem of donkey sentences

*Linguist C is such that there is no problem for which s/he studied all its solutions

...

Linguist C makes sentence (1) on the intended interpretation false. A natural way to describe the unsystematic linguist situation would be:

- (16) Not every linguist studied every conceivable solution that some problem might have.

Now let us see what the two theories considered above predict in this connection. Let us start with the Reinhart/ Winter approach. Assuming, as seems intuitively plausible, that the constituent negation in (16) winds having sentential scope, on the Reinhart/Winter approach we get:

- (17) a. $\neg \forall x [\text{linguist}(x) \rightarrow \exists f \forall z [\text{solution to } (z, f(\text{problem})) \rightarrow \text{studied}(x, z)]]$

it is not the case that for every linguist x there is a way of choosing a problem f such that x studied every solution to $f(\text{problem})$

- b. $[\text{not every linguist}_i] \exists f [\text{every solution}_j \text{ that some}_f \text{ problem has } t_i] t_i \text{ studied } t_j$

As the informal paraphrase given below the formula in (17a) makes clear, this is just the intended reading. If sentence (16) has the interpretation in (17a), then it is correctly predicted to be true in the unsystematic linguist situation (and false in the systematic linguists situation). This reading is obtained by closing existentially the choice function between the two universal NPs (as schematically shown in the LF in (17b)).

Let us now turn to the Kratzer/Matthewson proposal. According to them, either there is no existential closure or existential closure takes place at the top most level. We thus get the following interpretations for sentence (16):

- (18) a. $\neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

It is not the case for every linguist x f selects a problem such that x studied every solution to $f(x, \text{problem})$.

- b. $\exists f \neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f_x(\text{problem})) \rightarrow \text{studied}(x, z)]]$

For some function f , it is not the case that for every linguist x f selects a problem such that x studied every solution to $f(x, \text{problem})$.

Let us start by discussing (18b). For (18b) to be true, it suffices to find some function f that makes the formula true. Since, the body of the formula is of the form $\neg \phi$, this means that f must make ϕ false. Clearly, then, formula (18b) is true in the unsystematic linguist situation. For one can easily concoct a function that would make $\forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$ false: pick any function that maps linguists into problems they never looked at. However, formula (18b) is also true in the systematic linguists situation. This is so because also in situation 1 there will be some problem considered by some linguist that, however, did not study all of its solutions. So, if (18b) is the interpretation of sentence (16), we would expect such a sentence to come out true both in the systematic linguists situation and in the unsystematic linguist situation. This is no good. The problem is that formula (18b) has exceedingly weak truth conditions. There are too many values for f that make it true.

Perhaps, contextual knowledge can come to the rescue by suitably narrowing down the range of functions under considerations. Perhaps we might regard (18b) as an abbreviation for:

- (19) $\exists f C(f) \wedge \neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

The variable C in (19) supplies a restriction for (Skolemized) choice functions. This would be an ordinary case of domain selection for quantifiers, or perhaps an ordinary case of presupposition accommodation, a strategy that works often enough. But what could such a restriction look like? Reasonable candidates might be the semantic counterparts of relative clauses (with overt pronouns) like *problems he or she considered* or *problems that intrigued him or her*; i.e.:

- (20) Let LP be the set of all linguistic problems.

- a. for any linguist x , $f_1(x, LP)$ chooses from LP a problem x considered

- b. for any linguist x , $f_2(x, LP)$ chooses from LP a problem that intrigued x

...

Under this construal, (16) says something of the following sort:

- (21) There is some function f , such that for any linguist x , $f(x, LP)$ is a problem that

intrigued x and it is not the case for every linguist x , x studied every solution to $f(x, LP)$.

This is still not good enough, however. It leaves us with the very same problem we had before. Formula (21) is, alas, also true in both Situation 2 and Situation 1. In Situation 1, surely not everybody studied every solution to *every* problem that he or she considered (or to every problem that intrigued him or her, and so on for all the natural functions). If this is so, there will be values of f in C that will make the $\forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$ false, and hence its negation true. We are, therefore, still stuck with the same paradoxical situation: sentence (12a) and its negation sentence (16) are predicted to both be true in Situation 1, whereas intuitions tell us that (16) ought to be false in Situation 1. Definitely not good. We must conclude that contextual knowledge does not seem to be of help, in the case at hand. We seem unable to narrow down the range of the quantifier over choice functions so as to get the right truth conditions for (16).

Actually, there is one case, where a representation like (19) might be appropriate. This would be a situation in which every linguist considered (or was intrigued by...) exactly one problem. Hence, the expectation becomes that, if (19) is the only representation for (16), in any situation where it is left open whether some linguist considered more than one problem, sentence (16) ought to be infelicitous. But this is surely wrong. We can use sentences like (16) in situations where there is some uniqueness presupposition associated with the embedded indefinite. But we are not limited to such cases (and, indeed, the unsystematic linguist situation is a case in point).

We have discussed so far a Matthewson-style construal of long distance indefinites, with topmost existential closure. But it should be obvious by now that the very same considerations apply to the Kratzerian representation in (18a), where the choice function is left free. The philosophy behind this way of representing long distance indefinites is that the context has to supply a suitable value for the functions. But if, as we just saw, the context cannot suitably narrow down the range of an existential quantifier, it will all the more fail to find a suitable value for the function, if this is left free. No

particular choice of value like those listed in (20) is able to capture the intended reading of (16). What we really seem to need is a quantifier in the right place. Either something like (17) (i.e. the Reinhart/Winter representation) or, equivalently, a universal wide scope quantification as in:

- (22) $\forall f \neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

For every function f , it is not the case for every linguist x f selects a problem such that x studied every solution to $f(x, \text{problem})$.

Formula (22) is true in Situation 2 (the unsystematic linguist situation). And false in Situation 1 (the systematic linguists situation). As one would intuitively want. Summing up so far, the Reinhart/Winter approach yields the right truth conditions for sentences involving negation, such as (16), without any special assumption. The Kratzer/Matthewson hypothesis does not. Some additional stipulation requiring choice functions to be quantificationally closed when in the presence of negation seems to be needed.

2.2 Other downward entailing contexts

Even though the reader will have already figured it out, I will nonetheless pedantically underscore that the point made in the previous section is not limited to sentences with overt negation. It extends to all "negative" contexts (which for our purposes can be equated with the downward entailing ones, in the sense of Ladusaw's (1979) classical work). Consider for example:

- (23) No linguist considered every solution that some problem might have

Using choice function, the salient reading of sentence (23) is:

- (24) $\neg \exists x \exists f [\text{linguist}(x) \wedge \forall z [\text{solution to } (z, f(\text{problem})) \rightarrow \text{studied}(x, z)]]$

Such reading can be straightforwardly obtained on the Reinhart/Winter approach. On the Kratzer/Matthewson's approach we get:

- (25) a. $\neg \exists x [\text{linguist}(x) \wedge \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

- b. $\exists f \neg \exists x [\text{linguist}(x) \wedge \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied}(x, z)]]$

These are exceedingly weak.

By the same token, even if it takes a bit of processing, scenarios analogous to the systematic linguists situation and to the unsystematic linguist situation are bound to arise for sentences like:

- (26) At most two linguists studied every solution that some problem might have

But perhaps most striking and easy to check case is the following:

- (27) Every linguist that studied every solution that some problem might have has become famous.

In sentence (27), the "long distance" indefinite occurs inside the restriction of *every*, another familiar downward entailing context. Let us again look at what the two approaches under consideration predict for this case. On the Reinhart/Winter approach, by choosing to existentially close the choice function between the two universal quantifiers we get:

- (28) a. $\forall x [\text{linguist}(x) \wedge \exists f \forall z [\text{solution to } (z, f(\text{problem})) \wedge \text{studied } (x, z)]] \rightarrow \text{became famous } (x)]$

- b. every linguist x , such that there is a way of choosing a problem y for which x studied every solution became famous.

As the informal paraphrase of formula (28a), given in (28b) makes clear, this can well be the intended reading of sentence (27). On a theory that disallows intermediate closure such a reading cannot be obtained. So, for example, on Kratzer's approach we would get:

- (29) $\forall x [\text{linguist}(x) \wedge \forall z [\text{solution to } (z, f(x, \text{problem})) \wedge \text{studied } (x, z)]] \rightarrow \text{became famous } (x)]$

Formula (29) will be verified by any problem whatsoever for which some linguist didn't consider every solution (for that makes the antecedent false, and hence the whole formula true). And clearly no sensible way of further restricting the antecedent will work. It is a little bit like the problem of donkey sentences. What we want is:

- (30) $\forall f \forall x [\text{linguist}(x) \wedge \forall z [\text{solution to } (z, f(x, \text{problem})) \wedge \text{studied } (x, z)]] \rightarrow \text{became famous } (x)]$

But to obtain this we have to modify some of the basic assumptions of the Kratzer/Matthewson's approach.

Let me elaborate a bit on this latter case. In the original sentence (1a), the long distance indefinite *some problem* does occur in the restriction of *every*

solution, which is a downward entailing context. In this regard, sentence (1a) and sentence (27) are alike. However, in the case of (1a) leaving *f* free (or topmost *existential* closure), coupled with the (plausible) requirement that the restriction of *every solution* be non empty (which independently follows from the presuppositions associated with *every*) suffices to get us the right truth-conditions. But in the case of (27), this is not so. Satisfying the presuppositions of *every* is not enough by itself to get the right truth-conditions (unless coupled with a wide scope universal closure of the choice function). Intuitively, such presuppositions are satisfied by there being some linguist that studied every solution to some problem (in the case of the upper *every*) and by disregarding unsolvable problems (in the case of the lower *every*). But even when such presuppositions are satisfied, formula (29) can be trivially verified in a situation where sentence (27) is intuitively false. For example, consider the following situation:

(31) Situation 3

A was most interested to weak crossover and binding theory. She studies every solution to both such problems and becomes famous.

B was most interested to donkey sentences and superiority. He studies every solution to the problem of donkey sentences and some (though not all) solutions to the problem of superiority. B's merits go unnoticed. He retires into oblivion.

In situation 3 sentence (27) is intuitively false. Yet formula (29) comes out true under the construal where *f* maps B into the problem of superiority (which is consistent with the natural interpretation of *f* as mapping linguists into problems that interested them the most). And there appears to be no presupposition failure (or other funny business) of any sort. This result is unsatisfactory. The only way to avoid it (within our current assumptions) seems to be either going the Reinhart/Winter way or universal closure of *f* at the top, as in (30). Thus, sentences like (27) do constitute a problem for the Kratze/Matthewson approach (unlike the original sentence (1a)).

We have discussed so far one family of examples (Abusch's "professor" sentences) in downward entailing contexts. We have seen that while the Reinhart/ Winter approach predicts the right range of readings in these contexts, the Kratzer/Matthewson one does not. Obtaining the right truth conditions for the sentences we have considered appears to be impossible if the (Skolemized) choice functions either stay free or are closed existentially at the root. This does not mean that Kratzerian representations like (25a) or

(29) are always unwarranted. They may be right for "referential" construals. But sentences like those considered in the present sections are not limited to such construals. The conclusion is that their truth conditions cannot be captured if one disallows quantificational closure. These conclusions are not limited, of course, to "professor" examples. Parallel arguments can be constructed for all cases of long distance indefinites discussed in the literature.

2.3 Embedding

Perhaps we can modify Kratzer's approach along the following lines:

- (32) Choice functions are quantificationally closed only at the topmost level.

If the choice functions occur in the (local) context of a downward functor it is universally quantified; otherwise, it is existentially quantified.

This would be a way of limiting quantificational closure of choice functions arguably in the spirit of the Kratzer/Matthewson proposal (i.e. by limiting oneself to a kind of topmost/context level maneuver). One might, of course, accuse our modification of being a descriptive constraint that merely photographs the facts, without making us understand why things come out this way. But then, there might be independent justification for such a move. As we have noticed, the above discussion is reminiscent of issues that arise in the interpretation of donkey pronouns. As is well known, such pronouns give rise to existential ("weak") as well as universal ("strong") interpretations; and such interpretations are sensitive to the polarity of the context in which the pronoun occurs.⁹ So an approach along the lines in (32) may find some independent justification. Be that as it may, I would like to use the statement in (32) as a strawman to exemplify why no approach that disallows quantificational closure in *embedded* contexts can be descriptively adequate.

Consider again sentence (16) against the background of the unsystematic linguist situation (both repeated here):

- (33) a. Not every linguist studied every solution that some problem might have
- b. Situation 2 (the unsystematic linguist situation).

Linguist A studied every conceivable solution to the problem of weak crossover

⁹See, e.g., Pelletier and Schubert (1989), Chierchia (1992, 1995), Kanazawa (1994) for extensive early discussion of some of the relevant issues.

Linguist B studied every conceivable solution to the problem of donkey sentences

- * Linguist C is such that there is no problem for which s/he studied all its solutions

...

Suppose now that Lee, aware of this state of affairs, utters (33a). We then might well report what happened in the following terms:

- (34) Lee said that not every linguist studied every solution that some problem might have

Our report, against the background we are considering, would be a true one. Yet, let us see how it would come out according to the hypothesis in (32) (i.e. the modified Kratzer/Matthewson approach):

- (35) $\forall f$ said (Lee, $\neg \forall x$ [linguist(x) $\rightarrow \forall z$ [solution to (z, f(x, problem)) $\rightarrow$ studied (x, z)]]

for every function f , Lee said that not for every linguist x and for every solution z to whatever problem f selects, x studied z

To see what this says, let f range over some set of plausible candidates like those listed in (20) and repeated here:

- (36) a. For any linguist x , $f_1(x, \text{problem})$ is a problem that intrigued x
 b. For any linguist x , $f_2(x, \text{problem})$ is a problem that x considered
 etc.

If the relevant range of the variable f looks like the functions spelled out in (33), what Lee ought to have uttered, according to (32) is something of the following sort:

- (37) not every linguist studied every solution that a problem that intrigued him or her might have and not every linguist studied every solution that a problem that he or she considered might have and...
 (so on for all the relevant functions).

In other words, Lee would have to have made lots of statement. But this is not what happened. Lee simply uttered (33a). This vividly shows that (35) is the wrong interpretation for sentence (34). Clearly, also on the unmodified Kratzer/Matthewson approach, where the choice function stays free or

gets existentially closed at the top, we would get the wrong results in embedded contexts of this sort (in such a case, Lee would have had to have made one of the statements listed in (37), which again, is not what happened). The truth conditions that (31) has can, instead, be readily specified as follows:

(38) a. said (Lee, $\wedge \neg \forall x$ [linguist(x) $\rightarrow \exists f \forall z$ [solution to (z,f(problem)) $\rightarrow$ studied (x,z)]]]

b. said (Lee, $\wedge \forall f \neg \forall x$ [linguist(x) $\rightarrow \forall z$ [solution to (z,f(problem)) $\rightarrow$ studied (x,z)]]]

Formula (38a) corresponds to what the Reinhart/Winter approach predicts. The embedded formula in (38b) is an equivalent way of expressing the content of what Lee said.

Clearly, this is not restricted to verbs like *say*. It extends to many (most?) cases where the indefinite occurs in an embedded DE context, like:

(39) a. It is possible that not every linguist studied every solution that some problem might have.

b. Lee wonders why not every linguist studied every solution that some problem might have.

It should also be clear that the problem we are considering does not depend on what the ultimately correct analysis of embedding predicates is. I am assuming a classical possible worlds analysis of embedding. But also more finely structured analyses of the content of embedded clauses, married with a Kratzer/Matthewson approach (even a modified one) will run into the same sort of trouble.

We are forced to conclude that there are strong empirical reasons for believing that a choice function approach to long distance indefinites requires quantificational closure of such functions at embedded contexts.¹⁰

¹⁰As P. Schlenker points out to me, virtually all of the points made in this section hold of determiners like "exactly n":

(a) exactly two linguists studied every solution that some problem might have.

In generalized quantifier theory, quantifiers like "exactly two linguists" can be viewed as the intersection of an upward entailing quantifier ("at least two linguists") and a downward entailing one ("at most two linguists"). So I think that the claim that it is the presence of a downward entailing component in a quantifier that creates the trouble remains intuitively correct. At any rate, the final constraint on existential closure that we will wind up with is more general and applies to all quantifiers. It will, therefore, take care also of Schlenker's examples. See section 4 below.

3 Is Skolemization necessary?

Let us go back to the basic architecture of the two theories we are considering. One has free existential closure, the other hidden parameters and no (or only topmost) existential closure. In DE contexts, quantificational closure seems necessary. In non DE contexts, the trade off between these two approaches boils down to the following two equivalent ways of interpreting sentences like “every linguist studied every solution that some problem might have”:

(40) a. Intermediate closure:

$$\forall x \text{ [linguist}(x) \rightarrow \exists f \forall z \text{ [solution to } (z, f(\text{problem})) \rightarrow \text{studied } (x, z)]]$$

b. Hidden parameters (Skolemization):

$$\exists f \forall x \text{ [linguist}(x) \rightarrow \forall z \text{ [solution to } (z, f(x, \text{problem})) \rightarrow \text{studied } (x, z)]]$$

Prima facie, it would seem that in non DE contexts these two devices achieve the same effects. Now, if the arguments given in section 2 are correct, then it is pretty clear that even if one is willing to grant hidden parameters, intermediate quantificational closure appears to be indispensable. This raises immediately an obvious question: can’t we do away with hidden parameters altogether? Doesn’t the argument given above establish that a “pure” Reinhart/Winter approach is right period? Are there cases that the latter approach *couldn’t* handle? The remarks that follow address these questions.

Let us briefly review Kratzer’s (1998) arguments in favor of hidden parameters. They are primarily based the behavior of modified indefinites like *a certain* or *some particular*. Building on work by Hintikka (1986), she observes that sentences of the following sort display a systematic contrast:

(41) a. Every professor rewarded every student who read a certain book she had reviewed for the NY Times.

b. Every professor rewarded every student who read a certain book I had reviewed for the NY Times.

While (41a) essentially *requires* the intermediate scope reading, for (41b) a widest scope or “referential” interpretation of the indefinite is strongly preferred. This follows, Kratzer argues, if we assume that modifiers like *certain* or *particular* (on a par with modifiers like *local*, studied in Mitchell

1986) only have a functional interpretation. I.e. they are interpreted as functions from contextually specified parameters into what the modified noun denotes. Sentence (41a) makes salient a function from professors into books reviewed by them; the argument of the function is bound by the subject. Sentence (41b) makes salient a function from the speaker into some book reviewed by her; the argument of the function is indexically filled in. Kratzer, then, points to the fact that unmodified indefinites can have a behavior partially similar to that of *certain*, which is explainable under the hypothesis that they may (though do not have to) be interpreted just like *a certain*.

While Kratzer's point is well taken, we now know that intermediate existential closure cannot be dispensed with. This provides us with an alternative to positing hidden parameters that also enables us to explain the behavior of unmodified indefinites. In other words, *a certain* might indeed be a Skolemized choice function, which either stays free or is subject to topmost only existential closure. But the Reinhart/Winter approach might still be right for unmodified *some* or *a*. Hence, the question whether unmodified indefinites call for an interpretation analogous to that of *a certain* remains open.

A nice argument that shows that unmodified indefinites sometimes must be Skolemized can be found in Schlenker (1998). To see it, consider the following scenario:

(42) a. Situation 4

Every student in the semantics class has difficulty with a specific point of the program.

A has difficulty with assignment functions (but understands the rest)

B has difficulty with generalized quantifiers (but understands the rest)

...

b. So if every students manages to understand some problem, nobody will flunk

The natural interpretation of sentence (42b), uttered against the background of situation 4, cannot be captured on a pure choice function approach. For there are three admissible sites at which such function may be existentially closed: at the matrix level, at the level of the embedded if-clause and in the

scope *every student*. The first two choices force the problem to be the same for every student. The third, winds up saying that if every students manages to understand any problem, nobody will flunk, which is not the intended reading. Such a reading, on the other hand, can be readily captured with Skolemization:

- (43) a. $\exists f[[\forall x \text{ student } (x) \rightarrow \text{understand } (x, f(x, \text{problem}))] \Rightarrow \text{no body will flunk}]$

The conclusion seems to be that pure (unskolemized) choice functions are not sufficient to give us all the readings that long distance indefinites give rise to.

Schlenker's argument shows that unmodified indefinites sometimes must have an implicit argument. In what follow, I provide evidence in favor of the claim that they always do. Thus, Kratzer appears to be right on this point: always having a hidden parameter is a property that long distance *some* or *a* share with *a certain*.. The argument to be given is based on weak crossover. In other domains where resorting to something like Skolem functions has been advocated (see fn. 5), an important piece of evidence in favor of such a view was that the hypothesized hidden parameters seem to obey canonical constraints on anaphoric elements (like weak crossover). This enables one to, arguably, explain otherwise peculiar properties of the relevant constructions. For example, certain subject/object asymmetries in the interpretation of *wh* words turn out to be instances of weak crossover. One may wonder whether similar evidence is available in the case of indefinites. I believe it is and what follows is an attempt at showing this.

3.1 Indefinites and weak crossover

Canonical cases of weak crossover include the following:

- (44) a. who_i [does his_i mother like t_i]
- b. His_i mother loves everyone_i
- ↑ _____ |
- c. everyone_i [his_i mother loves t_i]

The question in (44a) cannot mean "for which x , x 's mother loves x " as the indexing given in (44a) would have it. By the same token, sentences (44b) cannot have the meaning represented by the LF (44c). In both cases, we have a lower operator being scoped over, and hence binding, a pronoun contained in some C-commanding constituent (overtly in (44a), covertly in (44c)). This move gives raise to ungrammaticality. Various attempts have

been made at accounting for such phenomenon. I will take it as merely descriptive statement and use it to detect the presence of null pronouns in indefinites. If such elements are present, they should be subjects to weak crossover. Hence certain readings one might otherwise expect should be systematically absent.

To test this prediction, let us begin by considering the behavior of *a certain*. Compare the sentences in (45)

(45) a. A technician inspected every plane

b. A certain technician inspected every plane

While (45a) can readily be interpreted with *every plane* having wide scope over *a technician*, a parallel interpretation appears much harder to get for (45b). *A certain technician* in (45b) seems to have only the "referential" reading. Assuming, with Kratzer, that *a certain* always contains a null pronominal (which can either get its value from the context or be bound by a suitable quantifier), then this contrast is readily understood as a weak crossover violation. The reading where *a certain* winds up in the scope of *every* in (45b) goes through a step which involves crossing over the implicit pronoun associated with *a certain*: (which I represent, again, a superscript on *certain*).

(46) a certainⁱ technician inspected [every plane]_i

↑ _____|

If this configuration is illegal, there is no way for the implicit argument of *certain* to get bound by the lower quantifier. The only option is to contextually fix the value of the implicit argument, thereby getting the "referential" interpretation. For sentence (45a) we have no such problem, under the assumption that next to their interpretation as (Skolemized) choice functions, indefinites also have their "normal" interpretation as, say, existentially quantified terms (or whatever one takes the canonical, local interpretation of indefinites to be). This results in the following LF for (45a), which poses no crossover problem:

(47) [every plane]_i [a technician_j [t_i inspected t_j]]

The effect in (45) thus confirms Kratzer's analysis of *a certain*. Now, if we detect something similar in long distance indefinites, we would be lead to conclude that they too *must* contain an implicit argument. The following sentence, yet again a variant of the professor-example, might constitute a fairly clear case in point.

- (48) a. Every student was examined by every professor competent on some problem

b. Situation 5

Student A was examined by every professor competent on OT
 Student B was examined by every professor competent on Cre-
 oles

...

Quite clearly, sentence (48a) readily lends itself to describe situation (48b). This is so because it naturally has the by now familiar intermediate scope construal of the long distance indefinite. Now, undo the passive in (48a). Here is what we get:

- (49) a. every professor competent on some problem examined every student

- b. every student_i [every professor_j competent on some
 problem [t_j examined t_i]]
- ↑ _____ |

It is intuitively clear that sentence (49a) is hardly apt to describing situation 5. Its salient interpretation is that every professor competent on something or other examined all the students. The question is why. Why can't (49) be interpreted as its passive counterpart? An answer that quite readily comes to mind is the following. Suppose that long distance indefinites must always have hidden parameters and that there is no intermediate existential closure. Then, the intended reading could only be gotten by raising the lower quantifier over the subject and thereby binding the implicit pronoun contained in it, as schematically illustrated in (48b). But this would give rise to a cross-over violation (compare (49b) with (46) and (44)).

Notice that the impossibility of obtaining the relevant reading is not due to some ban against raising the quantifier in object position over the subject, as the following sentence shows:

- (50) Some professor competent on some problem examined every student.

Sentence (50), which differs minimally from (49a), has a reading where every student was examined by a possibly different professor, which must be obtained by raising the object over the subject, just like in (49b). But in

the latter case, we don't have to bind anything in order to get the intended reading (i.e. *some problem* in (50) has its normal, local construal as an existential quantifier). It is the combination of raising the lower quantifier and the binding of a hidden pronoun (necessary to the long distance construal of *some*) that results in ungrammaticality. It is also important to realize that if long distance indefinites are allowed to be interpreted as plain choice functions (coupled with free existential closure), as on the Reinhart/Winter approach, this account would be immediately lost. For on such an approach the unavailable reading can be readily obtained as follows:

- (51) every student_i $\exists$ f[every professor_j competent on some_f problem
[t_j examined t_i]]
- ↑ _____|

If existential closure is freely available and there is no obligatory pronoun associated with *some*, we obtain the LF in (51), which violates no known grammatical constraint. The LF in (51) yields the unwanted reading.

The following sentences illustrate the same phenomenon. They are due to J. Stanley, who made a point similar to the one just sketched at the 99 Cornell Conference on pragmatics:

- (52) a. Every analysis that solves some problem has been looked at by every linguist
- b. Several stories that concerned some member of the royal family were told by every man present.

Such sentences seem to lack the intermediate scope readings, just like (49). For example, it is hard or impossible to interpret (52b) as saying that for each man *x*, there is some member *y* of the royal family such that *x* told several stories about *y*.

In fact, the phenomenon illustrated with sentences like (49) or (52) can also be observed in more complex structures. Below, we consider embedded clauses and *if*-clauses. The latter add an extra twist to the issue, as we will see.

3.2 De re readings

Consider the following sentences, involving attitude verbs:

- (53) a. everyone believed that a (certain) Vermeer painting had been stolen from the Isabella Stewart Gardner collection (from Kratzer 1998)

- b. That a (certain) Vermeer painting had been stolen from the Isabella Stewart Gardner collection was upsetting to every one
- c. It seemed to everyone that somebody was being rude
- d. That somebody was being rude was plain to everyone

Sentence (53a) has a natural interpretation according to which it attributes a *de re* belief to every (relevant) person (e. g., John believes that *The Concert* has been stolen, Bill believes that *The Lady Seated at a Virginal* has been stolen, etc.). A parallel reading is impossible or much harder to get with (53b). It's very hard to interpret (53b) as saying that John was upset by the theft of *The Concert*, Bill by the theft of *The Lady Seated at a Virginal*, and so on. The same holds, *mutatis mutandis*, for (53c-d). Sentence (53c) can be naturally used to describe a situation in which it seems to John that Leo is being rude, it seems to Bill that Hugo is being rude,...while it would be at best misleading to use (53d) in a similar situation. Thus, sentences of this sort provide us with minimal pairs. In the first member of the pair a *de re* reading is possible, in the second it is not. The question is why.

Traditionally, *de dicto/de re* contrasts have been treated in terms of scope. For example, the *de re* reading of sentence (53a) could be obtained by scoping the embedded indefinite at the level of the matrix clause (but within the scope of *every*). However, an approach in terms of scope clashes with the generally very local character of scope assignment (which tends to be clause bound). It is therefore only natural to expect that a theory of long distance indefinites should pave the way to an alternative treatment of such ambiguities. This indeed appears to be so. For example, using Skolemized choice functions, we can account for the *de re* interpretation of sentence (53a) without resorting to scope along the following lines.

(54) a. everyone_i [t_i believes that a^i Vermeer painting had been stolen]

b. $\forall x$ [person(x) $\rightarrow$ [believe (x , $\wedge$ stolen(x , ($f(x$, Vermeer painting)))]

where, for any x , $f(x, P)$ selects the P that x believes to have been stolen.

In (54a), the indefinite *a student* is interpreted as a function with a hidden argument (represented by the *i*-superscript) which is bound by the matrix subject. Such a function intuitively maps every person x into the painting x believes to have been stolen. The truth conditions associated with (54a) are spelled out in (54b). This enables us to represent the link of the belief holder

to the res of his/her belief.¹¹ Now, if this is the way in which de re readings are obtained, then in order to get a reading of this sort for a sentence like (53b) we would have to proceed as follows:

- (55) everyone_i [[that aⁱ Vermeer painting had been stolen] was upsetting to t_i]



As in the previous case, here the embedded indefinite is construed as a function. In order to get the hidden pronominal element properly bound, we have to scope the lower quantifier over it, as illustrated in (55). But in so doing, the position of the null pronominal associated with the indefinite winds up offending whatever constraint handles weak crossover configurations. It is needless to underscore that this account gets lost if existential closure is freely available; for whatever enables one to derive the relevant reading for good sentences like (53a) (see, e.g., Reinhart (1997, 393-394) for a specific suggestion) would apply equally well to bad sentences like (53b) (bad, of course, on the relevant reading). So a Kratzerian approach readily accounts for the contrasts in (53), while one à la Reinhart/Winter does not.

3.3 Abusch's problem

Conditionals can give rise to intermediate readings of indefinites. In particular, Abusch (1993) discusses examples of the following kind:

- (56) a. Every professor gets a headache if a student he hates is in class
 b. Every professor gets a headache if a certain student wants to see him
 c. *every professor* gets a headache if *some student* is in class
 [italics indicates stress]

All of these sentences have a reading that can be given a Kratzer style representation along the following lines.

¹¹ There are several issues that get discussed under the heading of de dicto versus/de re contrast. One, which we are not addressing here, concerns the fact that the restriction of an NP can be construed "transparently". For example, the following sentence (from Bonomi 1995) can be used to report a belief that is not specifically about a particular football players, but is about a group of people who, unbeknownst to the believer are, in fact, members of the local football team:

(a) Leo believes that a member of the local soccer team has a dog.

(57) a. every professor_i [t_i gets a headache [if aⁱ student wants to see him]]

b. $\forall x$ [professor(x) $\rightarrow$ [wants to see (f(x, student) , x) $\Rightarrow$ gets a headache (x)]]

Such a reading is favored by the usual factors, such as the presence of a bound pronoun in the restriction of the indefinite (cf. (56a)), the presence of the modifier *certain* (cf. (56b)) or a contrastive stress pattern (56c). Abusch contrasts the conditionals in (56) with cases of preposed if-clauses that had been noted in the literature to *lack* intermediate readings. Here is one of her examples:

(58) If a student cheats on the exam, every professor might institute ethics proceedings.

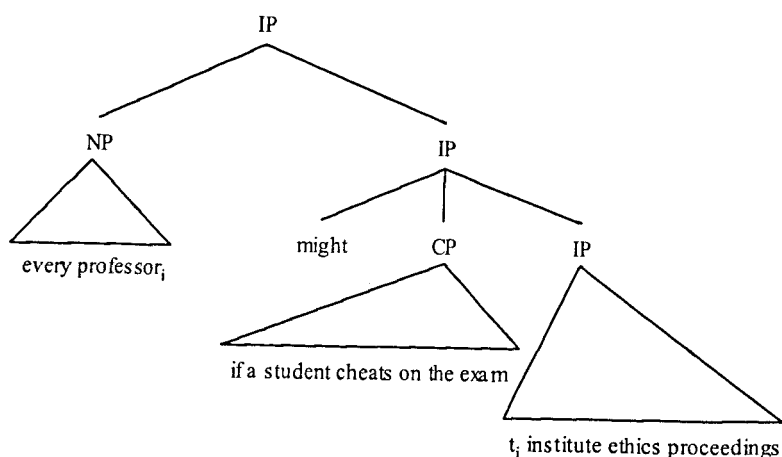
This sentence lacks the intermediate scope reading. It cannot mean that for every professor *x*, there is a certain student *y* such that if *y* cheats, *x* might institute ethics proceedings. The same is true of the sentences in (56) if the position of the if-clause is switched around:

(59) a. If a student wants to see him, every professor gets a headache

b. If a student he hates comes to class, no professor is happy

Sentences like those in (59) are about any student, not about students specific to each professor; Why would that be so? Abusch notices that it is unlikely that this restriction is due to the fact that *every professor* in (58) or (59) cannot, in principle, be scoped over the if clause. For one thing, in (59) we see overt pronouns in the if-clause bound by the main clause subject. As for (58), it clearly has a prominent reading in which *every* has scope over *might*. Under the plausible assumption that the if-clause forms the restriction of *might* (Kratzer 1981), by transitivity it follows that *every professor* in order to have scope over *might* must have scope over *might's* restriction (viz. the if-clause) as well. Consequently, according to Abusch, the LF of (41) would be something like:

(60) a.



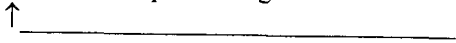
b. $\forall x [\text{professor}(x) \rightarrow [\exists y \text{ student}(y) \wedge \text{cheat}(y) \Rightarrow \text{institute proceedings}(x)]]$

So, if Abusch is right, we have the making of a real puzzle here. Intermediate scope readings are possible with if-clauses. However, in preposed if-clauses like (58) or (59) such readings appear to be absent, in spite of the fact that the subject of the main clause can be scoped over the whole if-clause. On the Reinhart/Winter approach, Abusch's problem takes the following form. In sentences like (58), standard scope shifting operations can scope the subject of the main clause over the left adjoined if-clause. Existential closure over choice functions is free; hence nothing prevents it from applying between the universally quantified subject and the if-clause, obtaining a structure isomorphic to the one associated with the sentences in (56) and wrongly predicting the intermediate scope reading for *a student*.

A Kratzer style approach provides at least part of the solution to this puzzle. Let us suppose, with Kratzer, intermediate existential closure is not available and that long distance readings of indefinites must be obtained by resorting to hidden parameters.¹² If this is so, then the sentences in (56) posit no problem, as the binder of the hidden argument C-commands it at the spell out position. But in cases like (58) and (59) it does not. Hence, some scope shifting operation must take place. Suppose we apply QR and raise the subject over the preposed if-clause as shown below:

¹²Sentences like (59b) involving a downward entailing NP require, of course, intermediate existential closure. For the time being, let us pretend that they don't. I.e. let's assume that, contrary to fact, there is a way of getting the intended reading without quantificational closure of the choice function. We will come back to sentences of this sort in section 4.

- (61) if aⁱ student cheats on the exam [every professor]_i might institute ethics proceedings



This will give rise to a canonical crossover configuration. Hence, this option is ruled out.

The reason why this can constitute only part of the solution to the problem is that another analysis is arguably available which yields the unwanted reading, namely a reconstruction based one. A sentence like (58) can be presumably also be derived by fronting the adjunct from a post verbal position analogous to the one if-clause occupy in sentences like:

- (62) every professor might institute ethics proceedings if a student cheats on the exam.

Hence, reconstruction to such a position ought to be possible. In fact, in Chierchia (1995, ch. 3), I argue that this is the way in which pronouns in fronted if-clauses (an other adjuncts) can get bound without violating cross-over. Evidently, reconstruction must be blocked when long distance indefinites are involved. But why and how remains a mystery.

I find this last puzzle particularly intriguing. Consider the following two sentences:

- (63) a. Every book might sell better if the cover is sexy
b. If the cover is sexy, every book might sell better

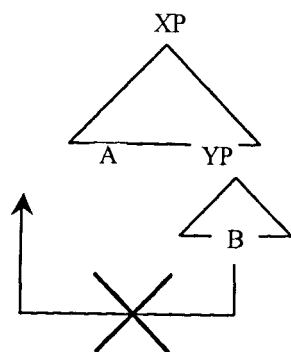
There is no difference in the interpretation of these sentences. They are structurally similar to those we are considering, except that we have a definite NP *the cover* in the if-clause, instead of an indefinite. Now such a definite clearly must contain a null pronominal element (i.e. is understood as something like *its cover*), for the cover is understood to vary with the book. Evidently, since there is no difference in the interpretation of the two sentences in (63), reconstruction of the if-clause (or whatever is responsible for the bound interpretation of the hidden parameter of the definite) must be available in this case. So the mystery thickens. Definites and long distance indefinites are only minimally different.¹³ Yet, the former allows a bound

¹³In Chierchia (1995, ch. 4) I have argued for a general theory of definites as Skolemized choice functions (without using that label; I called it "the functional theory of definites"). According to it, a definite is analyzed as a choice function with possibly hidden parameters. The value of such function must be supplied by the context (i.e. is never subject to quantificational closure of any sort). Essentially, I proposed for definites an analysis virtually identical to what Kratzer (1998) proposes for *a certain*.

construal of their hidden parameter in preposed if-clauses, while the latter do not seem to. In so far as I can see, the facts are rather robust and systematic.

So Abusch's problem remains, in part at least, an open one. But the facts go in the same general direction as those considered in section 3.1 and 3.2 (where reconstruction is not an option). In all three cases, long distance interpretation of indefinites appears to be subject to a systematic "superiority" constraint. Roughly speaking, an indefinite A, when construed non locally, cannot be in the scope of a quantifier B, unless B c-commands A at the spell out position. The offending configuration is the following one.

(64)



A = indefinite

B = (strong) quantifier

Whenever the scope of an indefinite escapes an island, scoping over it a lower quantifier appears to be impossible. We have observed this with if-clauses, relative clauses and sentential subjects. If long distance indefinites are simply choice functions that can be freely existentially closed, these asymmetries constitute a mystery. If they are Skolemized choice functions (which are either left free or bound at the topmost level), the asymmetry in question can be naturally viewed as a weak crossover effect, induced by the implicit argument of the choice functions.

4 Discussion

The situation we got is paradoxical. There are two theories that nicely explain why indefinites have the peculiar scopal properties they have. Such theories have a common core: they analyze indefinites as (possibly Skolemized) choice functions. But on the one hand, a certain set of facts shows

that intermediate existential closure of such functions is necessary. On the other hand, we have another set of facts that can be readily understood only if there is no intermediate existential closure. How can we get out of such an impasse? The answer to this question is not altogether trivial.

The simplest hypothesis to come to mind is one that merely registers what we have observed:

- (65) a. Indefinites, when interpreted as choice functions, always have a hidden parameter.
- b. Existential closure is restricted to the (top and the) immediate scope of a DE operator.

Such an approach posits no constraint on the interpretation of the hidden parameter and tries to limit existential closure as much as possible to those environments where not having it yields truth conditions that are too weak. The generalizations in (65) are not merely a statement of the facts, as (65a) is a (seemingly well motivated) theoretical hypothesis. But, as things now stand, (65b) is an essentially descriptive statement. Such a statement is unexpected from the point of view of either the Reinhart/Winter or the Kratzer approach. In so far as I can see, (65b) remains at present unexplained.

Prima facie, a theory of this sort seems to be at least descriptively adequate. Consider for example one of the crossover configurations discussed in section 3 and embed them in a DE context, as in the following example (suggested to me by K. Von Fintel):

- (66) It is doubtful that every solution that some problem might have has been looked at by every linguist.

This sentence lacks the intermediate scope reading (i.e. the problems do not vary with the linguists). This is accounted for as follows. The long distance indefinite must have a hidden argument. If such argument is left free we get something like:

- (67) a. It is doubtful that $\exists f$ [every linguist]_i [every solution that some_f^k problem has]_j [_{t_j} was looked at by _{t_i}]
- b. doubtful ($\exists f \forall x$ [linguist(x) $\rightarrow \forall z$ [solution to ($z, f(k, \text{problem})$) $\rightarrow$ studied (x, z)]]])

The LF in (67a) represents the reading where the embedded object has scope over the embedded subject. However, since closure is restricted to the *immediate* scope of the DE operator, it must take place above the universal quantifiers in the embedded clause. Hence, the choice of problem cannot covary with such quantifiers. If on, on the other hand we let the lower quan-

tifier bind the hidden argument of the indefinite, covariance would become possible:

(68) a. It is doubtful that

$$\exists i [\text{every linguist}]_i [\text{every solution that some}_f^i \text{ problem has}]_j [t_j \text{ was looked at by } t_i]$$

↑ _____|

b. doubtful ($\exists f \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied } (x, z)]]$)

But the LF in (68a) constitutes a crossover violation. So the facts are correctly accommodated by the assumptions in (65).

However, the approach in (65) has both conceptual and empirical problems. The main conceptual problem is how to explain in a principled manner the restriction in (65b). There are various options one might be tempted to explore in this connection. One possibility is to hypothesize that long distance indefinites are systematically ambiguous between a “normal” interpretation and one in which they are Negative Polarity Items. On the normal interpretation they can’t be existentially closed at intermediate levels. On the NPI interpretation they must be existentially closed in the (immediate) scope of a DE functor. One can freely choose between the two interpretations, and if one happens to pick the “wrong” one, the result is ruled out by independent principles. It is unclear, however, whether this hypothesis constitutes any progress over generalization (65). For one thing, systematic ambiguities of the sort we are considering, far from explaining things, cry out for an explanation. Moreover, it is unclear why standard NPIs (which are generally taken to be scopally restricted to their local environment) typically have a special morphology, while our alleged long distance NPIs would be morphologically undistinguishable from their non negative polarity counterparts.

A second possibility worth exploring might be the following. It seems reasonable to assume that existential closure is a costly operation. Implicit parameters, on the other hand, are freely available, just as other null pronominal elements like, say, PRO. This is why when there is an option, the implicit parameter option must be chosen. However, in downward entailing contexts there seems no other way to obtain the intended readings. That is why precisely in those contexts quantificational closure is allowed. Topmost existential closure, if it exists, either has itself a “last resort” character or it is simply part of the definition of truth (something like: a sentence S is

true in a context c relative to its LF ϕ iff there is an assignment g to the variables free in ϕ such g satisfies ϕ).

While this line of analysis might well be plausible, it is not immediately obvious how to make it reasonably explicit. Here is a stab at it. One might conjecture that there is a presupposition/implicature on quantificational closure of choice functions (somewhat in the spirit of recent proposals on NPIs like Kadmon and Landman 1993 or Lahiri 1997):

- (69) $Qf \phi$ (Q a quantifier, f a choice function) is only allowed when it leads to a stronger statement than ...

The problem is to spell out the dots in (69), which is needed in order to identify the relevant comparison class. Ideally, the condition in (69) should not mention DE contexts (for that would tantamount to registering the facts) and should fit within a general picture of how the expressive resources of grammar get optimized. To see what is involved in this, consider a concrete example, like (16) above, repeated here as (70)

- (70) Not every linguist studied every solution that some problem might have.

The readings we want to allow are either of the following:

- (71) a. $\neg \exists f \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied } (x, z)]]$
 b. $\forall f \neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(x, \text{problem})) \rightarrow \text{studied } (x, z)]]$

The interpretations with which those in (71) are contrasted are instead:

- (72) a. $\neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f_x(\text{problem})) \rightarrow \text{studied } (x, z)]]$
 b. $\exists f \neg \forall x [\text{linguist}(x) \rightarrow \forall z [\text{solution to } (z, f(\text{problem})) \rightarrow \text{studied } (x, z)]]$

One complicating factor is that the interpretations in (72) are not bad per se. They are O.K. if a referential construal of the indefinite is intended. Such interpretations are, however, not appropriate (i.e. insufficiently strong) in certain situations, like in the unsystematic linguist one. Moreover, the formulae in (71) can occur in an indefinitely embedded position. This makes it hard to state (69) without considering global properties of the linguistic and extralinguistic context in which the indefinites occur.

On top of this, as P. Schlenker has pointed out to me, the assumptions in (65) yield wrong results for sentences like:

(73) If a student is too demanding, no professor is happy

As noted above, sentences of this sort lack the intermediate reading. But on the assumptions in (65), such a reading can be obtained as follows:

(74) [no professor]_i ∃f [[if a_f^k student is too demanding] [t_i is happy]]

In (74) the hidden pronoun is left free. The subject is assigned scope over the if-clause. Since the raised subject doesn't bind any pronoun, no cross-over violation arises. Then closure takes place in the immediate scope of the negative quantifier. This results in the unwanted reading (according to which no professor *x* is such that for some particular way of choosing a student *y*, if *y* is too demanding, *x* is unhappy).

Clearly, if we want a constraint on existential closure that is at least descriptively adequate, we must revise the assumptions in (65). Now, what goes wrong with our problem sentence (74) might be the following. In (74), existential closure of the function *f* takes place in the immediate scope of the quantifier *no student*, which, however, does not bind the argument of *f*. Suppose that such a configuration is, in fact, illegal:

(75) * Q_i ∃f [...f(k)...]

Then in order to circumvent (75) we would have to modify (74) as follows:

(76) [no professor]_i ∃f [[if a_fⁱ student is too demanding] [t_i is happy]]

The LF in (76) meets the constraint in (75). But it, in turn, violates cross-over. Thus, if we adopt (some version of) (75), then there is no way to derive the unwanted reading.

If these considerations are on the right track, we are led to revise (65) along the following lines:

- (77) a. Indefinites, when interpreted as choice functions, always have a hidden parameter.
- b. Existential closure of a function *f* is restricted to the (top and the) immediate scope of the quantifier that binds the argument of *f*.

The b- part of (77) is to be understood as follows:

- (78) If an NP binds the argument of a functional indefinite, it must also C-command the binder of the function.

The restriction in (77) is, of course, still not much more than the statement of a problem. But it is a step ahead on what we had before. For one thing, there is a certain air of naturalness to it. In a sense, (77b) makes existential closure of a function part of the definition of the binding of its argument. We might implement it by inserting automatically an existential quantifier in the scope of the binder of the argument of an indefinite determiner:

- (79) $[NP_i S] \Rightarrow [NP_i [\exists f S]]$, whenever $some_f^i$ or a_f^i is in the scope of NP_i ¹⁴

Moreover, and more importantly, (77b) it is *not* restricted just to DE functor. Hence it is a more general statement than what we had before. Consider, for example, the kind of sentences we have been discussing throughout:

- (80) a. every linguist studied every solution that some problem might have
 b. not every linguist studied every solution that some problem might have.

The approach sketched in (77) yields in each case essentially two (relevant) LFs. In the case of (80a), they are:

- (81) a. $\exists f[\text{every linguist}]_i [\text{every solution that } some_f^k \text{ problem might have}]_j [t_i \text{ studied } t_j]$
 b. $[\text{every linguist}]_i \exists f[\text{every solution that } some_f^i \text{ problem might have}]_j [t_i \text{ studied } t_j]$

The LF in (80a) is obtained via the topmost closure option. If we select it, then the covert argument of *some* must be left free, because of (78), and hence its value must be indexically filled in. The result is the referential construal of the indefinite. The LF in (80b) is obtained by choosing to bind the hidden argument of *some*. In such a case, existential closure in the scope of the binder is forced by (78). The result is the intermediate scope reading.

¹⁴Alternatively, we might build existential closure into the semantics of binding along the following lines. A superscripted indefinite like a^i or $some^i$ is interpreted as a variable ranging over functions applied to the i -th variable. The interpretation of the result of QR can be modified along the following lines:

If i is the index of an indefinite a^i or $some^i$, then:

$\| [NP_i S] \|^g = \| NP \|^g \{ \{ u: \text{for some } f \| S \|^g [a^i/f]_i/u \} = 1 \}$, where $g [[a^i/f]_i/u](a^i) = f$ and $g [[a^i/f]_i/u](i) = u$. I am assuming that NPs are interpreted as generalized quantifiers (i.e. functions from sets into truth values).

In this way existential closure of choice functions becomes part of the semantics of binding.

One consequence of the present view is that the Kratzer/Matthewson style representation (repeated below) is ruled out:

- (82) $\exists f$ [every linguist]_i [every solution that some_fⁱ problem might have]_j [_i studied _j]

This representation violates the constraint in (78). Notice that, in the case at hand, (82) and (81b) (if grammatical) would yield equivalent truth conditions (banning empty domains for universal quantifiers). For clearly, if (82) is true, then (81b) also must be (just keep choosing for every linguist the function that verifies (82)). But it also holds that if (81b) is true, then (82) is. For out of the functions that verify (81b) for each linguist, we can surely build a “big” function that verifies (82). So, nothing is lost by ruling (82) out.

Parallel considerations apply to DE contexts, such as (80b). The two relevant LFs we get for (80b) are fully parallel to those in (81):

- (83) a. $\exists f$ [not every linguist]_i [every solution that some_f^k problem might have]_j [_i studied _j]
 b. [not every linguist]_i $\exists f$ [every solution that some_fⁱ problem might have]_j [_i studied _j]

LF (83a) corresponds to the referential construal; the one in (83b) to the reading discussed in section 2, reading which cannot be obtained without intermediate existential closure. Again, the Kratzerian representation (parallel to (82)) is, correctly it seems, ruled out. I leave it the reader to verify that the crossover cases discussed in section 3 come out right. I.e. the unattested readings are excluded by the approach sketched in (77) in interaction with whatever takes care of crossover configurations. So (77) seems to constitute some progress over (65).

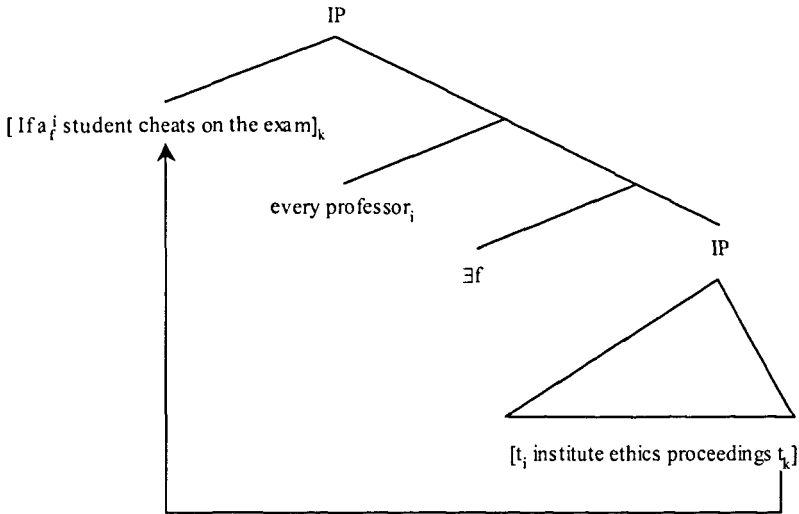
There is one final remark that is worth making in connection with (77). In section 3.3 we discussed a contrast which we repeated here:

- (84) a. If a student cheats on the exam every professor might institute ethics proceedings
 b. If the cover is sexy enough, every book might sell better

The observation is that (84a) doesn't have an intermediate scope reading, while (84b) admits a reading where the implicit argument of the definite *the cover* is understood as bound by *every book*. Parts of these effects are probably crossover effects. But an outstanding issue remains concerning a possible reconstruction analysis of these sentences. Such an analysis should

be viable for (84b), but has to be ruled out for (84a). Consider the relevant structure, given, in schematic form, in what follows:

(85)



In this structure (where I am ignoring the modal, for simplicity), the if-clause is fronted from a post verbal position. If reconstruction (or whatever subsumes its effects) were possible, we would get the intermediate scope reading for the indefinite, since the main clause subject has a suitable index and existential closure is therefore bound to apply within its scope. Presumably, however, the existential operator interferes with (i.e. blocks) reconstruction. In other words, we are in presence of an intervention effect, similar to other kinds of effects noted in the literature (see e.g. Chierchia (1995, ch. 3) or Beck (1996), among others). The structure of a sentence like (84b) would be identical to that in (85), except that since we are dealing in that case with definites, existential closure wouldn't apply. Consequently, reconstruction is not blocked and binding of the hidden argument of *the cover* by the main clause subject (*every book*) is, accordingly, expected to be possible. While this is a far cry from a full account, still the subtle but steady contrast between sentences like those in (84) begins to make some sense (since we begin to see, at least, its connection with other independently observable properties of grammar). This may be a further advantage of the constrained view of existential closure embodied in (77).

In conclusion, we have seen that the two theories of long distance indefinites discussed here constitute a significant step forward towards a better

understanding of the scopal properties of indefinites. But, if the arguments developed above withstand closer scrutiny, both theories miss certain important points. A Kratzer style theory (with no existential closure) allows for a crossover account of certain missing readings. But Winter and Reinhart are right (contra Kratzer) that intermediate existential closure is necessary. On the other hand, an unconstrained approach to closure appears to overgenerate predicting the existence readings that aren't there. We come out of this discussion with a conjecture as to how existential closure is constrained. The relevant constraint (i.e. 78) above) is formally rather simple and has a broad empirical coverage (superior to that of other conceivable alternatives). But from which deeper properties of grammar it may follow (or, should (78) turn out to be factually wrong, how the empirical pattern that has emerged should be properly accounted for in an economy driven grammar) will have to be left open here.

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