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WH-IN-SITU IN THE FRAMEWORK OF THE MINIMALIST PROGRAM*

In the framework of the minimalist program, the assumption that *wh*-in-situ move covertly to be assigned wide scope is infeasible. Rather, it is assumed that they must be interpretable in situ, and that syntactic conditions like 'superiority' are effects of economy, which restricts overt rather than covert movement of a *wh*-element. The remaining syntactic problem for this line of reasoning is the putative ECP effects of adverbial *wh*-adjuncts, which were the strongest evidence for covert movement. A serious semantic problem is that the interpretative procedures which have been proposed for *wh*-in-situ – unselective binding or absorption – fail to capture correctly their interpretation. I will argue first that both problems are solved if the interpretation in situ employs choice functions, and it is the function variable, rather than an individual variable, which is long-distance bound by the question existential operator. Adverbial adjuncts, which cannot be interpreted via choice functions, cannot, therefore, be interpreted in situ. However, the concept of economy underlying the account of overt superiority effects requires both theoretical and empirical clarification (as it leaves some empirical problems unaddressed). I argue, following a proposal by Golan (1993), that in this case the economy considerations apply at the interface ('interface economy') and that they consider not only different derivations out of the same numeration, but also their semantic representation.

1. THE SYNTAX OF SCOPE ASSIGNMENT

Two approaches have been proposed within syntactic frameworks regarding the assignment of wide scope to *wh*-in-situ. (I will be concerned here only with the standard cases where the *wh*-in-situ is assigned wide scope, as in (1).[1]) The one most commonly assumed is that they undergo movement at LF to some clause-initial position where their scope is correctly captured, as illustrated for (1) in (2a). The other approach, originating in Baker (1970), takes it that each question sentence contains an abstract Q-morpheme and *wh*-in-situ are bound directly by Q. Recently, this view has regained popularity and got further developed in the work of Pesetsky (1987) and Nishigauchi (1986), who argued that at least in certain cases *wh*-in-situ

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* This is the text of a lecture given at the Utrecht Colloquium in October 1993, and it appears here with only minor modifications. The view of economy it assumes is based on the early stage of the minimalist program, as laid out in Chomsky (1992). Several of the problems raised here were later addressed in Chomsky (1995), where a different implementation was proposed (most notably, for *wh*-islands), and where the idea of interface economy is built into the numeration. These recent developments are discussed in Reinhart (forthcoming).

[1] The scope of a *wh*-expression can be checked by the possible answers to the question containing it. In (1), the answer provides pair(s) of a lady and a book.

Natural Language Semantics **6**: 29–56, 1998.

are bound in situ by Q. Their formulation of this line makes use of the mechanism of unselective quantification developed in Heim (1982), following Lewis (1975): the Q-operator unselectively binds all the variables in the *wh*-NPs which have not moved. The LF derived in this way for (1) is (2b).

(1) Which lady$_2$ [e$_2$ read which book$_1$]?

(2) a. LF movement: [Which book$_1$ [which lady$_2$ [e$_2$ read e$_1$]]]
b. Baker (1970): Q$_{\langle 1,\,2\rangle}$[which lady$_2$ [e$_2$ read which book$_1$]]

Let us examine, first, the problems that these analyses are designed to solve. Apart from the issue of correctly assigning scope and interpretation to *wh*-in-situ, there are well-known syntactic restrictions on their distribution. The first is due to superiority, illustrated in (3)–(5).

Superiority (Chomsky 1973)

(3) a. Who e discussed what with you?
b.*/? What did who discuss e with you?

(4) a. What did Lucie discuss e with whom?
b.*/? Whom did Lucie discuss what with e?

(5) a. Whom did Lucie persuade e [PRO to visit whom]?
b.*/? Whom did Lucie persuade whom [PRO to visit e]?

In the (a)-cases, the *wh*-NP that has moved overtly originates higher in the tree than the one that stays in situ. If the lower one moves, as in the (b)-cases, the derivation is worse (though this is a weak violation).

Apparent ECP Effects with Adjuncts

Another problem to be captured is *wh*-adjuncts. The distinction between this and the superiority problem is not always drawn. If we look at (6), it may appear similar to (3), and under some analyses they are viewed as illustrating the same problem. Still, we should distinguish these, since, as we will see directly, analyses are divided on how well they account for the two cases. The problem is that adverbial *wh*-phrases are never very good in situ. This is best illustrated with (7). In (7a), with an argument *whom* in situ, the derivation is fine even though it occurs in an island, but the adverbial *how* in this position in (7b) yields an effect similar to that of the ECP violation in the overt movement of (7c).

(6) *Who e arrived why?

(7) a. Who fainted when you attacked whom?
b.*Who fainted when you behaved how?
c.*How did Max faint when you behaved e?

Two lines of argument have been proposed for the syntactic facts above. In Chomsky (1973), where the term 'superiority' was coined, they are viewed as instances of syntactic movement. The relation 'superior' is the predecessor of c-command, and the superiority condition requires that given two or more *wh*-candidates for movement at DS, the one which moves is the highest, i.e., that which c-commands the others. This account captures correctly all the pairs in (3)–(5), which are the original cases falling under superiority, but it does not explain the adjunct cases of (6) and (7). In these cases, the moved *who* c-commands the adverbial *wh* that remained in situ, so the superiority requirement is satisfied.

In the alternative line, originating with Huang (1982), the hope was that both the superiority and the adjunct effects can be reduced to the ECP, if we assume that *wh*-in-situ undergo movement at LF. On this view, SS movement can apply to any of the *wh*-candidates (subject to standard restrictions on SS movement), but at LF all other *wh*-elements must raise. In the specific implementation of Huang, the *who* of, e.g., (3b) adjoins to *what* in Spec,CP, as in (8a). From that position it does not c-command its trace (since the index of this Spec remains that of *what*). So the trace of *who* is not antecedent governed – violating the ECP. The same is true for (3a), but there the trace is head governed, and hence the ECP permits the derivation.

(8) a. LF of (3b): *[Who$_1$ [what$_2$]]$_2$ [e$_1$ discussed e$_2$ with you]
b. LF of (5b): [whom$_1$ [whom$_2$]] [Lucie persuaded e$_1$ [to visit e$_2$]]

This account captures correctly the adjunct cases, since adjuncts always require antecedent government, and it also happens to capture superiority with subjects, as in (3b), but it leaves the other superiority cases – (4) and (5) – unexplained. In the LF of (5b), for example, given in (8b), the trace is appropriately head governed.

Though several other implementations of the LF movement approach exist, it remains the case that the syntactic problem of *wh*-in-situ is unsolved.

In the minimalist program (Chomsky 1992), Chomsky returns, in a sense, to the analysis of Chomsky (1973), where superiority is a restriction on overt movement. But while at the previous stage, this condition seemed arbitrary and structure specific, it can now be viewed as an instance of the economy strategy of preferring shorter links. Travelling to Spec,CP, the c-commanding *wh* has to cross fewer nodes which dominate it than any

wh it c-commands. Hence the movement in the (a)-cases of (3)–(5) is more economical. For reasons I will turn to directly, the same economy considerations entail that there can be no further LF movement of *wh*-in-situ, and they must be interpreted and assigned scope without moving. The mechanism assumed for their interpretation is what Chomsky calls 'absorption', borrowing the name from the absorption mechanism proposed by Higginbotham and May (1981). A structure like (9a) will be assigned an analysis along the lines of (9b), where the N-restriction (*book*) stays in situ since *which book* did not move. We should note that in the specific case of *wh*-phrases, as well as with indefinite NPs, the absorption mechanism assumed by Chomsky is semantically indistinguishable from the mechanism of unselective binding. The two may differ only in the cases where two distinct determiners, or operators, are involved. But given two or more occurrences of an existential quantifier, as in the case of questions, the two interpretations are equivalent. so this is, essentially, taking the Baker-type line.[2]

(9) a. Who e bought which book
b. for which ⟨x, y⟩, x bought y, and book(y)

Let us look now at some of the motivation for this analysis – why it is advantageous and necessary within this framework to assume that there can be

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[2] As for the implementation, namely, the question how the semantic representation (9b) can be derived for (9a), there are several hints in Chomsky (1992), one of which is the idea that it is obtained by an operator movement, or movement of the *wh*-determiner, as proposed by Hornstein and Weinberg (1990), which is illustrated for (9a) in (i). Applying absorption to (i) yields (9b). This is supposed to be a different type of operation than syntactic movement, hence not subject to economy considerations.

(i) [which [who [e bought [e book]]]]

However, given that it is completely unneeded for interpretative purposes, I will not assume this here.

It may appear that assuming the movement in (i) may help to solve another problem that is left somewhat open in the program, namely what precisely forces *wh*-movement. Since movement is driven only by the need to check features, *wh*-phrases should carry some such feature, which can be checked by the matching feature of C. But, then, if there is more than one *wh*-phrase, and only one moves, the question is how this feature is checked for the others. (Unchecked features disallow a derivation to converge.) I will assume here that this feature is optional on the *wh*-phrase, so a *wh*-phrase moves only if marked with this feature. (If no *wh*-phrase marked with this feature happens to be selected, hence no *wh*-phrase ends up in Spec,CP, the C features cannot be erased, and the derivation will crash.) I will leave further details of this assumption open here. The alternative assumption – of movement of the *wh*-determiner alone – is still more costly theoretically, since it has to be declared as non-movement; it also opens other checking questions, such as what it means for one functional head to check the features of several elements in Spec.

no LF movement of *wh*-in-situ. In fact, given the full set of assumptions, it is impossible to allow such movement. Let's look first at the economy problem in (10).

(10) a. Who knows where to find what?
b. for which ⟨x, y⟩, x knows where to find y

(10a) is an ambiguous question. It can be answered with one argument (*Max knows where to find what*), which means that the scope of the *wh*-in-situ is the embedded clause. Or it can have a pair answer like *Max knows where we can find bicycles . . .* , in which case *what* has scope over the matrix clause and the semantic representation of the question is, roughly, (10b). Under the movement analysis, this would be obtained by adjoining *what* to *who*. But given the economy requirement of taking the shortest move, the movement deriving (10b) should not be allowed. Since we have the option of adjoining *what* to the lower *where*, adjoining it higher up violates economy. So, in order to allow for the reading (10b) we would either have to say that the movement of *wh*-in-situ violates economy, which is not, in fact, statable in the minimalist framework, or that such movement does not exist.

A strong support for this approach is the issue of subjacency. It is well known that, under a movement analysis, the movement of *wh*-in-situ does not obey subjacency. For instance, while the syntactic movement in (11b) is ruled out by subjacency (which should ultimately be an instance of economy), (11a) is completely permissible.

(11) a. Who reads the books that who writes?
b.*Who do you read books that e writes?

Starting with Huang (1982), this fact was handled by stating that LF movement, unlike syntactic movement, does not obey subjacency (whereas it does obey the ECP – an issue we return to later). Already in the previous stages of the theory, opinions where sharply divided regarding the status of such statements. Some thought that this view of LF movement was a real hindrance to a unified theory of Move α,while others thought that the fact that syntactic movement and LF movement obey different constraints was strong evidence for the existence of LF as distinct from SS. While this purely conceptual debate could go on forever, in the minimalist program it is impossible even to state the question, since there are no levels. There is only one derivation – deriving LF – which can be spelled out and enter the PF interface at any stage, but there is no way to state that up to the branching to PF you have to obey a certain constraint and beyond that you do not.

Independently of the conceptual issue, it is simply empirically wrong that phonetically invisible (LF) movement does not obey subjacency. In the case of comparatives and other elliptic conjunctions, as in (12), the underlined (correlate) phrase must move at LF and adjoin to the *than*- or *except*-phrase. (This is laid out in detail in Reinhart (1991), where it is also argued that no overt syntactic movement can account for such structures.) This movement is not clause-bound, as illustrated in (12a,b), but must still obey subjacency. (12c,d), where the correlate is in an island, and hence its LF movement violates subjacency, are as bad as the cases of overt movement such as (11b).

(12) a. More people said that they will vote for Bush in the last poll than for Dukakis.
b. Lucie did not admit that she stole anything when we pressed her, except for the little red book.
c.* More people who love Bach arrived, than Mozart.
d.* The people who love every composer arrived, except Mozart.

So subjacency is a general constraint on Move α, and there can be no difference in this respect between phonetically visible and invisible movement. If *wh*-in-situ do not show subjacency effects, this cannot be dealt with through statements about properties of LF movement; rather, it indicates that they don't move.

It is clear that, conceptually, the analysis of *wh*-in-situ in the minimalist program is superior to previous analyses. Specifically, the syntactic evidence *against* LF movement of *wh*-in-situ is much more compelling than the evidence *for* such movement. But there are still problems to be addressed:

Interpretation: As we will see, the interpretation obtained by leaving the *wh* restriction is situ and applying the absorption mechanism cannot be right as stated. In fact, none of the available implementations of the idea of capturing the scope of *wh*-in-situ without moving them captures correctly the full range of their interpretations.

Adverbial adjuncts: Since the syntactic analysis in the minimalist program is identical, empirically, to that originally proposed in Chomsky (1973), it faces precisely the same problem of how to rule out the adverbial-adjunct cases in (6) and (7), which motivated the assumption that movement is involved which obeys the ECP. I will argue that the solution to the interpretation problem provides the solution to this problem as well.

Economy: The concept of economy underlying the account of superiority

effects above requires further clarification. Furthermore, there are widely noted empirical problems with structures where violations of the superiority requirement are permitted, which, as we will see, suggest some revisions in the concept of economy underlying this requirement.

2. INTERPRETING *WH*-PHRASES WITHOUT LF MOVEMENT

Since *wh*-in-situ don't move, a crucial result of the analysis is that although their scope is identical to that of a moved *wh*-phrase, the N-restriction stays in situ, rather than occurring as a restriction on the question operator. Applying an interpretative procedure to the LFs in question results in something like (9b), repeated below. This would be the same under any of the implementations mentioned above – unselective binding, absorption, or the movement of the *wh*-determiner alone (discussed in footnote 2). In the specific case of (9), the result is unproblematic. (9b) is equivalent to any more familiar representation of the question, like (9c), which would be obtained from an LF in which *which book* has moved.

(9) a. Which lady e bought which book
b. for which ⟨x, y⟩ (lady(x)) (x bought y and book(y))
c. for which ⟨x, y⟩ (lady(x) and book(y)) (x bought y)

But if we look deeper, we will discover that this is, nevertheless, the wrong interpretation. Before proceeding, I should note that it is essentially pointless to ponder over the meanings of representations such as (9b,c). Since *which* does not correspond to any known logical quantifier or operator, these are just sentences of English written in a funny notation, rather than logical formulae. We can continue using such notation only if we know what it corresponds to in a semantic language.

2.1. *Background: Interpretation of Questions*

Let us assume here the semantics of questions proposed by Karttunen (1977) (see also Engdahl 1986).[3] On this view, *wh*-NPs are, essentially, existential NPs, and the question denotes the set of propositions which are true answers to it. For example, the interpretation of question (13a) is given in (13b).

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[3] I choose this framework since it lends itself easily to the type of solution I propose for the problems below. I leave it open whether the same solution can also be stated in the framework of Groenendijk and Stokhof (1982).

(13) a. Which European country has a queen?
b. {P|(∃x) (European country (x) & P =ˆ(x has a queen) & true(P))}
c. {England has a queen; Holland has a queen}

(13b) is the set of true propositions P such that there is a European country x about which P asserts that x has a queen. In our actual world, the values of x yielding 'x has a queen' as a true proposition turn out to be England and Holland, so the question denotes the set in (13c).

(14) a. Which lady bought which book?
b. *With LF movement*: {P|(∃x) (∃y) (lady(y) & book(x) & P =ˆ(y bought x) & true(P))}
c. *Without movement – "absorption"*: {P|(∃⟨x, y⟩) (lady(y) & P =ˆ(y bought x & book(x)) & true(P)}

Applying this analysis to the two LFs assumed in (9), we get (14b) for the LF obtained by raising of the *wh*-in-situ. Namely, (14b) is what (9c) means. (This is the set of true propositions P such that there is a lady y and a book x about which P asserts that y read x.) (9b), the representation obtained without LF movement of the *wh*-in-situ, now corresponds to (14c), which differs from (14b) only in where the *book*-restriction occurs in the representation.

Assuming that the informal representations of (9) are directly translatable into such formulae, we may continue to use them, and proceed to the problem with the proposed analysis. (For convenience, I will use both the informal representation and Karttunen-type representations in the examples.)

2.2. *Problem: Can* Wh-*in-Situ Be Interpreted in Situ*

The idea of leaving the restriction in situ is very dangerous, as can be seen in the case of (15).

(15) Who will be offended if we invite which philosopher?

Wrong:

(16) a. for which ⟨x, y⟩, if we invite y and y is a philosopher, then x will be offended
b. {P|(∃⟨x, y⟩) & P =ˆ((we invite y and y is a philosopher) → (x will be offended)) & true(P)}
c. Lucie will be offended if we invite Donald Duck.

Right:

(17) a. for which ⟨x, y⟩, y is a philosopher, and if we invite y, x will be offended

b. {P|(∃⟨x, y⟩) ((y is a philosopher) & P =ˆ((we invite y) → (x will be offended)) & true(P))}

In this case, the restriction occurs in an *if*-clause. So the representation obtained if we leave it in situ is (16a). Now, if (16a) is the question expressed by (15), one of the possible answers to it should be (16c). Since Donald duck is not a philosopher, it must be true of him that if he was a philosopher and we invited him, Lucie would be offended. In fact, anything which is not a philosopher could be a value for y in (16a), since its restriction occurs in the antecedent clause of an implication. This result is just wrong. We do not want to allow (16c) in the set of possible true answers to the English question (15). The representation yielding the correct set of answers in such cases is that in which the restriction is pulled out of the implication, as in (17a). This correctly allows the values for y to be all and only those individuals who are philosophers and for whom the implication is true.

The same problem is illustrated with (18). Leaving the restriction in situ and applying absorption or unselective binding, we obtain (18b), under which it turns out that a necessarily true answer is, e.g., (18d), since it is true for every linguist x that if Nancy Reagan is a philosopher, then x read every book by her.

(18) a. Which linguist read every book by what philosopher?
b. for which ⟨x, y⟩, x is a linguist and for every z, if z is a book by y and y is a philosopher, then x read z
c. {P|(∃⟨x, y⟩) linguist (x) & P =ˆ(∀z (z is a book by y & y is a philosopher) → (x read z)) & true(P)}
d. All linguists read every book by Nancy Reagan.

It is fashionable nowadays to enrich both the semantic and the syntactic machinery by associating presuppositions with almost any type of NP. This line of thinking would attempt to address the problem with claims that *wh*-phrases carry presuppositions, and that it is the presupposition of *what philosopher* which should somehow explain why the wrong answers obtained by the derivations above are excluded. But we should note that the problem is not restricted to the set of *wh*-expressions defined as D-linked by Pesetsky (1987): *what*-expressions, as in this example, are prototypically non-D-linked. Since there is no context in which a question like (18a) can have the interpretation (18b), a presuppositional approach to this problem should entail that *wh*-NPs are always presuppositional. As we saw, *wh*-expressions (of all types) are analyzed as standard existential quantifiers. Though attempted by some, associating presuppositions with existentially quantified NPs is highly problematic within any of the familiar

semantic systems, disabling basic entailments. (This is discussed, e.g., in Lappin and Reinhart 1988).[4] In any case, even if *wh*-expressions are always presuppositional, we would still need to know how precisely the association between presuppositions and the wrong entailments under consideration is to be executed. For the syntactic analysis to work, we need more than the mere hope that this problem could somehow be solved.

The interpretation problem is, in fact, independent of the syntactic analysis in the minimalist program. In Reinhart (1992) I argue that there are cases where the correct interpretation for multiple questions cannot be derived under a movement analysis either; so in any case, we need some mechanism allowing *wh*-phrases to be interpreted in situ. I proceed to outline the choice-function analysis for *wh*-in situ proposed in Reinhart (1992). I will do so in some detail, since the solution to the interpretation problem leads also to the answer to the question of the distribution of adjuncts, which I propose in section 3.

2.3. *A Solution to the Interpretation Problem*

2.3.1. *Choice Functions*

The interpretative problem is how to assign wide scope to *wh*-phrases which otherwise show properties of remaining in situ. Suppose, for the sake of analogy, that we had some reason for wanting to assign wide scope to the existential *some book* in (19a), without pulling out its restriction (i.e., without moving it at LF). One way to do that is to allow existential quan-

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[4] I believe that D-linking, as well as many of the other instances of what is called 'presupposition', is a purely pragmatic notion, which is not directly encoded into the computational system. Semantically, all *wh*-expressions are strictly weak NPs. This claim cannot even be evaluated under Karttunen's analysis, which I assumed here only because it is the most familiar and because the fine details are irrelevant to my main argument. For instance, if *wh*-expressions are weak, the question *How many chairs in this room are broken*? should be equivalent to the question *How many broken chairs are there in this room?*. Under Karttunen's analysis, the definition of P in the set of propositions will be entirely different for these two questions, so equivalence cannot even be computed. However, this problem does not arise in the original analysis of Hamblin (1973), where the restriction is put inside the definition of P. This captures correctly what I believe to be the semantic properties of *wh*-expressions. Hamblin himself is quite explicit about the issue of presuppositions belonging into pragmatics (Hamblin 1973, p. 257). In Lappin and Reinhart (1988) we argued that even clearer cases of apparent presuppositions of non-emptiness of the N-set, such as universal determiners, are better explained in terms of assessment of sentences in discourse, along the lines proposed by Strawson.

Of course it is possible that some new semantics will be developed for questions (see, e.g., Higginbotham (1992) for interesting suggestions), but for the time being it is not clear how presuppositions can solve the problem under consideration.

tification over choice functions, i.e. functions applying to a non-empty set and yielding an individual member of the set (notated here as 'CH(f)').

(19) a. Every lady read some book.
b. ∃f (CH(f)) & (∀z) (lady(z) → z read f(book))

In (19), such a function applies to the set of books. The function variable can be bound by an existential operator that is arbitrarily far away. (19b) says that a function exists such that for every z, if z is a lady, then z reads the book selected by this function (which is equivalent to saying that a book exists such that every lady reads it). Note that *f*(*book*) here is an argument (of *read*) – which corresponds to the fact that its NP has stayed in argument position – and that it denotes the value of the function f, i.e. a given book.

It is more interesting to check how the same procedure applies when the N-restriction occurs in the antecedent clause of an implication, since these are the contexts which posed problems in the case of *wh*-in-situ.

(20) a. Max will be offended if we invite some philosopher.
b. (∃f) (CH(f) & (we invite f(philosopher) → Max will be offended))
c. (∃x) ((philosopher(x)) and (if we invite x Max will be offended))

Although the N-restriction (*philosopher*) in (20) has stayed in situ, inside the *if*-clause, the representation in (20b) captures its truth conditions correctly. It states that a function exists such that if we invite the philosopher it selects, Max will be offended. In a model where the N-set is non-empty, (20b) is equivalent to the standard representation of wide scope in (20c).[5]

At first sight this may seem nothing more than a trivial exercise in logic. So trivial, in fact, that it has not been used before for existential structures of this sort (although choice functions have been studied by logicians since Hilbert and Bernays (1939)). The reason is probably that it was not obvious why it should be interesting to do so. However, in Reinhart (forthcoming) I argue that this mechanism for interpreting existential NPs in situ is needed for a much broader range of problems than just the case of *wh*-in-situ, to which I return directly. For the present discussion, it is sufficient to note that if existential DPs are interpretable in situ by choice functions, this explains why they can get wide scope out of a syntactic island.

The availability of apparently arbitrary wide scope for existentials has been treated in the past by statements about their "specific" interpreta-

[5] The semantics of choice functions and the question of the empty set are discussed in Reinhart (forthcoming).

tion. However, Ruys (1992) shows, first, that this notion is ill-defined (if it needs to be distinguished from the wide scope reading of existentials) and, second, that even if it was definable, it would not solve the problem. In (21) the choice of a problem may vary with the choice of a linguist, in which case *some problem* is not "specific." Nevertheless it can take scope over *every analysis*.[6]

(21) Most linguists have looked at every analysis that solves some problem.

(22) a. [Most linguists]$_1$ [[every analysis that solves some problem]$_2$ [e_1 looked at e_2]]

b. For most linguists x, ($\exists$f) (CH(f) & ($\forall$y) (analysis(y) and y solves f(problem)) $\rightarrow$ (x looked at y))

Assuming instead that existentials can be interpreted without movement, via a choice function, this reading of (21) is not a problem. Existential closure of the function variable (its binding by an existential operator) is a purely interpretative procedure, applying arbitrarily far away, so there is no reason why one should not introduce this existential in the scope of another operator as well. Assuming the conventional QR for strong QNPs, the LF derived for (21) is (22a). The binding existential can be introduced anywhere. If it is introduced as in (22b), we obtain the interpretation under consideration.

We may conclude that some mechanism is needed anyway for assigning existential NPs what manifests itself as wide scope, without moving them syntactically. But here I will continue to address only the problem of the *wh*-existentials that we started with.

Crucially, in all standard semantic approaches to questions, such as Karttunen's, which I assumed here, *wh*-NPs are always translated as existential quantifiers. Hence we can apply to them straightforwardly the same mechanism of quantifying over choice functions. In (23a), *which lady* has moved to Spec,CP, so it is no longer in argument position and cannot serve as an argument of the form *f*(*lady*) in this position. (Though it can be reconstructed to an argument position to be interpreted in the same way, this is not necessary for the present discussion.) But for the *wh*-in-situ *which book* we can apply a choice function, yielding *f*(*book*). The function variable will then be bound by the relevant question operator, as illustrated informally in (23b). (It would be useful to go over the semantic

[6] Fodor and Sag (1982) argued, with other examples, that such interpretations of indefinites are not possible. However, Ruys shows convincingly that they are. (His examples involve more complex contexts, but I think (21) is sufficient to show the relevant reading.)

representation (23c), to know what the informal statement (23b) is intended to mean. The question here denotes the set of true propositions P, each stating for some lady x and for some choice function f that x read the book selected by f.)

(23) a. Which lady e read which book?
b. for which ⟨x, f⟩ (lady(x)) and (x read f(book))
c. {P|(∃ ⟨x, f⟩) (CH(f) & lady(x) & P =ˆ(x read f(book)) & true(P))}

Turning to our problem case, repeated in (24a), we apply the same procedure, where the choice function bound by the question operator selects a value from the philosopher set. Although the restriction occurs in an *if*-clause, the values permitted in the answer can only be from the philosopher set, as we saw already in the discussion of (20), in that case for the existential *some philosopher*.

(24) a. (=15) Who will be offended if we invite which philosopher?
b. for which ⟨x, f⟩, if we invite f(philosopher), x will be offended
c. {P|(∃⟨x, f⟩) (CH(f) & P =ˆ((we invite f(philosopher)) → (x will be offended)) & true(P))}

2.3.2. *Extensionality*

I have not been fully explicit here on the formal characterization of the choice functions I assume. (This is discussed in Reinhart (forthcoming)). But one aspect which needs attention is extensionality: the analysis should capture all standard properties of the wide scope of *wh*-existentials. For this, we must make sure that in all cases the given choice functions select only from the extension of the N-set in the actual world (even when the N-restriction originates in an intensional context).[7]

Technically this can be captured by defining the range of quantification for f, as in (25). The set of choice functions is now defined in G. These functions apply to the intension of a given set and select an element from the extension of this set in the actual world.

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[7] The problem can be illustrated with the question in (i).

(i) Who wants to marry which millionaire?

Which millionaire here occurs in the complement of *want*. Nevertheless, its scope is marked by the top *who*, so the question cannot be ambiguous, and *which millionaire* has only an extensional construal. But since no movement is involved and the N-restriction stays in situ, nothing so far guarantees that the function will select from the set of millionaires in the actual world.

(25) G = {f|∀P (ˇP ≠ ∅ → f(P) ∈ ˇP)}
P of type ⟨s,⟨e, t⟩⟩

This means that the precise representation of, e.g., the *wh*-in-situ of (24a), repeated in (24′a), should be (24′b), rather than the simpler version I used so far. (f is defined to belong to the set in (25). Thus, its argument is an intension and its value is an extension – a philosopher in the actual world.)[8]

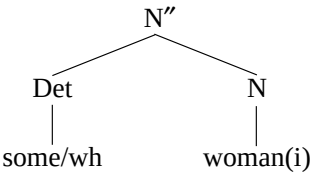
(24′) a. Who will be offended if we invite which philosopher?
b. {P|(∃x) (∃f ∈ G & (P =ˆ((we invite f(ˆphilosopher)) → (x will be offended)) & true(P))}.

All instances above of quantification over function variables should be read in the same way.

2.4. *Deriving the Interpretation*

What we saw so far is that using existential quantification over choice functions solves the interpretation problem encountered by the syntactic analysis of the minimalist program: it allows *wh*-expressions to be interpreted in situ, without running into the problems with unselective binding of individual variables, or their equivalents with the absorption mechanism. But for this to be a feasible solution, rather than an exercise in logic, we need to show that it is motivated by the syntax of natural language, and that it can be directly derived. I will examine here one implementation, though others are conceivable. Let us look at a standard existential NP such as *some woman* or *which woman*, represented schematically in (26a).

(26) a.



b. (∃x) (woman(x))
c. f {x|woman(x)}

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[8] Similarly, the *wh*-in-situ of (i.a) (mentioned in the previous footnote) is interpreted as in (i.b).

(i) a. Who wants to marry which millionaire?
b. {P|∃x (∃f ∈ G & (P =ˆ(x wants to marry fˆ(millionaire)) ∧ true(P))}

Following Higginbotham (1985), N is generated with an index argument ('role'), which must be bound ('discharged' in his terms). This is in fact assumed by any analysis of NPs: N is always viewed as a set with an index variable. One way the variable can be bound is if the determiner *some* itself is translated as an existential operator, as in (26b). However, one of the basic insights emphasized in the DRT framework is that indefinite determiners, or more generally weak determiners, do not necessarily correspond to an operator (unlike strong determiners).[9] An available alternative, then, is to bind the variable by forming a set as the translation of N, as in (26c). Now, the determiner is, in any case, a function, so one option (in the case of weak NPs) is to let it serve as a (choice) function variable applying to the given set. This is how *f*(*woman*), used in our formulae before, is derived. (As I mentioned, other implementations assuming no syntactic variables are easily conceivable.)

The next procedure is the binding of the function variable. Here existential closure applies, introducing an existential operation, or binding the function variable to an available existential operator, along the lines proposed in Heim (1982) (except that this operator binds a function variable here, whereas closure can apply anywhere).[10]

As to *wh*-expressions, such as *which woman*, under the semantics we assumed for them all along they are just viewed as standard existentials. Hence at the local NP-level, they can be analyzed just as in (26c). However, they differ from other existentials in that their binding existential operator must be inserted in a predetermined position in the scope of the question-formation operator (which forms the set of propositions denoted by the question). Syntactically, then, 'absorption' can be viewed as the binding of the f-variable by the Q operator.

Note that it is not sufficient to show that the interpretation we assumed here is possible, but also that this is the only way to bind unselectively into an existential NP which stays in situ. Otherwise, the interpretation we wanted to exclude for the Donald Duck example would still be allowed. The relevant restriction can be drawn from Higginbotham (1985). He argues that the N-variable must be discharged inside the NP. This constraint could

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[9] In slight variance from DRT I am assuming here that the determiner can also be directly interpreted as an existential operator, though it does not have to.

[10] In Heim's analysis, an indefinite can be closed only by the nearest c-commanding operator. Thus, closure is not allowed across an intervening operator. Wide scope in such cases can be obtained only by QR. (Heim assumes both unselective binding and an island-free QR.) This was needed in her system in order to avoid problems of the 'Donald Duck' type, illustrated in (15)–(16) above. However, once we disallow unselective binding of individual variables, this problem is avoided, as we saw, so this special restriction is no longer needed.

not, of course, follow from principles of logic, but is most likely a universal constraint of natural language. If true, this entails that the options illustrated in (26) are the only ones available: either the variable is bound by the NP's determiner or by a set-formation operator. This result does not affect the major insight of DRT, that weak NPs are not necessarily closed (since they may still contain a free function variable), but it entails a severe restriction on unselective binding. Variables bound in this way must be function variables. (If this is so, this means that quantification over choice functions is a crucial linguistic device.)

Regarding pronominal *wh*-phrases, such as *who*, I assume that their structure is the same. That is, *who* is a determiner, but the noun position is empty, as in (27).

(27) [who [$_N$ e(i)]]

We may take several lines regarding the interpretation of this empty N: it can be viewed as denoting the set of entities in the model or as containing the selectional-restriction of the determiner (such as animacy). The crucial point, however, is that (under the implementation with variables assumed here) such NPs also contains an N-index variable. This means that the mechanism of discharging this variable and closing the NP with a set variable can proceed just as above. (An alternative that can be pursued is that such *wh*-phrases do not contain an N and are translated directly as variables, which can be long-distance bound.)

We may conclude, then, that it is straightforward to derive the appropriate interpretation for *wh*-in-situ without movement. It is a property of weak NPs that they allow this type of interpretation; this properly follows from their syntax and their semantics.

3. ADJUNCT-ADVERBIAL *WH*'S

The next problem for the non-movement analysis was how to capture the apparent ECP effects in the case of adjunct *wh*-phrases, as in (28a). Since these phrases don't move, the effects cannot be explained by the ECP, and as we saw, the superiority restriction does not capture their distribution. In fact, the solution to the interpretation problem also provides the solution to this second question.

(28) a.* Who fainted when you behaved how?
b. Who fainted when you behaved what way?

Note first that the problem here is not a general problem with *wh*-adjuncts, but is restricted to adverbial *wh*-phrases. (28b), where *how* is replaced

with *what way*, is fine. Syntactically, and semantically, the *wh*-phrase is an adjunct in both. Still, only the adverbial adjunct causes problems. If the problem in (28a) was due to an ECP effect, there should have been no difference between the two.

One thing that would be agreed upon in all frameworks is that *wh*-adverbials are different from *wh*-NPs. First, because they do not have an N-set, hence no N-role or variable; and second, because they denote functions ranging over higher-order entities (Szabolcsi and Zwarts 1993). This entails that they cannot be interpreted via choice functions selecting an individual from a set (since there is neither a variable that can be bound by forming a set nor a set of individuals that the choice function could apply to). In (28a,b) superiority determines that the c-commanding *who* is the *wh*-constituent which moves. In (28b), the adjunct which stays in situ is still an NP, hence it can be interpreted in situ. In (28a), the same procedure cannot apply to interpret it.

This is not necessarily the end of the story, but the generalization which emerges is that *wh*-adverbials are only interpretable in Spec,CP, perhaps requiring their own Q operator. From here, there are several ways to proceed. One is to assume that such adverbials are, in fact, base generated in Spec,QP, as proposed in Reinhart (1981). The analysis assumes two Specs, which would correspond in current syntax to CP and QP; among the arguments for base generating adverbials in Spec,QP is the fact that we never find more than one such adverbial per clause. While (29a), which could be obtained by some sort of scrambling of the adverbial, is marginal, (29b) is completely out.

(29) a.? Who spoke how?
b.* Who spoke when how?

Though there are more problems that need to be addressed by a full analysis of *wh*-adverbials, the generalization that they are not interpretable in situ is sufficient to distinguish them from *wh*-NPs, which is all we needed for the present discussion.

4. Interpreting Economy

We may conclude that, once the interpretation problem is solved, the analysis of *wh*-in-situ in the minimalist program, apart from its conceptual advantages, gets closer empirically to covering their distribution than any previous analysis. With the apparent ECP effects resolved, the remaining superiority effects are to follow from economy considerations: of several *wh*-candidates, the one moved into Spec,CP should be that which yields

the most economical derivation. (Recall that within this approach, there is no covert (LF) movement of *wh*-in-situ.)

But the concept of economy underlying the account of superiority effects requires further clarification. As we shall see, the type of economy assumed for superiority is not, in fact, the same as with other instances of 'shortest link'. Furthermore, there is a residue of facts which have been noted over the years that pose problems for any analysis of *wh*-in-situ. One such problem, noted by Lasnik and Saito (1992), is given in (30). (30a) is a standard superiority violation. (The lower rather than the higher *wh*-phrase has moved.) But (30b), where precisely the same happens in the embedded clause, is much better.

(30) a.*/? I know what who bought e?
b. Who e knows what who bought e?

(31) a. for which ⟨x, y⟩, x knows what y bought
b.*/? for which x, x knows for which ⟨z, y⟩, y bought z

However, this is so only if *who* has matrix scope. The question is in principle ambiguous: *who* could be interpreted in the lower clause, as in (31b) (yielding an answer like 'Lucie knows what who bought'). But on this reading there remains a superiority violation just as bad as (30a). It is only on reading (31a) (answered, e.g., by 'Max knows what Lucie bought') that the superiority effect disappears.

Given that economy is an absolute requirement in this framework the problem posed by such facts is why it appears to be possible to violate it sometimes. I will pursue here an analysis which was proposed by Golan (1993). But first, let us explore a bit further the notion of economy in Chomsky (1992).

4.1. *Two Types of Economy Strategies*

There are two types of economy considerations in the framework of Chomsky (1992), which are summarized in (32).

(32) a. "If the derivation D converges without application of some operation, then that application is disallowed" (p. 47).
– Procrastinate
– Last resort ('greed')

b. "Given two convergent derivations D1 and D2 with the same LF output . . . D1 blocks D2 if its links are shorter" (p. 48).
– Shortest link

(32a) reflects the idea that operations are only allowed if they enable a derivation to converge, i.e. that derivations are driven only by the need to check features; unchecked features will disable convergence. (32b) governs the strategies that should apply if there is more than one possible way for a derivation to converge (i.e. if there are two or more ways to satisfy feature checking). Chomsky argues that the strategies governed by (32a) ('greed' and 'procrastinate') could be viewed as reducing the computational complexity of the syntax. Given that the second type of strategy, (32b), requires comparing derivations and choosing one of them, the more permissible derivations there are to select from, the bigger the computational effort is. If the syntactic operations permitted are only those that satisfy (32a), the number of permissible (convergent) derivations to compare is dramatically reduced. When there is nevertheless more than one way a derivation can converge, (32b) requires choosing the shortest one. The superiority requirement is a protypical example. Both *who e saw what* and *what did who see e* are convergent derivations in terms of feature checking: the movement of any of the *wh*-phrases to Spec-CP enables checking and erasing the relevant C-features (and the *wh*-features; see footnote 2). But the first derivation is shorter (in terms of c-command, i.e. nodes crossed), hence (32b) determines that this is the derivation which is selected.

The idea behind (32b), then, is that a given convergent derivation α is evaluated against a set of alternative convergent derivations – its reference set. If a derivation more economical than α is found in this set, α is blocked. Of course, the reference set should be strictly defined. (We do not want to compare derivations related by some arbitrary notion of similarity.) In a framework assuming syntactic levels, the reference set should include all and only derivations with identical input, i.e. the same Deep Structure.

But examining the full range of selections which are assumed to be governed by 'shortest link' in the minimalist program reveals that this is a much broader set of strategies than suggested in (32b). It is also intended to entail the relativized minimality effects, as well as minimizing the number of chain-formation operations, in cases discussed by Epstein (1992) and Collins (1994). Relativized minimality effects are illustrated in (33), where, in each case, the derivation is blocked since a closer landing site for the moved phrase exists.

(33) a. Head movement (HMC): *Where find Max will t the book.
b. A-movement (superraising): *Max seems [that it is certain [t to arive]]
c. A′-movement (*wh*-islands): *I wonder what you forgot from whom you got e e.

d. I wonder for which x you forgot for which y you got x from y.

Now, while there is some intuitive sense of 'shortness' that appears to be shared by superiority and relativized minimality, if we look closely at the strategy defined in (32b), it is not the case that it entails relativized minimality.[11] (32b) applies to select between two derivations which are both convergent and which have the same LF output. None of these hold in the case of relativized minimality. For example, in the case of *wh*-islands illustrated in (33c), assuming that the top C is *wh*-marked, if no *wh*-phrase gets to its Spec the derivation will crash (since the C-features remain uninterpretable). The only convergent derivations are the one in (33c) and the alternative movement of *from whom* to that position, which equally violate relativized minimality. It is, thus, not the case that this strategy selects among convergent derivations. In fact, it serves as a further filter on permissible derivations, disabling movement even if it is necessary for convergence. There is also no other derivation with an identical LF. In fact, the only way to express the question (33d) is through derivation (33c) (though this is not directly relevant to the definition in (32b)). This too does not matter for relativized minimality; yet the derivation is ruled out nevertheless.

This suggests, then, that 'shortest-link' is not in fact one unified strategy. Unlike superiority, relativized minimality and 'minimize chain formations' (which I did not address here) do not fall under the strategies defined in (32b). It is more appropriate to view them as restricting computational complexity, i.e., as reducing the number of convergent derivations, just as the strategies of (32a). Possibly, what they all have in common is that they are strategies applying during the derivation. The superiority requirement, by contrast, is a global-representation strategy which, indeed, compares convergent derivations. Golan (1993) argues further that this type of strategy is interpretation dependent, i.e., it determines the most economical way relative to interpretative goals.

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[11] Recall that the discussion here is based on Chomsky (1992). The analysis of both 'shortest-link' and *wh*-islands was substantially modified in Chomsky (1995), chapter 4, where the problems raised here are addressed.

4.2. *Interface Global Economy*

4.2.1. *Superiority*

Let us see, first, how Golan's analysis handles the problem of permissible superiority violations. The derivation (34a), which violates superiority, yields the question (34b). (For convenience, I will ignore in this section the precise details of the interpretation of *wh*-in-situ that I assumed above.) The shorter derivation (35a) yields (35b), which is precisely the same question. So we get identical semantic representations, whether we raise the higher or the lower *wh*-phrase. (This is due to the property of questions that all variables end up bound by the same operator.) In this case the more economical derivation blocks the less economical one.

(34) a.* What did who buy e?
b. for which ⟨x, y⟩ x bought y

(35) a. Who e bought what?
b. for which ⟨x, y⟩ x bought y

Turning to Lasnik and Saito's problem in (30b), repeated in (36a), the derivation here appears to violate economy as well, since a shorter derivation exists, as in (37a), where the c-commanding *who* is moved. So the problem is why it is nevertheless allowed, with a matrix scope for *who*, as in (36b).

(36) a. Who e knows what who bought e?
b. for which ⟨x, y⟩, x knows what y bought

(37) a. Who e knows who e bought what?
b. for which ⟨x, z⟩ x knows who bought z

The point is that if we look at the questions denoted by these different derivations, they are not, in this case, identical. With matrix scope of the *wh*-in-situ, (36b) asks for a value for *who*, while (37b) asks for a value for *what*. There are independent reasons for why this is so, say, for why (37a) cannot be interpreted as (36b): a *wh*-phrase in Spec,CP cannot take scope higher than the respective CP. Epstein (1992) argues that this too follows from economy, but in any case, it is a fact about *wh*-scope. So we are comparing here two representations which are not identical. The only way to express the question in (36b) is via the derivation in (36a). In this case, Golan argues that global economy, unlike the (absolute) derivational economy operative in relativized minimality, allows the derivation.

More attention needs to be given to the view of global economy assumed by this reasoning. As stated, (32b) enforces the shorter derivation when

two derivations have the same LF output. It may appear that this would give the expected result for (36)–(37), since the LFs here are distinct. But in fact, the same is true also for (34) and (35). LF is just syntax, and the syntactic derivations here are strictly distinct, with e.g. the traces in different positions. So if (32b) is correct as stated, there would never be any superiority violations, since the LFs obtained by moving the higher or the lower *wh*-phrase are distinct.

The intuition behind (32b) can be captured if we look at a more abstract representation than LF. What we are comparing in this case are the questions which are being asked, rather than their syntactic form, which is LF. It is not necessarily full semantic representations which need to be considered, but some representation in which variables are introduced and bound, since it is only there that the derivations (34) and (35) end up identical. Another way to look at it is that this type of global economy is, in fact, an interface strategy applying at the stage of translating syntactic forms into semantic representations, which is where Reinhart and Reuland (1993) argue that condition B applies as well. One way to state Golan's generalization, then, is that if at the stage of translating a given convergent derivation D into some semantic representation we discover that an equivalent semantic representation could be obtained by a more economical derivation D′, D′ blocks D. (That is, D′ blocks D unless their translations are not equivalent.[12]

Checking competing derivations at the stage of the translation into semantic representations has the effect of reducing the number of derivations to consider, since only derivations with the same interpretation are included in the reference set. Nevertheless, this is a costly calculation, and we may expect not to find too manly instances of it. Indeed, the economy strategies of the derivational type dramatically reduce the instances where this could be relevant. So far, superiority is the only known instance in cases of movement.[13]

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[12] A more sophisticated and explicit execution of this view of interface economy was proposed in Fox (1995). Fox argues that the reference set for economy includes only derivations with identical semantic output.

[13] There are two other contexts which were observed over the years to show violations of the superiority requirement. One is the so-called *D-linking* context of Pesetsky (1987). Though (i.b) is syntactically equivalent to (i.a), a standard superiority violation, it is for some reason less bad. (Pesetsky assumed the LF movement analysis for *wh*-in-situ, for which the problem was why it is possible in certain cases to avoid this movement.)

(i) a.*/?What did who buy?
b. ?Which book did which man buy?

(ii) ? What did who buy where?

4.2.2. *Coreference*

We may note that superiority is, nevertheless, not the only case where an interface strategy of the type discussed above has been argued to be operative. The coreference strategy I argued for in Reinhart (1983) has precisely the same properties. In that case, the processing complexity involved has been directly witnessed and confirmed in studies of acquisition. So if Golan's proposal is right, comparable results should be found in the acquisition of superiority. Let me, therefore, go over this strategy briefly.

Abstracting away from the technical details (which are worked out in Grodzinsky and Reinhart 1993), the coreference generalization is that two expressions in a given LF, say D, cannot corefer if, at the translation to semantic representations, we discover that an alternative LF, D′, exists where one of these is a variable bound by the other and the two LFs have equivalent interpretations. In other words, D′ blocks coreference in D unless they are semantically distinct.

(38) a. The bear near Max touched him.
b. He touched Max.
c. He is Max Smith.

Let us assume that we want to let the pronouns in (38) denote Max, thus obtaining coreference. In (38a) there is no way to replace either *him* or *Max* with a variable bound by the other, assuming any of the standard conditions on variable binding at LF. So, no alternative LF, D′, exists and, hence, the coreference strategy above says nothing on the matter (which means that it permits this interpretation). But in (38b) an LF, D′, exists in which *Max* is replaced with a variable bound by *he*. The interpretations

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The other context is the observation of Kayne (1984) that adding another *wh*-focus to the sentence usually improves superiority violations. Thus (ii) is better than (i.a).

I think that, overall, the judgments on these two types of apparent violations are far less clear than in the previous case. Their assessment often rests on statements about their use in context, and the contrasts are not really sharp. I assume for now that these remain economy violations, though there may be prosodic and other reasons for why the standard superiority violations sound worse than these cases.

Another line for the D-linking cases is proposed by Golan (1993). She argues that the intuition behind D-linking is that the relevant expressions are topics. She assumes, following Lasnik and Uriagereka, that a *wh*-phrase in Spec,CP cannot be used as topic. So the only way to obtain a derivation in which *which man* of (i.b) is the topic is to leave it in situ. The longer derivation is chosen, then, to enable a representation with this expression as topic. This account is less straightforward than the previous one, since it is not clear that topic distinctions are truth-conditional, or are sufficient to conclude that two representations are not equivalent, though in the long run it may be possible to decide that. In any case, to the extent that D-linking is a defendable semantic property, it can distinguish the two derivations under the present analysis as well.

of the two LFs end up equivalent. (*He touched Max*, with *he = Max*, is equivalent to *He* (λ*x*(*x touched x*)), with *he = Max*.) So this D′ blocks coreference in (38b). In (38c) it is also the case that an alternative LF, D′, exists, which yields *He* (λ*x*(*x is x*)), with *he = Max*. However, the two are not equivalent: D′ is a tautology, while (38c) is not. For this reason, the coreference strategy still allows coreference in (38c).

The economy rationale behind this strategy is that variable binding is a more economical means to convey referential identity of two expressions. Actual assignment of reference at the interface requires relating an expression to the set of entities in the discourse (model, domain, or whatever). This is a rather complex procedure, although it falls outside of the computational system. In the case of variable binding, as with *He* (λ*x*(*x touched x*)), the procedure has to apply only once, identifying the value of one of the arguments (*he* in this example, or any other expression in the same position in other examples). In all other cases, it has to apply to each argument. For instance, in *He touched Max* it has to apply both to *he* and to *Max*. If what is intended is the referential identity of these arguments, applying the same procedure twice when we could have done it just once is uneconomical. (38b) with *he = Max*, then, is an economy violation. But if this violation enables an interpretation not available with variable binding, it is allowed, as a marked derivation.

This coreference strategy was unexpectedly confirmed by studies of the acquisition of anaphora. Virtually all these studies found that children have problems with coreference – specifically, that they do poorly on non-coreference, as in (38b). ((38c) was not studied.) The actual statistics is particularly interesting here: Children get the right responses with the permitted coreference case of (38a) at about 100%. But on non-coreference, like (38b), we only find about 50% correct responses. This means that the children guess on the latter. If they did not know the coreference rules at all, we should not expect to find this specific guessing pattern. Not knowing that a rule of non-coreference exists, children should always allow for coreference, i.e., we should get about 100% responses allowing coreference for both (38a) and (38b) (or, at most, a guessing pattern on both). As explained in detail in Grodzinsky and Reinhart (1993), these results follow directly if we assume that the coreference strategy, like anything else, is innate. When processing (38b), children know exactly what they have to do: construct an alternative LF, and hold the two LFs while checking if their interpretations are equivalent in context. But they lack the computational ability (storing and processing) to go through with this, which is known to develop with age. So having started, and gotten stuck, they give up and volunteer a guess. The processing of (38a), by contrast, is much easier. Since

no alternative derivation is found to begin with, the task of approving coreference can be completed without comparing two semantic representations.

Note now that the strategy Golan proposes for superiority violations is precisely of the same complexity as that for the processing of non-coreference. To determine whether a derivation violating superiority is allowed, we first have to construct an alternative derivation, and second, to compare the two semantic representations that will be obtained by the two derivations. If this view of superiority is correct, we should expect the same acquisition results: In the case of structures not violating superiority, no alternative, more economical, derivation is found (since the alternative derivation is less economical), so there should be no problem. But in superiority violations, there is an alternative, more economical, derivation, so the two representations have to be held and compared. Only if they yield distinct interpretations, can the less economical one go through. This is precisely what children can't do, so we should expect the guessing pattern (again, only on the non-economical derivations). If such results are indeed found, no other (existing) account of superiority could explain them, so we have an interesting way to check the psychological reality of the hypothesis of interface global economy and, perhaps, decide between competing analyses.

4.2.3. *QR and Optionality*

We should note that allowing interface economy strategies of the type proposed here is not a trivial move. The biggest problem is to define exactly the conditions under which derivations count as yielding distinct semantic representations, and to define the set of such distinctions that actually allow choosing the less economical move. Without such definition, there is always a danger of falling into vacuity. In the superiority cases discussed here (Lasnik and Saito's example), as well as in the basic cases of the coreference strategy (analyzed in Reinhart 1983), this is not a problem, since distinctness is defined by standard notions of logical equivalence. But extending it to other instances requires care and further study. (See footnote 13 on questions of topichood.)

Nevertheless, I would like to mention some other areas in which this type of economy strategy may be operative. There is a general problem in the minimalist program regarding what enables QR in the case of quantified NPs, given that it seems arbitrary to try to motivate this type of movement with needs of feature checking. Even if an answer is found to this question, there is still an issue of superiority: raising, say, an object QNP to obtain

scope over a subject QNP violates superiority. In the long run, this too may be reducible to this type of interface economy, given the well-motivated assumption in the framework of generalized quantifiers that to interpret quantified expressions, there is no need to ever raise them. The only motivation for movement is to obtain scope wider than their c-command domain at the overt structure. As argued by many (e.g., Keenan, Reinhart, Gil) such movement usually yields marked interpretations, ones less accessible than those obtained by leaving the quantified expressions in situ. The option to be pursued, then, is that QR – as a non-economical and costly operation – is motivated only in case of such need to obtain a non-equivalent semantic representation. This requires further work, since such movement, unlike the cases we have been considering here, still also violates the absolute economy requirement given in (32a) that derivations are only driven by convergence needs. But I would like to point out one potential derivative of the interface economy view of QR, though at present this is only a speculation.

As is well known, none of the existing accounts for weak crossover gets close enough to capture the facts. Historically, one of the reasons why this got to be a problem is, precisely, the introduction of QR. If quantifiers cannot have scope outside their c-command domain, nothing is needed to explain why (39) does not allow the pronoun to be bound. Trivially, variables can be bound only in the scope of the binding operator.

(39) * His_i mother praised every speaker_i

But since it was assumed that *every speaker* undergoes QR, the pronoun ends up in its scope; hence the problem in (39) was understood as an anaphora problem specific to natural language that cannot follow from standard logical considerations alone.[14] But all attempts to capture the distribution of variable binding as an independent syntactic issue have, so far, run into substantial difficulties.

Ruys (1992) argued, in view of these difficulties, that we should reconsider the assumption that the availability of pronouns as bound variables is dependent on the scope of the operators that bind them, and on nothing else. However, executing his proposal under the assumption of obligatory QR, which he attempted to keep, required a substantial enrichment of the machinery, leading to a certain degree of arbitrariness.

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[14] This was essentially the argument in Chomsky (1976). The same conclusion holds also for approaches assuming that QR is only optional. Thus, I argued in Reinhart (1983) that the fact that the pronoun can never be bound in (39), regardless of whether the marked QR operation applies or not, indicates that variable binding and scope are independent.

Possibly, the present view of QR as subject to interface economy may open the way to a reexamination of our basic assumptions. Support comes from comparing (39) to cases like (40).

(40) a. A copy of his_i speech was placed in front of every $speaker_i$
b.? A friend of his_i mother praised every $speaker_i$
c.? Someone paid by his_i mother praised every $speaker_i$

(41) ?/* Every copy of his_i speech was placed in front of every $speaker_i$

If we assume that QR takes place only when needed to yield a distinguishable interpretation, there is no need for it to apply in (39). Hence, *every speaker* does not have scope over the pronoun, and it cannot bind it. But in (40), the derivations with and without QR yield distinguishable interpretations. Only if *every speaker* raises, does it get scope over the subject. If it does, it has the pronoun in its scope and can bind it, in apparent violation of all standard weak crossover requirements. (In the specific example (40a), the reading obtained by QR happens to be more plausible than the one without it. This may be the reason why it is easier to perceive this reading, and consequently, to get anaphora, than in the (b) and (c) cases.) Another entailment of this line of reasoning is that in (41) anaphora is much worse than in (40), since QR is not motivated by any added interpretation.

Needless to say, there are many questions to answer before we can conclude that this is the right road. Not least is the question how we can rule out the possibility that binding a variable is, itself, sufficient license for QR.

REFERENCES

Baker, C. L.: 1970, 'Notes on the Description of English Questions: The Role of an Abstract Question Morpheme', *Foundations of Language* **6**, 197–219.

Chomsky, Noam.: 1973, 'Conditions on Transformations', in S.R. Anderson and P. Kiparsky (eds.), *A Festschrift for Morris Halle*, Holt, Rinehart & Winston, New York, pp. 232–286.

Chomsky, Noam: 1992, *A Minimalist Program for Linguistic Theory*, MITWPL, MIT, Cambridge, Mass.

Chomsky, Noam: 1995, *The Minimalist Program*, MIT Press, Cambridge, Mass.

Collins, Chris: 1994, 'Economy of Derivation and the Generalized Proper Binding Condition', *Linguistic Inquiry* **25**, 45–61.

Engdahl, E.: 1986, *Constituent Questions*, Reidel, Dordrecht.

Epstein, S. D.: 1992, 'Derivational Constraints on A′ Chain Formation', *Linguistic Inquiry* **23**(2), 235–259.

Fodor, J. and I. Sag: 1982, 'Referential and Quantificational Indefinites', *Linguistics and Philosophy* **5**, 355–398.

Fox, Danny: 1995, 'Economy and Scope', *Natural Language Semantics* **3**(3), 283–341.

Golan, Yael: 1993, 'Node Crossing Economy, Superiority and D-linking', ms., Tel Aviv University
Grodzinsky, Yoseph and Tanya Reinhart: 1993, 'The Innateness of Binding and Coreference', *Linguistic Inquiry* **24**(1), 69–101.
Groenendijk, Jeroen and Martin Stokhof: 1982, 'Semantic Analysis of *Wh*-complements', *Linguistics and Philosophy* **5**(2), 175–234.
Hamblin, C.: 1973, 'Questions in Montague English', *Foundations of Language* **10**, 41–53. Reprinted in B. H. Partee (ed.), *Montague Grammar*, Academic Press, New York, 1976.
Heim, Irene.: 1982, *The Semantics of Definite and Indefinite Noun Phrases*, Ph.D. dissertation, University of Massachusetts, Amherst, Published in 1989 by Garland, New York.
Higginbotham, James: 1985, 'On Semantics', *Linguistic Inquiry* **16**, 547–593.
Higginbotham, James: 1992, 'Interrogatives', ms., MIT.
Higginbotham, James and Robert May: 1981, 'Questions, Quantifiers and Crossing', *The Linguistic Review* **1**, 41–79.
Hilbert, D. and P. Bernays: 1939, *Die Grundlagen der Mathematik II*, second ed. (reprint 1970), Springer-Verlag, Berlin.
Hornstein, Norbert and Amy Weinberg: 1990, 'The Necessity of LF', *The Linguistic Review* **7**, 129–167.
Huang, Jim: 1982, *Logical Relations in Chinese and the Theory of Grammar*, Ph.D. dissertation, MIT.
Karttunen, Lauri: 1977, 'The Syntax and Semantics of Questions', *Linguistics and Philosophy* **1**, 1–44.
Kayne, Richard: 1984, *Connectedness and Binary Branching*, Foris, Dordrecht.
Lappin, Shalom and Tanya Reinhart: 1988, 'Presuppositional Effects of Strong Determiners', *Linguistics* **26**, 1021–1037.
Lasnik, Howard and Mamoru Saito: 1992, *Move Alpha*, MIT Press, Cambridge, Mass.
Lewis, David: 1975, 'Adverbs of Quantification', in E. Keenan (ed)., *Formal Semantics of Natural Language*, Cambridge University Press, Cambridge, pp. 3–15.
Nishigauchi, Taisuke: 1986, *Quantification in Syntax*, Ph.D. dissertation, University of Massachusetts, Amherst.
Pesetsky, David: 1987, 'Wh-in-Situ: Movement and Unselective Binding', in E. Reuland and A. ter Meulen (eds.), *The Representation of* (*In*)*definiteness*, MIT Press, Cambridge, Mass, pp. 98–129.
Reinhart, Tanya: 1981, 'A Second Comp Position', in A. Belletti et al. (eds.), *Theory of Markedness in Generative Grammar*, Scuola Normale Superiore, Pisa, pp. 517–557.
Reinhart, Tanya: 1983, *Anaphora and Semantic Interpretation*, Croom-Helm, London.
Reinhart, Tanya: 1991, 'Elliptic Conjunctions: Nonquantificational LF', in A. Kasher (ed.), *The Chomskyan Turn*, Blackwell, Oxford, pp. 360–384.
Reinhart, Tanya: 1992, 'Wh-in-Situ: An Apparent Paradox', in P. Dekker and M. Stokhof (eds.), *Proceedings of the 8th Amsterdam Colloquium, 1991*. Institute for Logic, Language and Computation, University of Amsterdam, pp. 483–492.
Reinhart, Tanya: forthcoming, *Interface Strategies*, MIT Press, Cambridge, Mass.
Reinhart, Tanya and Eric Reuland: 1993, 'Reflexivity', *Linguistic Inquiry* **24**, 657–720.
Ruys, Eddy: 1992, *The Scope of Indefinites*, Ph.D. Dissertation, Utrecht University, published in the OTS Dissertation Series, University of Utrecht.
Szabolcsi, Anna and Frans Zwarts: 1993, 'Weak Islands and an Algebraic Semantics for Scope Taking', *Natural Language Semantics* **1**(3), 235–285.

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