Total Reconstruction, PF-Movement, and Derivational Order

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Sauerland, Uli. 1999. Total Reconstruction, PF-Movement, and Derivational Order. *Linguistics* 7-2, 1-38. Movement usually brings about a semantic effect; for example, new scope and binding possibilities. But, there are also some cases where movement can or even must be invisible to interpretation. The terms *Scope Reconstruction* (May 1977), *Radical Reconstruction* (Saito 1989), and *Total Reconstruction* (Aoun and Benmamoun 1998) have been used for these phenomena—we'll use *Total Reconstruction* in this paper. While most analyses of total reconstruction assume that movement is followed by an undoing operation, and alternative analysis is to assume that total reconstruction involves movement at PF (Aoun and Benmamoun 1998). In this paper, we argue that total reconstruction phenomena can only be derived by PF-movement. **(Kanda University)**

A typical example of total reconstruction is (1). The subject *an Austrian* can take scope below *likely* in(1), since the sentence is felicitous in a situation, where every Austrian participant is likely not to win, as long as it's likely that the winner will from Austria—for example, if the Austrians that qualified outnumber those from elsewhere.

(1) [An Austrian] is likely to *t* win the Gold modal.

The analysis of the narrow scope interpretation of (1) we argue for is that *an Austrian* undergoes movement from the trace position *t*, but that this movement operation is purely phonological, and therefore doesn't affect interpretation. If there is PF-movement it's expected that like

other phonological processes(final obstruent devoicing, vowel epenthesis, ...) has no effect on interpretation. Aoun and Benmamoun(1998) suggest that some cases of reconstruction of clitic left dislocation in Lebanese Arabic should be analyzed as PF-movement. Our proposal is consistent with theirs, but much stronger: All cases of total reconstruction must be analyzed as PF-movement.[1)]

At this point, it's important to recognize that total reconstruction in (1) is distinct from the phenomenon of *Binding Reconstruction* or *partial Reconstruction* found with *wh*-movement in English. A typical example of binding reconstruction is (2), where the pronoun *her* is bound by the quantifier *every student*.

(2) [which relative of her$_i$'s]did every student$_i$ invite t ?

As Saito (1989) discusses in more detail, the process applying to the *wh*-phrases in (2) must differ from that applying to the indefinite in (1) since the scope of moved *wh*-phrases in English is fixed by their surface position: (3) doesn't have an interpretation corresponding to the paraphrase: *Did Mary ask which relatives to invite?* In (1), however the scope of the moved phrase is narrower than its surface position.

(3) [Which relative] did Mary ask whether to invite *t*?

We follow the literature (Chomsky 1993, Fox 1999, Sauerland 1998) in assuming that the mechanism accounting for (2) is the copy theory: In (2), only parts of the moved phrase occupy a position at LF that is lower than the pronounced material as shown in (4b)(Engdahl 1980, Fox 1999, Sauerland 1998).

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1. In unpublished work, (Bouchard 1983) also proposes that narrow scope in English raising constructions is a consequence of PF-movement, but for different reasons. We thank Anna Szabolcsi (p.c.) for pointing out Bouchaed's work to us.

4) which did every student$_i$ [relative of her$_i$'s]

In total reconstruction, however, the entire moved phrase occupies a position at LF that is lower than the pronounced position (Fox 1999, May 1977, Romero 1997). (3) and further evidence in Saito(1992) and Aoun and Benmamoun(1998) argue that total reconstruction isn't available with *wh*-movement.

Total Reconstruction has sometimes been viewed as that case of partial reconstruction, where all of the movement material is affected (Hornstein 1995). We, however, argue below that partial reconstruction cannot affect all the material of the moved phrase, and that total reconstruction involves a very different mechanism. One reason why specifically total deletion of the higher copy in a movement chain may not be possible, is that movement might create more than just a copy at the top position of a chain.[2] Heim and Kratzer (1998), Nissenbaum (1998) and Sauerland (1998) argue that movement also creates a λ -operator that initiates an operator-variable chain. then, we expect partial reconstruction to be possible via the deletion of the top copy of the movement chain at LF assuming structure(5a). But, deletion of the entire top copy of the movement chain would yield the structure(5b), which plausibly is ill-formed because it's not of the right type semantic type—a predicate rather than a question—and the λ-operator doesn't bind anything.

(5) a. which $\lambda\ \chi$ did every student$_i$ [χ, relative of her$_i$'s]

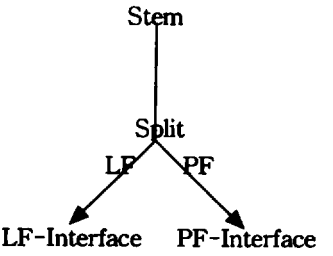
b. * $\lambda\ \chi$ did every student$_i$ [which relative of her$_i$'s]

The evidence in this paper has direct implications for the struction of

2. Chomsky (1995:326-27) also proposes that partial reconstruction of the type available in A-bar chains can never give rise to the effect of total reconstruction, though for different reasons.

grammar. The claim that there's is PF-movement, obviously, presupposes that LF and PF-representations are built in a derivational fashion by successive applications of simple operations and that the application of operations can either affect both LF and PF representation or affect only the PF representation. Furthermore, we show that intricate predictions arise from the assumption that there is an inherent order among the two types of movement we're concerned with—namely, that PF-movement must follow movement that affects both LF and PF. For the exposition we adopt the terminology of the *T-model* as sketched in (6). To distinguish between overt movement that affects interpretation and overt movement that doesn't affect interpretation, we use the terms *Stem-Movement* for movement affecting both LF and PF and *PF-Movement* for movement affecting only PF.

(6) T-model (Chomsky and Lasnik 1977)



The paper consists of two independent arguments for the PF-movement analysis of total reconstruction. The first argument in section 1 argues that an otherwise unexpected restriction on total reconstruction in raising constructions in English, follows in a straight-forward way from the c-command condition on movement on the PF-movement view. The third argument in section 2 concerns a second case well-studied case of total reconstruction, namely Japanese scrambling. We show that restrictions on total reconstruction in multiple scrambling constructions follow from the PF-movement view. In the

concluding section 3, we summarize the pieces of evidence that argue for a derivational view of syntax, and those that argue for a structure of grammar where PF-movement must follow movement that affects both interfaces.

1. English Raising

As already shown by (1), English raising constructions allow total reconstruction (May 1977).[3] In addition to narrow scope, licensing of negative polarity items and of binominal *each* in (8a) force total reconstruction.[4] In the examples in (7), the negative polarity item any must be in the scope of negation at LF (Linebarger 1980, 1987, 1992, Uribe-Etxebarria 1993). This is only possible in (7a) if the raised subject totally reconstructs.[5] As predicted, *a doctor with any reputation* must take scope below *likely* and *negation* in (7a). In the control (7b), the base position of the subject is above negation. Therefore, total reconstruction to a position below negation isn't available and *any* isn't licensed in (7b).

(7) a. [A doctor with any reputation]$_1$ is likely not to be t_1 available.
b. *[A doctor with any reputation]$_1$ is t_1 anxious for John not be available.

3. In raising constructios, total reconstruction of universal QPs is impossible. Our discussion relies only on examples where existentials raise.
(i) Every coin is 3% likely to land heads. (Lasnik 1998)
4. We assume here that partial reconstruction is also possible in raising constructions, but this assumption is not crucial. A prediction of this is that a variable can be bound in the reconstructed part while an R-expression in the non-reconstructed part doesn't trigger a Condition C effect. Sauerland (1998) contains some examples that seem to demonstrate this prediction.
5. Since licensing of the NPI requires a lowered interpretation, partial reconstruction if available in raising constructions at all cannot be sufficient for NPI-licensing. Since the interpretation of partial reconstruction when there's no variable binding is very similar to that of an unreconstructed LF, this result seems for a theory of NPI-licensing that makes reference to properties of semantic interpretation (Ladusaw 1979).

Binominal each is only licensed in the scope of a distributive noun phrase at LF (Burzio 1986). In (8b), *each* is licensed by the plural DP *the athletes*, which must receive a distributive interpretation.[6] On the other hand, *each* isn't licensed in (8c) because the subject cannot take scope below the plural *the athletes*. *Each* in (8a) is licensed only by total reconstruction of the subject to the indicated trace position, where it can be in the scope of the plural *the athletes*.

(8) a. [One translator *each*]$_1$ is likely to t'_1 be assigned t_1 to the athletes.
b. The Olympic Committee assigned one translator each to the athletes.
c. *[One translator each]$_1$ is likely to t_1 give a speech to the athletes.

At least four different analyses have been proposed for the phenomenon of total reconstruction.[7] May (1977) proposes the *LF-lowering* analysis (see also May 1985, Barss 1986, Fox 1996a, Chomsky 1995, among others). He proposes that the raised quantifier undergoes downward movement in the LF-branch of the derivation as sketched in (9).

(9) a. [An Austrian] is likely to t win.
b. is likely [an Austrian]$_1$ to t_1 win.

6. For many speakers, examples like (8a) and (8b) are Slightly marked as compared (i), where *each* is in the scope of a distributive plural that precedes it. See Safir and Stowell (1987) and Pesetsky (1994) for further discussion of binominal *each*, especially how *each* might be in the scope of the plural in (8b). We thank Richard Kayne (p.c.) for drawing our attention to binominal *each*.
(i) The athletes were assigned one translator each.
7. We only consider analyses here assuming roughly based on the framework of the *Extended Standard Theory* where overt movement can affect interpretation. McCawley (1999), for example, assume that PF-structures are derived by application of transformations to LF-structures. On this perspective, all movement is, in a sense, PF-movement. Therefore, the evidence in this paper doesn't distinguish empirically between the proposal of McCawley's and ours. We do believe, however, that overt movement can affect interpretation favoring our view.

Chomsky (1993), Hornstein (1995), and Bobaljik (1995a) most recently propose an explanation based on the *Copy Theory* of movement (see also Chomsky (1981), Burzio (1986) for earlier discussion). They propose that movement must leave a copy of the moved material in the trace position, but that at the LF and PF-interface one of the two copies must be deleted. However, even when the higher copy is pronounced and the lower copy deleted at PF, the lower copy can be the one that is interpreted. This is sketched in (10).[8]

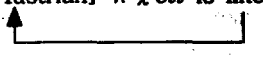
(10) a. [An Austrian] is likely to [an Austrian] win.

b. <[an Austrian]> is likely to [an Austrian] win.

von Stechow (1991) notices a possible analysis of total reconstruction, which Cresti (1995), Rullmann (1995), and Chierchia (1995) develop as *Semantic Reconstruction*. They propose that the semantic type of the trace can be the type of a quantifier, rather than that of an individual. The interpretation is then indistinguishable from one where the quantifier is interpreted in the trace position.

(11) a. [An Austrian] is likely to t win

b. [An Austrian] $\lambda\ \chi\ ett$ is likely to $\chi\ ett$ win.

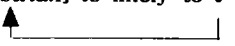


8. One difference between the LF-lowering view and all other proposal that it assumes that trace positions are not targeted in the undoing of overt movement. Chomsky (1995:327) argues for the LF-lowering view based on the contrast in (i). In (ia) negation can take scope above *everyone*, but not in (ib). But, if universal QPs cannot totally reconstruct in raising constructions (see footnote 3) the contrast in (i) is expected on any account of total reconstruction.

(i) a. (It seems that) everyone isn't here yet
b. Everyone seems not to be here yet.

All three proposals so far—LF-lowering, the Copy-Theory, and Semantic Reconstruction—assume that total reconstruction involves movement that is visible to interpretation followed by an optional undoing operation. We propose that movement cannot be undone and that the movement can optionally be invisible to interpretation, namely when it takes place at PF.

(12) a. [An Austrian] is likely to *t* win.



b. is likely to [an Austrian] win.

The argument for the PF-movement analysis in the remainder of this section comes form a restriction on total reconstruction Barss (1986) first observed. We argue that the restriction is actually predicted on the PF-movement analysis, while none of the other approaches to total reconstruction predicts it.

1.1 Barss' Generalization

Barss (1986:418-27) observes that (13a) only a scopal construal where *some* takes scope over *likely* and *every* is available. Unlike (13b), (13a) allows no interpretation where *some* takes scope below either *likely* or *every*. Barss concludes that total reconstruction is impossible in (13a).

(13) a. [How likely to t_{QP} address every rally]$_{wh}$ is [some politician]$_{QP}$ t_{wh} ? (some>>Likely /every, *likely/every>>some)

b. [Some politician]$_1$ is likely to t_1 address every rally. (some>>likely/every, likely/every>>some)

One of the ways(13) is different from examples like (1) is that the quantifier *some politician* doesn't c-command any potential

reconstruction position below *likely* in the overt form of (13).[9] Barss's discussion of (13) indicates that he believes that this is indeed the factor blocking total reconstruction and that the generalization in (14) holds, which we therefore call Barss' generalization.

(14) Total reconstruction to a position X is blocked when an A-moved quantifier doesn't c-command the position X in the overt form.

Brass presents only one example where total reconstruction is blocked in support of the generalization (14), namely (13a). But, we show now that his generalization turns out to be correct for a variety of other cases. Consider first (15), which is structurally similar to (13). Considering the scenarios discussed for (1) above shows that (15) doesn't allow *likely* to take scope above *an Austrian*. This corroborates generalization (14), since in (15) the trace position of *an Austrian* below likely isn't c-commanded by it in the overt form.[10]

(15) [How likely to t_{QP} win]$_{wh}$ is [an Austrian]$_{QP}$ t_{wh} ?
(an Austrian>>likely, *likely>>an Austrian)

Since both (13a) and (15) involve an A-moved quantifier that is stranded by subsequent movement of the constituent to its right, one might hypothesize that the stranded quantifier in such a construction is generally unable to take narrow scope. But, the examples in (16) show that the stranded A-moved phrase is capable of taking scope below a c-commanding quantificational element: In (16a), *some politician* can take scope below *every journalist*. (16b) shows that the stranded phrase

9. We use the term *Overt Form* rather than *Spell Out*, since it spell out is usually identified with the splitting point of the derivation.
10. The generic interpretation of (15) has a reading where the winning chances of different Austrians are under consideration. A paraphrase of this reading is: In each of the competitions, what is the chance of winning for the Austrian competitor.

can also take scope below a c-commanding *likely*.

(16) a. [Every journalist]$_\forall$ asked [how likely to $t_\exists$ address every rally]$_{wh}$ [some politician]$_\exists$ is t_{wh}. (every journalist>>some politician, some politician>>every journalist)

b. John is likely$_1$ to find out [how likely$_2$ to $t_\exists$ address every rally]$_{wh}$ [some politician]$_\exists$ is t_{wh}. (likely$_1$ >> $\exists$, $\exists$>> likely$_1$)

This shows that the lack of narrow scope of the stranded phrase in (13a) cannot be due to general inability of the stranded phrase to take narrow scope, but is specific to the relationship between the A-moved quantifier and quantificational elements that are part of the subsequently moved constituent.

Barss' example (13a) also contrasts with the examples in (17), which both allow the raised subject to take scope below *likely*. This corroborates the generalization (15) since the overt position of the raised phrase c-commands its trace position in both (17a) and (17b). This shows that even when the degree of likelihood is in question, total reconstruction to a position below *likely* is available.[11]

(17) a. [How likely]$_1$ is [some politician]$_2$ t_1 to t_2 attend every rally. (some >> likely, likely>>some)

b. Who claimed that [some politician]$_2$ is how likely to t_2 attend every rally. (some >> likely, likely>>some)

In Brass' example (13a), the relevant judgement concerned the absence of a particular scopal construal. The contrast in (18) involving

11. The precise structure of (17a) is not important for the argument here, as long as t_2 is c-commanded by *some politician*. However, the judgement on (17a) was only shared by roughly half of our informants. This might indicate that in fact for many of our informants the infinitive is extraposed form the fronted *wh*-phrase after *wh*-movement has taken place.

each-licensing confirms Brass' generalization where the judgement concerns the grammaticality of the example. As shown by (8) above, *each* can only occur in the scope of a distributive noun phrase, and in (18a), total reconstruction of *one translator each* is required for the plural *the athletes* to take scope above it. The ungrammaticality of (18b) then indicates that total reconstruction isn't available, as predicted by Barss' generalization.

(18) a. [One translator each]$_{QP}$ is likely to be assigned t_{QP} to the athletes.
b. *[How likely to be assigned t_{QP} to the athletes]$_{wh}$ is [one translator each]$_{QP}$ t_{wh}?

The contrasts in (19) and (20) show that the Brass' generalization is also observed in cases where the movement destroying the c-command relationship between an A-moved phrase and its trace is VP-fronting or *though*-raising, rather than *wh*-movement. The ungrammaticality of (19a) and (20a) again seems to be due to the presence of *each*, since when *each* is omitted in (19b) and (20b) the examples become acceptable. In fact, Barss' generalization predicts total reconstruction to be impossible in (19) and (20) and therefore *each* to not be licensed in (19a) and (20a)

(19) a. *...and [likely to be assigned t_{QP} to the athletes]$_{tQP}$ [one translator each]$_{QP}$ is t_{tQP}.
b. ...and [likely to be assigned t_{QP} to the athletes]$_{tQP}$ [one translator]$_{QP}$ is t_{tQP}.

(20) a. *[likely to be assigned t_{QP} to the athletes]$_{tr}$ though [one translator each]$_{QP}$ is t_{tr}, there were still complaints.
b. [Likely to be assigned t_{QP} to the athletes]$_{tr}$ though [one translator]$_{QP}$ is t_{tr}, there were still complaints.

While in questions, negative polarity items are often independently licensed, VP-fronting and *though*-raising don't license negative polarity items. Hence, we can use licensing of *any* for a further test for Barss' generalization. Licensing of *any* occurring in the raised DP was seen in (7) to require total reconstruction if the only potential licenser is a negation c-commanding a trace of the raised DP, but not its surface position. As the data in (21) and (22) show, the result from NPI-licensing confirms the *each*-licensing data.

(21) a. *...and [certain to be not t_{QP} available]$_{top}$, [a doctor with any reputation]$_{QP}$ was t_{top}.

b. ...and [certain to be not t_{QP} available]$_{top}$, [a doctor from cardiology]$_{QP}$ was t_{top}.

(22) a. *[Certain to be not t_{QP} available]$_{tr}$ though [a doctor with any reputation]$_{QP}$ is t_{tr}, patients were waiting.

b. [Certain to be not t_{QP} available]$_{tr}$ though [a doctor from cardiology]$_{QP}$ is t_{tr}, patients were waiting.

We have seen that Barss' generalization is corroborated by data from *each*-licensing and *any*-licensing across a range of structurally different examples.

1.2 Account of Barss' Generalization

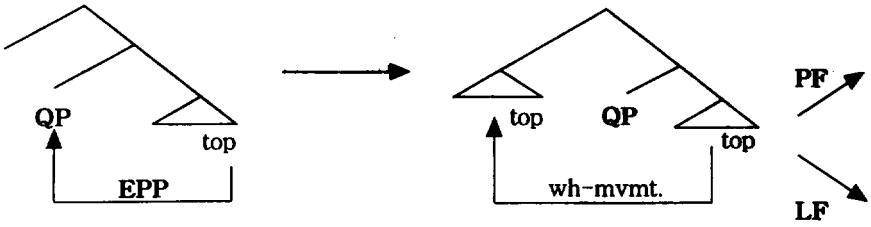
Barss' generalization is a direct consequence of the PF-movement analysis of total reconstruction combined with two very standard assumptions: the c-command requirement on movement and the assumption that PF-movement must follow movement that affects both

LF and PF. For the demonstration, consider again example (15), which is repeated in (23). Recall from above, that (23) is grammatical, but only allows an interpretation where *an Austrian* takes scope above *likely*.

(23) [How likely to t_{QP} win]$_{wh}$ is [an Austrian]$_{QP}$ t_{wh}.

Consider first the derivation of the available wide scope interpretation of (23), which is sketched in(24). In this derivation, first the subject, *an Austrian* in (23), raises from the embedded subject position to the matrix subject position. This movement satisfies the Extended Projection Principle (EPP), which requires that the subject position of English clauses must be filled. Subsequently, the embedded clause undergoes *wh*-movement to the sentence initial position, to satisfy the requirement that the specifier of constituent question must be filled by a *wh*-phrase. Both of these movements take part in the stem of the derivation, and are therefore visible to both the PF and LF-interfaces.

(24) Derivation for Wide Scope



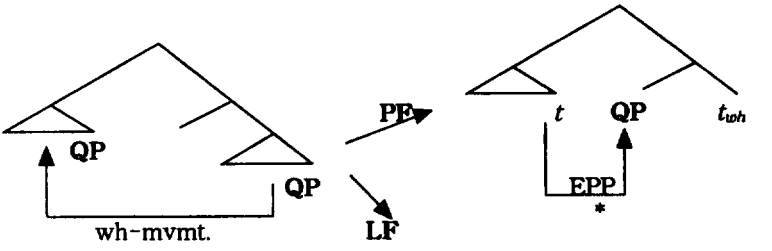
This derivation leads to the overt form in (23). In (23), however, the trace in the *wh*-moved constituent isn't c-commanded by its antecedent —the raised subject. As mentioned in the discussion of (2)above, *wh*-movement allows partial reconstruction, which doesn't alter the scope of the *wh*-phrase, but does allow parts of the moved phrase to be bound in the trace position. Partial reconstruction is forced in (23) for

the trace to be bound. As discussed above, we assume that partial reconstruction is accomplished by interpreting parts of the moved phrase in the trace position. The LF-representation (25) shows how partial reconstruction allows the trace t_1 to be bound. In (25) *an Austrian* must take scope above *likely*.

(25) [How]$_2$ is [an Austrian]$_1$ [likely to t_1 win]$_2$

Now consider the potential derivation of the narrow scope interpretation assuming that PF-movement is required for narrow scope. Then, raising of the subject into the matrix clause must be delayed to the PF-branch of the derivation, to yield total reconstruction. *Wh*-movement, however, as shown by (3) above never allows total reconstruction. Therefore, it must take place in the stem of the derivation. At this point the standard assumption, that movement in the stem precedes movement in the branches of the derivation becomes relevant. According to this assumption, *wh*-movement of the *wh*-constituent must be the first step of the derivation, as sketched in (26). In the PF-branch, then, the EPP-requirement of the matrix clause must be satisfied. But, the matrix subject position doesn't c-command the subject of the embedded clause anymore at this point of the derivation, because this c-command relationship has been destroyed by the preceeding *wh*-movement. Therefore, the c-command requirement on movement blocks satisfaction of the EPP in the derivation in(26).

(26) Failing Derivation for Narrow Scope



Since the derivation in (27) results in an EPP-violation, total reconstruction and consequently the narrow scope interpretation isn't available in (24).

This account extends straightforwardly to all those cases of Barss' generalization where *wh*-movement destroys the c-command relationship between the embedded subject position and the matrix subject position. Since *wh*-movement doesn't allow total reconstruction, it must take place in the stem part of the derivation, and thereby forces raising of the subject to take place in the stem as well. The other two constructions where the effect of Barss' generalization is observed above are VP-fronting and *though*-raising. These have been argued to share many properties with *wh*-movement: constituents other than DPs are moved, the locality restrictions (Chomsky 1977), the obligatoriness of some reconstruction (Huang 1993; Takano 1995), and interaction with A-bar movement for shortest attract (Koizumi 1994). It therefore has been proposed that VP-fronting and *though*-raising together with *wh*-movement form one class of movement operations which all involve the same feature. It seems therefore natural to assume that these movement also behave like *wh*-movement in disallowing total reconstruction. This proposal forces us to assume that an existential quantifier occupies the higher position of the A-bar chains in these cases. Then, the account presented for the absence of total reconstruction in (24) carries over without modification to the cases involving VP-fronting or *though*-raising.

The PF-movement analysis of total reconstruction predicts Barss' generalization as we have seen. The other analyses of total reconstruction presented after example (8) above don't share this prediction. Instead, Barss' generalization would need to be stipulated. This is directly apparent for the copy theory analysis and semantic reconstruction since these assume that total reconstruction isn't visible in the syntactic derivation, but only at a later point—on the copy theory analysis, this point is LF when copies are deleted; on the semantic reconstruction analysis, this point is when semantic types are assigned

to operators. However, (27a) (repeated form (13a)) has been argued to have an LF-structure very similar to (27b) (repeated from (17a)) since partial reconstruction is forced in (27a) (Huang 1993, Takano 1995, Heycock 1995). Therefore, the difference in the availability of total reconstruction between (27a) and (27b) isn't expected.

(27) a. [How likely to attend every rally]$_1$ is some politician t_1
b. [How likely] is some politician t_1 to attend every rally

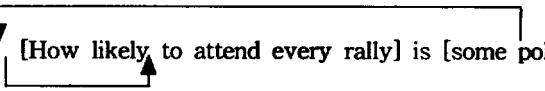
For the LF-lowering analysis, Barss (1986) proposes an explanation of the fact (13a). He proposes that instead of the c-command requirement assumed above movement is subject to a mutual c-command requirement. This allows movement form one position to another if either the target position c-commands the source position, or if the source position c-commands the target position. The mutual c-command condition allows movement to a position below likely in (28b), but not in (28a).

(28) a. [How likely *to attend every rally]$_1$ is some politician t_1

b. [How likely]$_1$ is some politician t_1 to attend every rally

One potential problem for Barss' account is that the derivation sketched in (29) is consistent with the mutual c-command condition. In (29a), the raised quantifier first raises to a position above the fronted *wh*-phrase, and then lowers to a position below *likely*. Since the lowering step of this derivation seems to cross similar material as in (28b), Barss' would probably want to rely on the assumption that that first step of (28) is impossible. This, however, is a controversial question—in the recent literature, for example, Fox (1995a), Beck (1996) and Hagstrom (1998) support the view that a quantified subject can raise above an

interrogative CP.

(29) 
[How likely to attend every rally] is [some politician]

A second difference between our account of generalization(13a) and that of Barss concerns the c-command requirement. Despite their superficial similarity, the two conditions have a very different status, which argues that the directional c-command requirement is strongly preferable. The difference is that the directional c-command requirement we assume follows from the strict cycle condition as discussed by Chomsky (1995) and others, (see also section 3). This isn't the case for the mutual c-command requirement of Barss (1986), which is an arbitrary condition to allow lowering precisely in the attested cases.

Thirdly, the restriction on reconstruction in Japanese scrambling discussed in section 2 also argues against the lowering view.

1.3 Subject and Object Inverse Scope

It's a known generalization that inverse scope of the object over the subject in English is blocked by VP-fronting(Hubert Truckenbrodt, p.c.), thought this fact has not been discussed in print before to our Knowledge. In this section, we first present some evidence corroborating this generalization. We then argue that this generalization is actually an instance of Barss' generalization in view of recent arguments that inverse scope of subject and object involves total reconstruction of the subject (Hornstein 1995, Johnson and Tomioka 1997) and therefore support the PF-movement analysis of total reconstruction.

The contrasts in (30) and (31) demonstrate the blocking effect VP-fronting and *though*-raising have on inverse scope between subject and object. In (30a), the object *every bank* can take scope over the subject *a policeman*, in fact this is the pragmatically preferred reading

of (30a). In (30b), however, this interpretation isn't available, and the sentence can only be true if there's one policeman that was simultaneously standing in front of all the banks that day.[12)]

(30) a. ...and a policeman stood in front of every bank that day.
($\forall >> \exists, \exists >> \forall$)

b. ...and [stand in front of every bank]$_{top}$ a policeman did t_{top} that day. ($\forall >> \exists$, $*\exists >> \forall$)

A similar contrast, but involving *though*-raising is shown in(31). (31a) allows inverse scope easily, but(31b) only allows wide scope of the subject.

(31) a. Though enough of us were defending every gate, the enemy broke through. (enough>>$\forall$, $\forall$>>enough)

b. [defending every gate]$_{tr}$, though enough of us were t_{tr}, the enemy broke through. (enough>>$\forall$, $*\forall$>>enough)

We claim that, in general, inverse scope of the subject below the object is blocked when the VP containing the object is moved. This generalization is further corroboration for Barss' generalization if inverse scope of the object over the subject required total reconstruction of the subject into the fronted constituent. Indeed it has been argued by Hornstein (1995:160-61) and Johnson and Tomioka (1997) that some amount of total reconstruction of the subject is required for the object to take scope over the subject.

Hornstein's (1995) argument is based on the contrast in (32). (32b), where the subject binds a pronoun in the adjunct clause, doesn't allow

12 The temporal adverbial *that day serves* to block a generic interpretation which would make scope illusions in the sence of Fox and Sauerland (1996) possible.

inverse scope between subject and object, in contrast to (32a). This fact follows if total reconstruction of the subject to a position below the adjunct clause is required for the object to take scope above the subject. Since the binding relation in (32b) blocks this total reconstruction, the object cannot take scope over the subject.

(32) a. Someone danced with every woman$_i$ before she$_i$ lift the party.
(someone>>every, every>>someone)

b. Someone$_i$ danced with every woman before he$_i$ left the party.
(someone>>every, *every>>someone)

The second argument is due to johnson and Tomioka (1997). They observe a restriction on the relative scope of subject, object and negation. Namely, the object cannot take over the subject if the subject is taking scope over negation in examples like (33).

(33) Some student or other hasn't answered two thirds of the questions.
(some>>2/3>>not, some>> not>>2/3, *2/3>>some>>not)

The restriction observed in (33) follows if the object can only take scope over the subject when the subject undergoes total reconstruction to a position in the scope of negation.

If Hornstein (1995) and Johnsone and Tomioka (1997) are correct, wide scope of the object requires reconstruction of the subject to a position that is lower than negation and temporal adjunct clauses. Both negation and temporal adjunct clauses can be part of the fronted constituent in VP-fronting shown in (34) and *through*-raising shown in (35).

(34) a. ...and [dance with her before Mary left]$_1$ John did *t*.
b. ...and [not dance with her]$_1$ John did *t*.

(35) a. [Answer the question before the bell rang]$_1$ though Sue did t_1 she was failed nevertheless.
b. [Not answer the question]$_1$ though Sue did t_1 she passed anyway.

Taken together, these arguments establish that the blocking of inverse scope on (30b) and (31b) is an instance of Barss' generalization. Consider the structure argued for (30b) shown in(36). With Hornstein (1995) and Johnson and Tomioka (1997), we assume that total reconstruction of the subject is required for inverse scope. And, as argued by (34) and (35) the position the subject must reconstruct to is part of the fronted constituent. In (36), the reconstruction position is indicated as t_{QP}.

(36) ...and [t_{QP} stand in front of every bank]$_{top}$ [a policeman]$_{QP}$ did t_{top} that day. ($\forall >> \exists$,*$\exists >> \forall$)

Since the overt position of the subject doesn't c-command t_{OP} in (36), total reconstruction is blocked by Brass' generalization (13a). Therefore, the absence of inverse scope in (36) and (31b) lends further to Barss' generalization and supports our account of Barss' generalization.

2. Japaneses Scrambling

In this section,[13] we argue that total reconstruction of Japanese scrambling, also, can only be derived by PF-movement. It's well known that Japanese scrambling allows total reconstruction. In particular, Saito (1989, 1992) and Tanaka (1999) argues that Japanese scrambling in must undergo total reconstruction in many cases where it crosses a

13. Danny Fox deserves special thanks for his help in developing the arguments in this section.

clause boundary (see also Nemoto 1995, Uchibori 1993). One argument from Saito (1989:(34b)) is based on (37). Here, the interrogative phrase is scrambled to a position outside of the embedded question, but nevertheless takes scope in the embedded question.

(37) [dono hon-o]$_i$ Mary-ga [John-ga t_i tosyokan-kara karidasita ka]
[which book ACC]$_i$ Mary NOM [John NOM t_i library-from checked out Comp$_{+wh}$

siritagatteiru
wants-to-know

'Mary wants to know which book John checked out from the library.'

A natural question is whether Barss' generalization holds for total reconstruction of Japanese scrambling. To investigate this question we need to look at examples where the remnant of scrambling undergoes *wh*-movement or a comparable movement, destroying the c-command relationship between the overt position of the scrambled phrase and its trace. It turns out this test cannot be conducted, even if we assume that overt movement of interrogative phrases in Japanese can be *wh*-movement, which is controversial (see Takahashi 1993, Tanaka 1999). Namely, the relevant examples turn out to be ungrammatical, even in cases where total reconstruction should not be required.
(38) how likely to win is a girl likely to be.

Nevertheless, it's possible to see that total reconstruction in Japanese scrambling must be derived by PF-movement. The argument in this section is completely independent of Barss' generalization. It relies on a restriction on total reconstruction in cases where two instances of scrambling target multiple specifiers of the same head—a configuration that cannot be created with raising in English.

2.1 Yatsushiro's Observation

The argument we develop in this section relies on an observation of Yatsushiro (1996) concerning the relative scope of two scrambled objects occurring to the left of subject. Consider first the examples in (39) where both objects occur to the right of the subject. Hoji (1985) first notes that a double object construction Japanese exhibits scopal rigidity in the Dat-Acc word order (39a), while the reverse order in (39b) is scopally ambiguous.[14]

(39) a. John-ga dareka-ni daremo-o syookaisita
John$_{NOM}$ someone$_{DAT}$ everyone$_{ACC}$ introduced

'John introduced everyone to someone.'

unambiguous: someone>> everyone, *everyone>>someone

b. John-ga daremo-o dareka-ni syookaisita
John$_{NOM}$ everyone$_{ACC}$ someone$_{DAT}$ introduced

ambiguous: someone >> everyone, everyone >> someone

The ambiguity of (39b) argues for an analysis that derives (39b) by means of a scrambling operation that can totally reconstruct, as sketched in (40) (Hoji 1985, Saito 1985).

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14. Miyagawa's (1997) judgement on (38) differs from that of the literature I rely on and my informants. Miyagawa develops a theory where both (a) and (b) are predicted to have the same status. However, Miyagawa assumes that a scrambling analysis is possible for (38b) in a later paper (Miyagawa 1996), and Yatsushiro (1998) presents arguments that (38b) must be derived by scrambling.

(40) John$_{NOM}$ everyone$_{ACC}$ someone$_{DAT}$ t_1 introduced.

Yatsushiro (1996) observes that the relative scope of two objects is rigid even when both Dat- and Acc-phrase appear to the left of the subject as in (41a). (41a) contrasts with (41b) and (41c) where also both objects occur to the left of the subject, but in the inverse order.

(41) a. Dareka-ni daremo-o John-ga syookaisita
someone$_{DAT}$ everyone$_{ACC}$ John$_{NOM}$ introduced

unambiguous: someone >> everyone, *everyone >> someone

b. Daremo-o dareka-ni John-ga syookaisita
everyone$_{ACC}$ someone$_{DAT}$ John$_{NOM}$ introduced

ambiguous: someone >> everyone, everyone >> someone

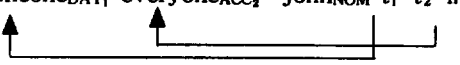
c. Dareka-o daremo-ni John-ga syookaisita
someone$_{ACC}$ everyone$_{DAT}$ John$_{NOM}$ introduced

ambiguous: someone >> everyone, everyone >> someone

The lack of ambiguity in (41a) is, prima facie, surprising. One conceivable derivation of (41a) is (42) where the two objects undergo scrambling separately. If in (42) the higher object *someone*$_{DAT}$ undergoes total reconstruction but the lower object *everyone*$_{ACC}$ is interpreted in its overt position, the inverse scope would result, contrary to fact.[15]

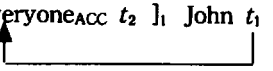
15. It's well known that, in Japanese, an object that is scrambled to the left of a clause-mate subject can take scope there (Hoji 1985 and references therein).

(42) someone$_{DAT_1}$ everyone$_{ACC_2}$ John$_{NOM}$ t_1 t_2 introduced.



Two potential explanations of the missing inverse scope in (41a) come to mind: Either the derivation (42) is not possible for the sentence (41a), or (42) is a possible derivation, but total reconstruction of the higher object requires total reconstruction of the lower object in this derivation. Yatsushiro (1996) pursues the former option. She observes following Koizumi (1995) that the remnant VP-remnant movement analysis of (41a) sketched in (43) is also predicted to be possible. Since fronting of the VP leads to a greater c-domain only for this VP, but for neither of the two object, it also doesn't create new scopal possibilities for either of the two objects. Hence, the derivation in (43) is predicted not to allow scope ambiguity. To explain (41a), Yatsushiro proposes that the analysis in (43) is forced for (41a) because it involves fewer applications of scrambling then (42).

(43) [someone$_{DAT}$ everyone$_{ACC}$ t_2]$_1$ John t_1 introduced$_2$



Yatsushiro's analysis, however, makes wrong predictions for the examples in (44). On the VP-fronting analysis in (43), nither of the two objects c-commands material in the subject position. (44a) shows that even the lower object can bind an anapher in the subject, and (44b) shows that the lower object can also take scope above the subject. Therefore, I conclude that a multiple scrambling analysis (43) must be possible for (41a), and that the explanation of Yatsushiro's observation is a restriction on total reconstruction.

(44) a. Dareka-ni daremo-o soitsu-no hahaoya syookaisita
someone$_{DAT}$ everyone$_{ACC}$ his$_{GEN}$ mother$_{NOM}$ introduced

'For everyone, his mother introduced him to someone.'

b. John-ni daremo-o dareka-ga syookaisita
John$_{DAT}$ everyone$_{ACC}$ someone$_{NOM}$ introduced

'Someone introduced everyone to John.'
(someone >> everyone, everyone >> someone)

2.2 Account of Yatsushiro's Observation

The account of Yatsushiro's observation I present here relies on the assumption that Japanese scrambling is constrained by the shortest move/attract condition. This assumption is justified in the work of Takano (1993), Kitahara (1994), Koizumi (1994), Muller (1998), Sauerland (1999), and others.[16] They show that shortest attract accounts for the grammaticality or ungrammaticality of structures that, like (45) have an unbound trace in the overt form. In particular, shortest attract predicts the ungrammaticality of (45): movement of *sono hon-o* out of the embedded clause violates shortest attract, because the embedded clause is closer to the target of this scrambling, and able to undergo scrambling in (45), where it subsequently moves to the clause initial position. Therefore, shortest attract makes earlier conditions postulated specifically to account for such structures (specifically, the (*Generalized*) *Proper Binding Condition* of Lasnik and Saito (1992)) superfluous.

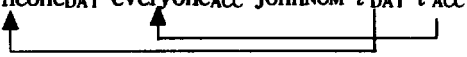
(45) * [Hanako-ga t_1 yonda to]$_2$ [sono hon-o]$_1$ Taroo-ga t_2 itta
(Saito 1992:(31c))
Hanako$_{NOM}$ read that that book$_{ACC}$ Taroo$_{NOM}$ said

The sensitivity of scrambling to the shortest attract condition would

16. The claim that scrambling is sensitive to shortest link is very controversial. Željko Bošković and Takahashi (1998), and Fukui and Saito (1998) dismiss this claim. But, to our mind, the arguments for sensitivity to shortest attract are convincing, and the claim receives additional support from the argument below.

prima facie seem to rule out the multiple scrambling analysis of (41a), which is sketched again in (46). The attractor of *everyone* isn't attracting the closest phrase, since *someone* is closer to this position.

(46) someone$_{DAT}$ everyone$_{ACC}$ John$_{NOM}$ t_{DAT} t_{ACC}

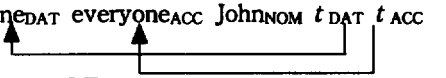


The only way the derivation in (46) is consistent with shortest attract is, if movement of *someone* could precede movement of *everyone*. Then, at the point of derivation when *everyone* is attracted it will be closest to its attractor because *someone* has already moved to a higher position. Therefore, the two movements in (46) must take place in the indicated order.

The derivation in (46) may seem to violate the cycle, since movement to a structurally higher position precedes movement to a lower position. But, Richards (1997) and Mulders (1997) argue for a version of the cycle that allows the order in (46) if both movements target specifiers of the same head—and, in fact, forces it.

Now, Yatsuhiro's observation follows from assumption that total reconstruction of Japanese scrambling can only be accomplished by PF-movement, which follows stem movement. The derivation of (41a) that would give rise to inverse scope is one where the Dat-object moves at PF, but the Acc-object moves in the stem, as indicated in (47).

(47) *someone$_{DAT}$ everyone$_{ACC}$ John$_{NOM}$ t_{DAT} t_{ACC}

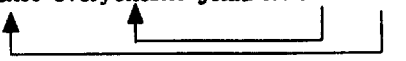


But, the order of operations forced by shortest attract in (46) implies that PF-movement of *someone* takes place before stem movement of *everyone*. This is ruled out by the assumption that PF-movement must follow stem movement.

This explanation allows for ambiguous scope in the examples (41b) and (41c), where the order of the two objects is inverted by scrambling.

Consider the structure of (41c) in (48). Superiority might block a derivation of (48) where movement of *someone*$_{ACC}$ preceds movement of *everyone*$_{DAT}$,[17] but superiority is consistent with derivations where either both objects move in the stem or both objects move at PF. The former of these derivations accounts for the scope of the *Acc*-object over the *Dat*-object, the latter accounts for the inverse scope.[18]

(48) someone$_{ACC}$ everyone$_{DAT}$ John$_{NOM}$ t_{DAT} t_{ACC}

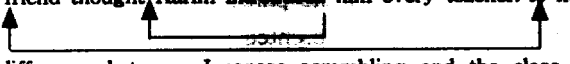


In this way, Yatsushiro's observation is a straightforward consequence of the PF-movement view of total reconstruction. The alternatives to the PF-movement analysis of total reconstruction again don't predict Yatsushiro's observation. Recall that all of three alternatives assumed that stem movement is followed by an undoing operation. But, the difference between (47) and (48) lies in the origin positions of the stem movement. Specifically on the LF-lowering view, the distinction between (47) and (48) is entirely unexpected since the different position of the traces crested in the stem part of the derivation should not be relevant

17. Whether it does or not is not certain a the moment but does make predictions for cases with three quantifiers.

18. Aoun and Benmamoun (1998) discuss in detail Lebanese Arabic examples that have the nested-paths structure of (48). In contrast to Japanese scrambling, Aoun and Benmamoun (1998) argue that such examples are only grammatical, if the inner movement takes place at PF, while for example (i)(= Aoun and Benmamoun 1998:(74a)) is ungrammatical.

(i) *her$_i$ friend thought Karim introduced him every teacher$_i$ to her



The difference between Japanese scrambling and the class of movement in Lebanese Arabic discussed by Aoun and Benmamoun (1998) is whether multiple specifiers are available. Reinhart (1981) and others show that this parameter varies across languages and types of movement, and that when multiple specifiers aren't available movement cannot cross a filled landing site of the same type of movement. Hence, (i) is only possible in Lebanese Arabic if the intermediate landing site of *Karim* isn't filled by stem movement.

to whether lowering can apply at LF. The semantic reconstruction and copy theory views of reconstruction, since they make use of the trace positions in the undoing operations can more easily capture the difference between (47) and (48). Richards (1997) proposes that reconstruction in examples where scrambling paths overlap must apply to either all or none of the scrambled phrases. This proposal captures the difference between (49a) and (49b) because reconstruction of both scrambled phrases in (49a) maintains their hierarchical order, but doesn't constitute an account from independent principles as the PF-movement account does.

3. Conclusion

Total reconstruction is a phenomenon where a moved phrase behaves in all respects as it occupied a position lower than the pronounced position. For the following discussion, we use the term *R-Movement* for totally reconstructing movement, and *Non-R-Movement* for all other overt movement. We presented evidence showing that R-movement is sensitive to general constrains on movement in a different way from comparable non-R-movement. The two general constraints on movement we considered are the c-command condition and the shortest attract requirement.

Section 1 argues that the c-command requirement applies to R-movement taking into account the effects of non-R-movement on the structure. Hence, in the configuration (49), the movement of DP*i* cannot be R-movement, since the c-command requirement isn't satisfied once the effect of non-R-movement of the phrase containing the trace t*i* is taken into account. The evidence presented in section 1 showed that the structure (49) is well-formed, however, when DP*i* undergoes non-R-movement.

(49) *[...t_i ...]$_j$ ...DP$_i$ ...t_j

R non-R

For the shortest move requirement, it was shown in section 2 that non-R-movement that crosses the trace position of the R-movement is blocked. In particular, non-R-movement crossing t_i was shown to be blocked in the configuration (50) when DP$_j$ undergoes R-movement.

(50) *DP$_i$ DP$_j$ ...t_i t_j

The interaction between R-and non-R-movement can be insightfully described by assuming that a derivational view of syntax where both the c-command condition and shortest attract apply to intermediate representations. Namely, the way R-movement is sensitive to the c-command condition and the shortest move condition argues that it R-movement follows non-R movement. We don't see an obvious way to capture this insight on a representational view of syntax, which doesn't assume intermediate representations.

Recall now that R-movement refers to movement that totally reconstructs, and often contrasts with movement that has the same PF-effect but doesn't totally reconstruct. What we have show then is that totally reconstructing movement must follow movement that doesn't totally reconstruct. The division between reconstructing and non-reconstructing movement follows naturally, if we assume with Aoun and Benmamoun (1998) that overt movement can either affect both the LF and PF interfaces (stem movement) or affect only the PF interface (PF-movement), and in fact adopt following stronger claim: totally reconstructing movement must take place at PF and non-totally reconstructing movement must take place in the stem. That total reconstruction of stem movement is blocked for stem movement follows form the view that movement creates open predicates as shown in(5). That non-totally reconstructing movement must take place follows if

it's impossible to move a phrase at both LF and PF to the same position. We propose that such a derivation is ruled out by economy since this derivation employs two applications of movement but yield the same LF and PF representations stem movement yields with just application of movement.[19]

3.1 Architecture of Derivations

At this point, we have established that total reconstruction must be derived by PF-movement. Another interesting aspect of the restrictions in (49) and (50) is that they argue that PF-movement must follow stem-movement. This result distinguishes between different architectures of syntactic derivations that have been proposed. The result is fully consistent with the T-*model* of Chomsky and Lasnik (1977), which we assumed above for the exposition. On the other hand, the result is entirely unexpected on the *Single Output* model of syntax developed by Bobaljik (1995b), Groat and O'Neill (1995) and others. This architecture assumes that the derivation yields a single output representation which is only accessed by the LF and PF-interface in different ways and therefore doesn't predict any ordering between totally reconstructing and other movement.

A third architecture for derivations recently proposed is the *Phases* model of Chomsky (1998), Epstein *et al.* (1998), Uriagereka (1998). [20]

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19. The economy condition postulated here is similar to an interpretation off Fox's (1995b) work by Chomsky (1995). Chomsky argues that movement is only possible if it brings about a difference in interpretation or pronunciation. The condition we argue for says that of two ways to bring about the interpretative and phonological effect of overt movement, the more economical one is chosen.

20. Epstein *et al.*(1998) use the term *strongly derivational*, uriagereka (1998) the term strictly cyclic. more importantly, the proposal differ significantly and we employ chomsky's (1998) proposal in text. however, the differences between this and uriagerka's (1998) proposal are mainly on the lf-side and therefore don't affect the following discussion. epstein *et al.* (1998) develop an account of reconstruction that doesn't distinguish between partial and total

In a simplified version, this architecture assumes that a derivation proceeds in phases where the derivation of each phase has the structure of the T-model yielding an LF and PF-representation as its output. In difference to the T-model though, the output of one phase can serve as the input of another phase just like an item drawn from the lexicon.

One attraction of the phases model is that it allows an account of the c-command condition on movement. namely, Chomsky (1995), Mulders (1997), and Richards (1997) argue that all checking requirements of a head that require overt movement must be satisfied in a structure where the root node is projected from this head. This blocks overt movement satisfying requirements of X after a constituent XP projected from X is merged into a bigger constituent not projected from X. In this way, movement to a head X must originate in the maximal projection of X. In effect, this amounts to an m-command condition on movement, which is far as we know is a satisfactory account of the facts underlying the c-command condition. The phases model makes it possible to assume that checking requirements that require covert movement (Chomsky 1998) and also PF-movement must be satisfied while the head bearing these requirements is the head of the current structure. Then, the m-command condition follows also for LF and PF-movement.

The account of the c-commend condition is an interesting implication of the phases model. Since the account of Barss's generalization in section 1 relied on the c-command condition on movement, it's important to see whether our arguments for derivational order are compatible with the phases model. The order of movement argued for in multiple scrambling in Japanese is straightforwardly compatible if the order of movements into multiple specifiers of the same head takes place within one phase as Chomsky (1998), Epstein *et al.* (1998) and Uriagereka (1998) do. However, the order of movement argued for in(51) (repeated from(15) above at first seems to incompatible with the phases

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reconstruction and is therefore incompatible with our proposal.

model. Specifically, we argued that a derivation where *an Austrian* moves at PF is blocked by the *wh*-phrase moving in the stem. This seems to involve look-ahead which is especially severe if *an Austrian* moves into its PF-position in an earlier phase then the one when the *wh*-phrase moves into Spec(CP).

(51) [How likely to t_{QP} win]$_{wh}$ is [an Austrian]$_{QP}$ t_{wh}

IP-phase

This apparent look ahead problem, however, is only a problem for the simplified version of the phases model we considered so far, and doesn't arise at least on the actual version of Chomsky (1998). Chomsky assumes with Uriagereka (1998) that the simplified version would never allow movement from one phase into another since the output of an earlier phase is treated by a later phase like a single lexical entry, which can only move as a whole. Chomsky proposes that this restriction is overcome by a movement into the *Edge* of the earlier phase, which is still accessible in a later phase. Chomsky proposes that all phrases with unchecked features must have moved into the edge of the current phase during the derivation of this phase.

Since phases can yield different outputs at LF and PF, we assume that also the edge of a phase can differ between LF and PF. Then it seems natural that a phrase must move into the edge in the stem if it is required to undergo further stem movement, but only needs to undergo in the LF or PF-branch if it's further movement is at LF or PF respectively. This assumption provides the kind of look-ahead required in (51). Consider the derivation of the IP-phase of (51). Since the *wh*-phrase must undergo further stem movement, it must move into the edge of this phase in the stem. Since PF-movement must follow stem movement within a phase, the subject would have to move from the edge of the phase to the subject position. This movement, However, is plausibly blocked because the edge of a phase is not accessible from within it.

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