

OPERATOR-BINDING, LF PIED-PIPING AND THE SYNTAX OF WH-IN-SITU*

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o. Introduction

According to a certain view shared by some generative linguists (Nishigauchi 1986, Choe 1987, etc.), the machinery of Pied-piping in LF (henceforth LF-PP) plays a crucial role in explaining the apparent discrepancy between overt syntax and LF with respect to constraints on movement—for example, the presence vs. absence of the Subject Condition effect as shown in (1):

- (1) a. *who did pictures of t amuse John
 b. who did pictures of who amuse t

The contrast seems to indicate that syntactic wh-movement observes the Subject Condition (1a) while wh-raising in LF does not (1b). At this point, the LF-PP hypothesis allows one to avoid making the claim that Subjacency does not apply to LF movement—an obviously undesirable claim in light of the generality of the movement theory—by saying that in (1b) it is not *who* alone but rather the whole subject that undergoes movement in LF. To put it in current *Barriers* terms (Chomsky 1986b, 1987), the inherent barrierhood of the subject NP that is responsible for the starred status of (1a) will be simply irrelevant to the LF movement in (1b).

A strong objection to this LF-PP hypothesis, raised by Fiengo, Huang, Lasnik & Reinhart (1988; henceforth FHLR), comes from the observation that LF-PP will then map (1b) onto the LF representation in (2), which is essentially no different from a structure that will exhibit

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the Superiority effect as in (3):

- (2) [CP [pictures of who]_i who_j [IP t_i amuse t_j]]
 (3) a. *what did who see
 b. [CP who_i what_j [IP t_i saw t_j]]

Within the GB tradition, the ungrammaticality of (3a) has been attributed to an ECP (Empty Category Principle) violation as the subject EC t_i fails to be antecedent governed by who_i in the corresponding LF structure (3b). But then (2) will be ruled out in exactly the same manner, and LF-PP would not offer an account of the well-formedness of this structure.

In this paper, I will show that this objection can be rejected by observing that the proper treatment of the Superiority effect is not provided by ECP but rather by the Operator-Binding Principle (OBP) first advocated in Fujita (1986), and also that the LF-PP hypothesis has to be supplemented by a further operation of what I will call 'Operator-Raising (OR).' I will argue that, incorporating LF-PP and OR, OBP offers a straightforward account of cases in which the Superiority effect does and does not show up, in a more principled and unified manner than in other analyses proposed so far.

1. Operator-Binding Principle

In this section I will outline the OBP analysis of the Superiority effect. OBP can be stated as in (4):¹

- (4) At LF, a variable must be locally bound to its Minimal Accessible Operator (MAO), where O_i is accessible to var_j iff $(O_i, var_{j=i})$ would yield an instance of local operator-binding.

Roughly put, OBP requires that, at the level of LF, each variable be bound by the closest operator that could locally bind it under hypothetical assignment of the index of the operator to the variable. As should be obvious, the idea behind OBP is an extension of Chomsky's (1986a) revised binding theory that incorporates the notion 'BT-compatibility,' in the sense that the relevant binding domain for a given

¹ The formulation in (4) is given in somewhat different terms from the original version of Fujita (1986), mainly for clarity's sake. See Rizzi (1990) and Aoun and Li (1989) for recent attempts to attain essentially the same effect as OBP in different approaches.

expression is the one in which it could satisfy its binding requirement by some hypothetical indexing.

Assume now that LF wh-raising takes the form of adjunction to CP, rather than to a syntactically moved wh-phrase as currently executed in most literature. The familiar requirement that (in English-type languages) wh-raising be only to [+wh] Spec of CP can readily be rephrased as in (5), by noting that CP has the feature [+wh] just when its Spec does, as a result of Spec-head agreement and head feature percolation:

- (5) LF wh-raising adjoins a wh-in-situ to [+wh] CP.

This much said, we can see how OBP accounts for the Superiority effect as in (6):

- (6) a. who t saw what
b. *what did who see t (= (3a))

Given (5), (6a, b) are each associated with the LF structures (7a, b), after every intermediate trace has been deleted along the lines suggested in Chomsky (1987, 1989):

- (7) a. [_{CP} what_j [_{CP} who_i [_{IP} t_i saw t_j]]]
b. [_{CP} who_i [_{CP} what_j [_{IP} t_i saw t_j]]]

OBP predicts the contrast in the following manner. In (7a), the two variables t_i/t_j are bound by their respective MAO's, $who_i/what_j$, satisfying OBP as required. In particular, who_i is not accessible to t_j ; if index i were assigned to t_j , then $t_{i=j}$ would be locally A-bound by the subject variable t_i rather than O(perator)-bound by who_i because who_i and t_i have already been coindexed at the preceding level of S-structure and t_i c-commands t_j .¹ On the other hand, t_i in (7b) violates OBP because it is not bound by its MAO, which turns out to be $what_j$. This is because in this structure t_j does not c-command t_i so that the assignment of index j to t_i would result in the local binding of $t_{i=j}$ by $what_j$, as

¹ The coindexation between who_i and t_i at S-structure is obligatory to satisfy ECP (and Subjacency). The effect is even more directly achieved in the framework of the 'Multilevel' ECP advanced in Fujita (1989a), according to which Subjacency is reduced to part of ECP as a general condition on chains. Note that automatic coindexation by Move α is now dispensable, and the simplicity of the theory of movement is enhanced accordingly.

stated in (4).¹

An obvious advantage of this OBP account over others is that the problematic case of the 'Pure Superiority' effect now follows in exactly the same way:

- (8) a. who does John expect t to read what
 b. *what does John expect who to read t
- (9) a. [_{CP} what_j [_{CP} who_i [_{IP} John expects t_i to read t_j]]]
 b. [_{CP} who_i [_{CP} what_j [_{IP} John expects t_i to read t_j]]]

LF representations (9a, b) correspond to (8a, b) respectively, and t_i in (9b) is the offending trace that distinguishes between the two structures.²

2. An Apparent Problem

It is often cited in the literature that the Superiority effect does not show up when the wh-in-situ involved has a rather complex internal

¹ As correctly pointed out by a *SEL* reviewer, OBP has nothing to say about the general impossibility of a wh-adjunct in situ:

- (i) *who left why
 (ii) [_{CP} why_j [_{CP} who_i [_{IP} t_i left t_j]]]

I agree with the reviewer that in the LF structure of (ii) the adjunct trace does not violate OBP, but for a different reason. Specifically, I assume, following Chomsky (1987, 1989), that a wh-adjunct and its trace(s) do not constitute an operator-variable construction at LF; rather, they form an adjunct chain, and one direct consequence is that t_j in (ii) is not subject to OBP (since it is not a variable at all). In other words, OBP is simply irrelevant here. Now since intermediate members of an adjunct chain must remain at LF, as dictated by Chomsky's "Least Effort" Principle, an ECP account is readily available for (i), whose LF structure is in fact as in (iii):

- (iii) [_{CP} why_j [_{CP} who_i [_{IP} t'_j [_{IP} t_i left t_j]]]]]

Given Rizzi's (1990) Relativized Minimality, t'_j fails to be antecedent governed by why_j because of the intervening potential antecedent governor, who_i . Contrast (iii) with (iv), which is an intermediate LF structure prior to (7b):

- (iv) [_{CP} who_i [_{CP} what_j [_{IP} t'_i [_{IP} t_i saw t_j]]]]]

In (iv) t_i is antecedent governed by t'_i , but this does not induce an ECP violation on the part of t'_i since it is subsequently deleted. (7b) satisfies ECP, then, and only OBP rules out this structure.

² As should be obvious by now, the empirical coverage of OBP overlaps with that of Pesetsky's Path Containment Condition (PCC; see May 1985) to a considerable extent, as they are essentially two notational variants of the crossing constraint. I believe that the main reason for choosing OBP over PCC derives from the degree of theoretical simplicity only OBP promises to attain. See fn. 1, p. 33.

structure. (10a) should be contrasted with (6b):

- (10) a. what did which man see
 b. [_{CP} [which man]_i [_{CP} what_j [_{IP} t_i saw t_j]]]

The grammaticality of (10a), with the alleged LF structure (10b), seems to present a serious problem for the OBP analysis, because t_i is apparently not bound by its MAO. Note at this point that the problem we are facing now is of the same theoretical import as that posed by (1b)–(2) against the LF-PP hypothesis. In our framework, (1b) is mapped onto (11) via LF-PP:

- (11) [_{CP} [pictures of who]_i [_{CP} who_j [_{IP} t_i amuse t_j]]]

It is again puzzling why t_i does not violate OBP.

Still assuming that OBP is the correct approach to the Superiority effect, we are led to the conclusion that the LF-PP hypothesis cannot be maintained in the present form. Two possible avenues to pursue suggest themselves; either to abandon LF-PP entirely and let some other principle take care of the contrast in question, or to revise the LF-PP analysis so that (1b) and (10a) may be associated with LF structures of the sort that will satisfy OBP. The former is adopted by FHLR and also by Hornstein & Weinberg (1987; H & W), whereas it is the latter that I will argue for in the following discussion. Below I will show that the other approaches are not viable at all.

3. Operator-Raising

Structures like (10b) and (11) are problematic for the OBP analysis only insofar as we take t_i in them to be an operator-bound variable which is subject to OBP, which in turn assumes that a Pied-piped expression as a whole functions as an LF operator. The latter point has in fact been one of the basic tenets of the LF-PP hypothesis, and it is to this that I object here. Rather, I will assume (12):

- (12) At LF, only wh-words function as wh-operators.¹

The consequence is that it is *which* rather than *which man* in (10b) and *who* rather than *pictures of who* in (11) that have the status of an operator.

¹ In other words, the feature [+operator] does not percolate up, as is also argued by Katada (1988) on independent grounds.

This shift makes good sense in particular within the tradition of restricted quantification. Thus in *which man*, for example, *which* acts as a quantifier while *man* is rather a restrictive predicate for the quantifier. What is necessary, then, is an operation that has the effect of locating the operator in its due position—actually a decomposition rule of some sort. Call this operation ‘Operator-Raising (OR).’ For concreteness’ sake, I will assume that OR adjoins an operator to CP, as analogous to (5). Consequently, a sentence like (13a) will have the LF representation (13b):

- (13) a. which man did you see t
 b. [CP which_i [CP [NP t’_i [NP t_i man]]] [IP you saw t_{NP}]]]

The application of OR as shown in (13b) may involve adjunction to NP to satisfy ECP / Subjacency;¹ note that the target NP occupies an A’-position with the status of a nonargument, providing a possible adjunction site in light of Chomsky’s (1986b) movement theory that prohibits adjunction to an argument for a θ -theoretic reason.² Very importantly, in (13b) it is not t_{NP} but rather t_i that counts as a variable

¹ Equivalently, OR may take the form of NP-adjunction, with the resulting LF structure as in (i), rather than (13b):

- (i) [CP [NP which_i [NP t_i man]]] [IP you saw t_{NP}]]

This is reminiscent of May’s (1985) treatment of inversely linked quantification, according to which a sentence like (ii) is mapped onto (iii) via repeated application of Quantifier Raising (QR):

- (ii) someone from every city despises it
 (iii) [IP [NP every city_j [NP someone from t_j]]_i] [IP t_i despises it]]

² In overt syntax, adjunction to a nonargument NP accounts for the cancellation of the Subject Condition when the subject is first moved to an A’-position, as in (i):

- (i) (?) who do you wonder [CP [NP t’ [NP which pictures of t]]] [IP t_{NP} are on sale]]

On the other hand, if the erosion of the inherent barrierhood of the subject NP were to be attributed to the L-marking by the matrix verb (see Chomsky 1986b), the ungrammaticality of (ii) would have no explanation:

- (ii) *who do you believe [IP [NP pictures of t] to be on sale]

which requires operator-binding.¹

4. Solving the Problem

Turning now to the cases where the Superiority effect is not manifested, it is easy to see that the mechanism of OR preserves the OBP analysis without damaging the LF-PP hypothesis. Thus by OR, LF structures (10b) and (11) are mapped further onto (14a, b), which I take to be the final LF representations for (10a) and (1b) respectively:

- (14) a. $[_{CP} \text{ which}_i [_{CP} [_{NP} t_i \text{ man}] [_{CP} \text{ what}_j [_{IP} t_{NP} \text{ saw } t_j]]]]]$
 b. $[_{CP} \text{ who}_i [_{CP} [_{NP} \text{ pictures of } t_i] [_{CP} \text{ who}_j [_{IP} t_{NP} \text{ amuse } t_j]]]]]$

The two relevant variables, t_i and t_j , both satisfy OBP by being bound to their respective MAO's. In addition, the three EC's, including t_{NP} , satisfy ECP; in particular, t_i is antecedent governed via NP-adjunction. Thus (14a, b) are ruled well-formed by OBP as well as by ECP, and the contrast between (6b) and (8b) on one hand and (1b) and (10a) on the other—the presence vs. absence of the (Pure) Superiority effect—is now properly accounted for.

Thus by exploiting the operation of OR, OBP offers a unified solution to the problematic cases under consideration, and this in turn constitutes strong evidence for the LF-PP hypothesis because the suggested explanation requires that LF-PP derive the input structure to OR. The kind of objection to the LF-PP hypothesis mentioned at the outset is now turned down accordingly.

Incidentally, it is also of theoretical interest to see what happens if reconstruction applies to (14a, b) succeedingly after OR. The resulting structures will then be (15a, b):

¹ In this respect, I depart from the convention of restricted quantification, according to which in the following formula;

(i) $(\forall x: \text{man}(x)) (\text{mortal}(x))$ (cf. *every man is mortal*)

the occurrence of x in *mortal* (x) represents the operator-bound variable. In the present analysis, however, it is rather the x in the restrictive predicate that requires operator-binding. I will not discuss potential problems that may arise from this move, while it may be suggested that the conflict turns out only apparent once the distinction between syntactic and semantic variables is taken into account. Thus OBP applies only to syntactic variables—to t_i but not t_{NP} in (13b) for example—while at a later level of semantic representation (say, LF') t_{NP} also functions as a semantic variable, as maintained by the format of restricted quantification. A question remains with respect to the syntactic status of t_{NP} . Here I simply assume that it is an A'-anaphor bound by a nonoperator.

- (15) a. $[_{CP} \text{ which}_i [_{CP} \text{ what}_j [_{IP} [_{NP} t_i \text{ man}] \text{ saw } t_j]]]$
 b. $[_{CP} \text{ who}_i [_{CP} \text{ who}_j [_{IP} [_{NP} \text{ pictures of } t_i] \text{ amuse } t_j]]]$

These structures are excluded by OBP, since t_i is not bound to its MAO. This observation might be taken to indicate that OBP is ordered prior to reconstruction, but a more plausible conclusion will be that LF reconstruction does not exist, as also argued by Barss (1986).

In the next section, I will take up two alternative analyses of the phenomena discussed here. They share the view that the LF-PP hypothesis is incorrect, and by showing that neither of them fully accounts for the relevant data, I would like to endorse the present analysis.

5. Problems with Other Analyses

5.1. Hornstein & Weinberg (1987)

H & W reject the LF-PP hypothesis and offer an alternative account of the lack of the Superiority effect in cases like (1b) and (10a) in the framework of Aoun's (1985) generalized binding.¹ Strictly prohibiting LF-PP, H & W associate (1b), for example, with the following LF structure:

- (16) $[_{s'} [_{Comp} \text{ who}_i \text{ who}_j]_j [_s [_{NP} \text{ pictures of } t_i]_k \text{ AGR}_k \text{ amuse } t_j]]]$

Limiting our attention to t_i , it can be seen that it lacks an accessible SUBJECT; in particular, AGR is not accessible because coindexing t_i with it will result in a Principle C violation, with the whole subject NP A-binding $t_{i=k}$. The consequence is that t_i lacks a Domain and there-

¹ The theory of generalized binding is reproduced as follows:

(i) Generalized Binding Principles:

(where $X = A$ or A')

- A. An X-anaphor must be X-bound in its Domain.
 B. An X-pronoun must be X-free in its Domain.
 C. R-expressions must be A-free.

Where;

- (ii) α is a Domain for β iff α is the first clause or NP that contains an accessible SUBJECT for β .
 (iii) α is accessible to β iff β is in the c-command domain of α and assigning the index of α to β would violate neither the i-within-i Condition nor Principle C of the binding theory.

In this framework, a wh-trace is characterized as both an A' -anaphor and an R-expression, subject to Principles A and C.

fore trivially satisfies Principle A. In contrast, usual Superiority violations are correctly predicted since, in such cases, AGR does stand as an accessible SUBJECT for the offending trace:

- (17) [s' [Comp who_i what_j]_j [s t_i AGR_i see t_j]] (cf. (6b))

Now S' counts as the Domain for t_i, in which it fails to be A'-bound by Comp since Comp has been assigned the index j by Comp-indexing.¹

In addition to the obvious conceptual problem raised by the implied LF / syntax discrepancy with respect to Subjacency, H & W's analysis is empirically inadequate because it fails to account for the full behavioral properties of multiple wh-constructions. To see this, consider how the Pure Superiority effect defies any generalized binding account. In this framework, (8a, b) above have the following LF structures:

- (18) a. [s' [Comp what_j who_i]_i [s John AGR expect [s t_i to read t_j]]]
 b. [s' [Comp who_i what_j]_j [s John AGR expect [s t_i to read t_j]]]

In these structures both t_i and t_j lack an accessible SUBJECT; neither *John* nor AGR in the matrix clause is accessible since coindexing the variables with them would yield a Principle C violation. This means that t_i and t_j trivially satisfy Principle A, in exactly the same manner as t_i in (16), and the contrast of (8a, b) remains unaccounted for.

To solve this problem, H & W first assume the existence of Infl (AGR) in infinitival complements of ECM verbs which may function as a SUBJECT. As a result, (18a, b) will now look like (19a, b):

- (19) a. [s' [Comp what_i who_j]_j [s John AGR expect [s t_i AGR to read t_j]]]
 b. [s' [Comp who_j what_i]_i [s John AGR expect [s t_i AGR to read t_j]]]

¹ To prohibit *who_i*, rather than the Comp that dominates it, from directly A'-binding t_i, advocates of generalized binding commit themselves to a rather ad hoc stipulation that operators do not function as A'-binders for binding principles (see Aoun, Hornstein, Lightfoot & Weinberg 1987). Note, however, that if the LF structure (i) is to be well-formed;

(i) [s' [Comp what_j who_i]_i [s t_i AGR_i see t_j]] (cf. (6a))
 t_j needs to be bound by *what_j* in order to satisfy the requirement of strong binding (Chomsky 1986a) and also to avoid vacuous quantification. Thus it is not appropriate, for example, to simply assume that in the structure (17) *who_i* does not c-command t_i. Any conceptual or technical complication that may arise from this consideration can be avoided in our framework which permits CP-adjunction for LF wh-raising.

In (19a, b), H & W argue, t_i now takes the lower AGR as its accessible SUBJECT, and therefore matrix S' as its Domain, with the correct consequence that only (19b) is excluded because t_i is not A' -bound by Comp.

This remedial strategy is self-destructive in that it creates its own problem. For example, consider (20a, b), with the LF representations (21a, b):

- (20) a. who t expects who to come
 b. *who does who expect t to come
- (21) a. [s' [_{Comp} who_i who_i]_i [_S t_i AGR expect [_S t_j AGR to come]]]
 b. [s' [_{Comp} who_i who_j]_j [_S t_i AGR expect [_S t_j AGR to come]]]

In (21a, b) AGR occurs in the complement clause in conformity with H & W's assumption. The ill-formedness of (21b) is correctly predicted because t_i violates Principle A, but then the serious problem is why t_j in (21a) does not violate Principle A in a similar manner. Here t_j has the lower AGR as its accessible SUBJECT, and its Domain is the matrix S' , in which it fails to be A' -bound. By now the failure of the generalized binding approach should be clear enough.

5.2. Fiengo, Huang, Lasnik & Reinhart (1988)

FHLR also reject the LF-PP hypothesis and instead propose to generalize May's QR so that it may also affect a phrase which contains a wh-in-situ in it. For example, applying QR to (1b) will yield (22a), and subsequent wh-raising derives the LF structure (22b):

- (22) a. [_{CP} who_j [_{IP} [_{NP} pictures of who] [_{IP} t_{NP} amuse t_j]]]
 b. [_{CP} who_i who_j [_{IP} [_{NP} t'_i [_{NP} pictures of t_i]] [_{IP} t_{NP} amuse t_j]]]

Adjunction to NP as shown in (22b) is possible for the same reason as it is in our analysis; the target NP has moved to an A' -position, now devoid of the argument status which would otherwise prohibit adjunction. In this way, the apparent lack of a Subject Condition violation in LF is explained without stipulating any LF / syntax discrepancy in observing Subjacency.

FHLR's proposal and ours look alike in that they both attribute the lost barrierhood of a certain category to prior A' -movement of that category, thereby creating a new adjunction site which will permit extraction from within. But the two analyses diverge radically in the

treatment of the Superiority effect—OBP vs. ECP—and our analysis is always favored over FHLR's, as I will now show.

According to FHLR's analysis, *who* in (23a)=(3a) may first undergo QR before adjoining to the Spec of CP, and this option yields the LF structure (23c) in addition to (23b)=(3b):

- (23) a. *what did who see t
 b. [CP who_i what_j [IP t_i saw t_j]]
 c. [CP who_i what_j [IP t'_i [IP t_i saw t_j]]]

In (23c), t_i is antecedent governed by the IP-adjoined intermediate trace t'_i , so that for FHLR it must be t'_i that violates ECP.¹ To achieve this effect, in addition to adopting the familiar Comp-indexing account (to exclude (23b)) FHLR argue that in (23c) the top segment of IP independently acts as a barrier to government, as opposed to what is assumed in Chomsky (1986b). It is easy to show that subjecting intermediate traces of LF wh-raising to ECP will bring devastating damage to any ECP account.

It is often discussed in the literature that the *[that-t] effect disappears in LF movement, as shown in (24a):

- (24) a. ?who t thinks that who left
 b. [CP who_j who_i [IP t_i thinks [CP t'_j [IP t_j left]]]]]

In the LF structure (24b) t_j is assumed to be antecedent governed by t'_j , as a result of the complementizer deletion along the lines of Lasnik & Saito (1984). But if intermediate traces also observe ECP, then the well-formedness of this structure is rather unexpected because t'_j is obviously not antecedent governed by who_j . (Further application of adjunction operation will yield additional offending traces.) Compare (25) with (24):

- (25) a. *what do you think that who saw t
 b. [CP who_i what_j [IP you think [CP t'_i [IP t_i saw t_j]]]]]

FHLR would rule out (25b) on grounds that t'_i is not antecedent governed, but then the well-formedness of (24b) would pose a real problem for their analysis. On the other hand, OBP correctly predicts the contrast between (24a) and (25a). Their respective LF structures are now

¹ See the discussion in fn. 1, p. 22.

(26a, b):

- (26) a. [_{CP} who_j [_{CP} who_i [_{IP} t_i thinks t_j left]]]
 b. [_{CP} who_i [_{CP} what_j [_{IP} you think t_i saw t_j]]]

Only (26b) violates OBP since t_i is not bound to its MAO, *what_j*.

FHLR's ECP analysis cannot overcome the problem of Pure Superiority, either. To repeat:

- (27) a. who does John expect t to read what
 b. *what does John expect who to read t
 (28) a. [_{CP} what_j who_i [_{IP} John expects t_i to read t_j]]
 b. [_{CP} who_i what_j [_{IP} John expects t_i to read t_j]]

To the extent that (28a) is well-formed because the two EC's are lexically governed, the same must hold of (28b), too. And if (28b) is ill-formed because t_i is not antecedent governed—assume now that proper government is limited to antecedent government (Chomsky 1986b, Fujita 1989a)—(28a) should also be ruled out because of the offending trace t_j .

Furthermore, by claiming that adjunction creates an additional barrier to government, FHLR will be forced to assume the 'defective' character of IP in the sense of Chomsky (1986b), which has now turned out to be an unnecessary stipulation (see Fujita 1989a, b, Frampton 1990). For example, consider the following long extraction of an adjunct:

- (29) a. why do you think that John left t
 b. [_{CP} why [_{IP} you think [_{CP} t' [_{IP} John [_{VP} left t]]]]]

In order for the chain (*why*, t' , t) to satisfy ECP, not only VP, as pointed out by FHLR, but also IP needs to be free from any barrierhood, as adjunction to these categories is of no help here. A related problem is that it is not at all clear how structures like (30a, b), each corresponding to (10a) in accordance with whether or not a rule like OR is assumed, can satisfy ECP, if adjunction yields a new barrier:

- (30) a. [_{CP} which_i what_j [_{IP} [_{NP} t'_i [_{NP} t_i man]]] [_{IP} t_{NP} saw t_j]]]
 b. [_{CP} [which man]_i what_j [_{IP} t'_i [_{IP} t_i saw t_j]]]

Here it is obvious that t'_i fails to be antecedent governed under their analysis.

In sum, FHLR's proposal contributes nothing to explain either the (Pure) Superiority effect or its apparent lack in certain environments, whereas these phenomena are susceptible of unified treatment in our framework. Without further discussion, the OBP analysis defies comparison with any ECP approach including FHLR's.^{1,2}

6. Concluding Remarks

In this paper I have developed a theory of LF syntax which departs from previous analyses in crucial respects. In particular, I have proposed the rule of OR to form a legitimate operator-variable structure. Given the LF-PP hypothesis supplemented by OR, OBP correctly predicts both the (Pure) Superiority effect and its lack in certain constructions. I have discussed two other recent analyses of the phenomena in question, both of which reject the LF-PP hypothesis, to show that neither of them can claim the level of explanatory force that our analysis attains.

There are some other considerations that prefer the OBP approach

¹ Another undesirable consequence of FHLR's proposal, of more conceptual nature, is that the unification of the theories of government and bounding must be abandoned in the *Barriers* program, in striking contrast to what I have claimed in Fujita (1989a).

² Taisuke Nishigauchi (p.c.) points out that FHLR's account based on the extended application of QR is inadequate also in light of the possible scopal behavior of the expression affected by QR. Consider (i):

- (i) a. anata-wa John-ga [[dare-ga t kaita] ronbun]-o hihan-sita to omotteiru no
 you Top nom who nom wrote paper acc criticized that think Q
 (lit. you think that John criticized a paper who wrote)
- b. Mary-ga kaita ronbun (desu)
 ((it is) a paper Mary wrote)

The fact that (ib) is a possible answer to (ia) indicates that not only *dare* but the whole object NP *dare-ga kaita ronbun* takes the matrix scope beyond the complement clause within which it originates, which fact is not accounted for if the NP undergoes QR rather than LF-PP since QR is generally assumed to be clause-bounded.

This objection may not be so strong as it first appears, however, because of examples like the following:

- (ii) a. which book did you say that everyone read t
 b. (I said that) Bill read *LGB*, Mary read *Barriers*, . . .

An answer of the form (iib) indicates that in (iia) *everyone* may take scope over *which book*, which in turn suggests two possibilities; either QR in fact allows long extraction, or, despite its surface position, a sentence-initial wh-phrase may not extend its scope beyond its own clause. Under whichever assumption, the significance of data like (i) is now dubious. See Haik (1984) for related discussion.

to the others. I will briefly mention only one. May (1985) observes that (31a) differs from (31b) in that it does not permit the wide scope reading of *everything*:

- (31) a. who t bought everything (for Max)
 b. what did everyone buy t

In other words, only (31b) is scopally ambiguous. Now for *everything/everyone* to take scope over *who/what*, these quantifiers must be adjoined to IP by QR, in conformity with May's Scope Principle, to govern the wh-operators. The relevant LF structures are (32a, b), respectively:

- (32) a. [_{CP} who_i [_{IP} everything_j [_{IP} t_i bought t_j]]]
 b. [_{CP} what_i [_{IP} everyone_j [_{IP} t_j bought t_i]]]

But (32a) violates OBP because t_i is not bound to its MAO, while (32b) is well-formed. On the other hand, if *everything* is adjoined to VP in (31a), then there will be no OBP violation in the resulting LF structure (33), which represents only the narrow scope reading of *everything*:

- (33) [_{CP} who_i [_{IP} t_i [_{VP} everything_j [_{VP} bought t_j]]]]

Thus OBP captures the fact that (31a) does not manifest the kind of scopal ambiguity that is present in (31b). ECP, on the other hand, does not account for the contrast, because even in (32a) t_i has already been antecedent governed and assigned the feature [+ γ] at S-structure, before QR applies.

More important than all this predictive force of OBP is the fact that our analysis avoids stipulating any LF / syntax asymmetry with respect to constraints on movement, by virtue of the LF-PP hypothesis it maintains in a revised form, thereby contributing to the enhancement of the generality of the grammatical theory as a whole.¹

Given the correctness of the OBP analysis, the logical problem which now arises is that of whether we should state OBP as an independent

¹ A possible objection here is that the application of OR is restricted to LF, and therefore certain LF / syntax asymmetry is also stipulated in our framework. In fact, however, the inapplicability of OR in overt syntax is a natural consequence of the Least Effort Principle. That is, since OR is an operation to form a legitimate operator-variable relation, and since this relation comes into play only at the level of LF, OR applies as a last resort in LF just when the relation in question has failed to be established by prior application of syntactic movement.

principle of grammar or rather it can be reduced to some or other already established subsystem. Without entering into concrete discussion, here I simply call the reader's attention to the possibility pursued in Fujita (1989b), that OBP constitutes one of the principles of an extended theory of X-binding, where $X=A, A',$ or O .¹

REFERENCES

- Aoun, J. 1985. *Generalized Binding: The Syntax and Logical Form of Wh-interrogatives*. Foris, Dordrecht.
- Aoun, J., N. Hornstein, D. Lightfoot, and A. Weinberg. 1987. "Two Types of Locality," *Linguistic Inquiry* 18, 537-77.
- Aoun, J. and Y. A. Li. 1989. "Scope and Constituency," *Linguistic Inquiry* 20, 141-72.
- Barss, A. 1986. *Chains and Anaphoric Dependence*. Doctoral dissertation, MIT.
- Choe, J. W. 1987. "LF Movement and Pied-Piping," *Linguistic Inquiry* 18, 348-53.
- Chomsky, N. 1986a. *Knowledge of Language: Its Nature, Origin, and Use*. Praeger, New York.
- Chomsky, N. 1986b. *Barriers*. MIT Press, Cambridge, Mass.
- Chomsky, N. 1987. "Kyoto Lectures," lectures delivered at Kyoto University of Foreign Studies.
- Chomsky, N. 1989. "Some Notes on Economy of Derivation and Representation," *MIT Working Papers in Linguistics* 10, 43-74.
- Fiengo, R., C.-T. J. Huang, H. Lasnik and T. Reinhart. 1988. "The Syntax of Wh-in-Situ," *West Coast Conference on Formal Linguistics* 7, 81-98.
- Frampton, J. 1990. "Parasitic Gaps and the Theory of Wh-Chains," *Linguistic Inquiry* 21, 49-77.
- Fujita, K. 1986. "Variables and Operator-Binding," *Kansai Linguistic Society* 6, 1-12.
- Fujita, K. 1989a. "On Deriving the Subjacency Effects from the

¹ There I have suggested that the notion of antecedent government should in fact be conceived of as a form of local binding, and that ECP (and Subjacency, given the Multilevel ECP) should therefore be reduced to X-binding. If this unification is viable on the whole, then OBP receives strong conceptual support over ECP and other similar proposals, including Pesetsky's PCC.

- ECP," *Studies in English Literature* 65, 229-43.
- Fujita, K. 1989b. "Review Article: *Knowledge of Language & Barriers* by Noam Chomsky," *English Linguistics* 6, 213-31.
- Haik, I. 1984. "Indirect Binding," *Linguistic Inquiry* 15, 185-223.
- Hornstein, N., and A. Weinberg. 1987. "Superiority and Generalized Binding," *North East Linguistic Society* 17, 311-24.
- Katada, F. 1988. "LF-Binding of Anaphors," *West Coast Conference on Formal Linguistics* 7, 171-85.
- Lasnik, H., and M. Saito. 1984. "On the Nature of Proper Government," *Linguistic Inquiry* 15, 235-89.
- May, R. 1985. *Logical Form: Its Structure and Derivation*. MIT Press, Cambridge, Mass.
- Nishigauchi, T. 1986. *Quantification in Syntax*. Doctoral dissertation, University of Massachusetts, Amherst.
- Oba, Y. 1990. "Multiple Wh-questions: Alpha-marking and Absorption Condition," in Hirakouji ed. *Perspectives in Generative Grammar*, 115-37. Shohakusha, Tokyo.
- Rizzi, L. 1990. *Relativized Minimality*. MIT Press, Cambridge, Mass.

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