# Strong features, pied-piping and the overt/covert distinction

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# Abstract

The purpose of this paper is to determine whether the different properties of the operation Move before and after Spell-Out can be grounded in independently motivated properties of the minimalist program. To this end I will address two potential problems for the requirement that derivations must be uniform: (i) the obligatory nature of pied-piping prior to Spell-Out and (ii) the obligatory elimination of strong features prior to Spell-Out. If these problems cannot be addressed in a satisfactory way, the motivation for the overt/covert distinction in the minimalist program is seriously undermined. I will show that the special properties associated with Move pre-Spell-Out can be derived from the economy condition requiring that an item enters the derivation only if it has an effect on output. Since it has recently been argued by Johnson and Lappin (Johnson and Lappin 1996) that this economy condition gives rise to serious complexity problems when combined with the theory of QR proposed by Reinhart (1993, 1995), I conclude the paper with a discussion of these claims and show that they are unwarranted.

# **1** Introduction

One characteristic the Minimalist Program has inherited from its predecessor, Government and Binding theory, is the distinction between overt and covert movement. The operation Move may apply both before and after the point in a derivation where the operation Spell-Out maps the phrase marker already formed to the articulatory-perceptual interface (henceforth PF). After Spell-Out the derivation continues to the conceptualintentional interface (henceforth LF). Whereas in GB theory the point at which Spell-Out applied corresponded to a syntactic level (S-Structure), this is no longer the case in the Minimalist Program, in which there are no levels internal to the computational system. For the purposes of this paper, the main consequence of the assumption that there is no level corresponding to S-structure is that derivations must meet the requirement of uniformity: we expect derivations to exhibit identical properties before and after Spell-

Out. Uniformity did not hold in GB theory because movement was assumed to be subject to different principles before and after S-structure. For instance, movement only obeyed Subjacency before S-structure. With S-Structure gone, there is no obvious way to distinguish between pre- and post-Spell-Out operations and therefore such distinctions either should not exist or, if they do, be attributable to properties of Morphology in the PF component or to considerations of economy. There are, however, at least two aspects of the theory of Chomsky (1995) that raise questions with regard uniformity.

One concerns the relation between the overt/covert distinction and pied-piping: movement prior to Spell-Out always requires pied-piping<sup>1</sup>. Why should this be so? This question is made even more pertinent by the fact that the distinction between moving just the formal features of a category and pied-piping could in principle make the overt/covert distinction entirely superfluous. Suppose there were no principled reasons to exclude raising of just formal features pre-Spell-Out. Then all covert syntax could in principle be "overt" (i.e. pre-Spell-Out). One would never notice the difference. Thus, we would end up with a theory in which Spell-Out is an operation mapping LF to PF and the derivation to LF satisfies uniformity trivially.<sup>2</sup> One question that must minimally be answered, then, is whether considerations of PF-convergence in general suffice to exclude raising of just for other ways in which the obligatoriness of pied-piping prior to Spell-Out can be derived.

Uniformity is also threatened by the properties of so-called strong features: why should it be the case that strong features can only be introduced and eliminated pre-Spell-Out? More precisely, strong features (i) can only be introduced pre-Spell-Out and (ii) must be eliminated "quickly". Chomsky (1995) stipulates (ii), while offering a potential explanation for (i) in terms of an economy condition requiring that an item enters the derivation only if it has an effect on output (henceforth the Have an Effect on Output Condition or HEOC). The stipulation (ii) is partly justified on the grounds that strict

<sup>&</sup>lt;sup>1</sup>Chomsky (1995) suggests that overt raising without pied-piping could be permitted, depending on morphological particulars of the language (as in the theory of overt raising of empty operators in Japanese developed by Watanabe 1992). But since the uniformity requirement implies that overt and covert feature-raising should satisfy the same principles, it is hard to see how we could ever find evidence for overt feature-raising.

<sup>&</sup>lt;sup>2</sup>As in Brody's (1995a) radically minimalist theory of grammar. Since this appears to be the simpler theory, the question arises whether the complications introduced by the standard overt/covert distinction can bear the explanatory burden. In this paper I will not be concerned with this more ambitious question, which has been addressed in great detail elsewhere (see Brody 1995b, 1995c).

cyclicity directly follows from it. Unfortunately, the stipulated property can easily be shown to be empirically inadequate. What appears to be required instead is that strong features be eliminated before the derivation reaches Spell-Out. This creates two problems. First, we can of course no longer derive the strict cycle from properties of strength. But more seriously, the stipulation that strong features must be eliminated before Spell-Out amounts to an S-Structure principle and therefore violates the uniformity requirement.

The purpose of this paper is to determine whether the standard overt/covert distinction can be grounded in independently motivated properties of the minimalist program. To this end I will address two problems for the uniformity requirement: (i) why is pied-piping obligatory prior to Spell-Out and (ii) why must strong features be eliminated prior to Spell-Out. If these two questions concerning uniformity cannot be answered in a satisfactory way, then the motivation for the overt/covert distinction in the minimalist program is seriously undermined. I will suggest that the special properties associated with Move pre-Spell-Out can be explained by fully exploiting the effects of the Have an Effect on Output Condition. Since it has recently been argued by Johnson and Lappin (Johnson and Lappin 1996) that the HEOC gives rise to serious complexity problems when combined with the theory of QR proposed by Reinhart (1993, 1995), I conclude the paper with a discussion of these claims and show that they are unwarranted.

# 2 Movement in the "overt" syntax and pied-piping

In the framework of Chomsky (1995) "overt" (pre-Spell-Out) movement might in principle be movement of just formal features, so that its effects would not be overt at all. Move targets a feature F and economy considerations require that F carries along enough material for convergence and no more. Chomsky suggests (p. 262-263) that full scale pied-piping pre-Spell-Out is due to properties of the phonological component. Failure to raise a full constituent would create problems in the phonological component, since isolated features might not be subject to its rules, causing the derivation to cancel. For instance, raising of just a *wh*-feature before Spell-Out would cause the derivation to crash at PF on the assumption that the resulting phrase marker contains unpronounceable elements.

Johnson and Lappin (1996) point out that this cannot possibly be the whole story. They argue that since the introduction of null elements (like pro and PRO) into a derivation prior to Spell-Out does not cause the derivation to crash at PF, there is nothing that prevents pre-Spell-Out raising of the formal features of a lexical item LI (FF[LI]). They

point out that the apparent reason for blocking pre-Spell-Out covert movement (raising of formal features only) is that the presence of FF[LI] in a structure will cause a derivation to crash at PF, but that this cannot be the case if elements without PF-features can be introduced in the derivation before Spell-Out. To my mind this is a strong argument against the claim that properties of the phonological component have a major effect on determining pied-piping. Since at best a subset of pied-piping facts can be derived from considerations of PF convergence, a potentially serious problem arises with regard to uniformity.

Let us take a look at possible solutions. In theory a property associated with Move (such as pied-piping) can have three different sources: it could be necessary for PF convergence or for LF convergence or it could be required by considerations of derivational economy. Suppose that pied-piping is a reflex of morphological requirements at LF, as in the minimalist theory of Brody (1995a). In that case, there is no need and therefore no motivation to maintain the overt/covert distinction at all and Spell-Out can map LF to PF. Of course uniformity is satisfied trivially by such a theory. We have seen that in the minimalist program PF convergence cannot account fully for the property that movement prior to Spell-Out requires pied-piping. But we could explore the possibility that pied-piping is a reflex of a combination of PF-triggering and derivational economy.

The argument that pied-piping is at least partly a reflex of derivational economy could run as follows. Suppose we follow Chomsky's suggestion and adopt the economy principle (1), which following Johnson and Lappin (1996) we have dubbed the HEOC (Have an Effect on Output Condition):

(1) HEOC

 $\alpha$  enters the numeration only if it has an effect on output (Chomsky 1995: p.294).

As Chomsky points out, (1) bars the covert introduction of strong features on the assumption that the LFs produced with and without the strong feature are the same<sup>3</sup>. But we can also use the HEOC to bar raising of just formal features prior to Spell-Out. Suppose an application of Move prior to Spell-Out checked a strong feature by raising formal features only. The operation would not have an effect on PF output. The LF output is the same no matter whether a strong feature is present or not. Therefore, the strong feature has no effect on output at all. Therefore, by (1), the strong feature cannot enter

<sup>&</sup>lt;sup>3</sup>In fact, the LFs differ trivially in form but not at all in interpretation.

the numeration. We conclude that considerations of derivational economy force piedpiping whenever Move targets a strong feature prior to Spell-Out.

Brody (1995b) points out that neither the PF nor the LF triggered version of pied-piping can account for the exact relation between the pied-piped phrase and the checking feature it contains. He gives the following example to exemplify this point:

(2) Pictures of whose mother did you think were on the mantelpiece.

I assume that what is intended is that under the standard (narrow) interpretation of the notions of PF and LF convergence in terms of Full Interpretation it would suffice if the *wh*-feature pied-piped no more than *whose mother*. The problem is the same for an approach which links pied-piping to derivational economy. The amount of material that is pied-piped by an instance of Move might well depend on other factors, such as whatever principles are invoked to account for CED effects. Thus, failure to pied-pipe the whole embedded subject in (2) causes the derivation to crash, as in (3):

(3) \*Whose mother did you think pictures of were on the mantelpiece.

In the worst case, however, the account of pied-piping proposed here is in the same boat with any other theory with respect to this problem. Let us therefore tentatively adopt this proposal and develop it more fully in the next section, in which we look at the properties of strong features.

# **3** Strength and the instant elimination problem

# **3.1 Strong features in the root**

Chomsky (1995) defines a strong feature as one that a derivation cannot "tolerate": a derivation is cancelled if H contains a strong feature and is in a category not headed by H. This formulation of the descriptive property of strength allows an adjunct to intervene between a strong head and its checker, in keeping with the observed facts. He also points out that the instant elimination requirement associated with strong features has the desirable property that cyclicity follows at once and that we also virtually derive the conclusion that a strong feature triggers a pre-Spell-Out operation to eliminate it by

checking, with the single exception of covert merger (at the root) of a lexical item that has a strong feature but no phonological features.

There is a problem with this definition of strength, however, as can be seen if we consider a derivation in which a category with a strong head remains the root until Spell-Out. Since the strong feature does not require elimination prior to Spell-Out in this case, Procrastinate determines that it cannot be eliminated prior to Spell-Out. Therefore, a category with a strong head which is the root node at Spell-Out should never have an overt specifier and its head should never be the target for overt adjunction<sup>4</sup>. These predictions are of course at odds with the facts. Suppose declarative C is merged with T after Spell-Out (as Chomsky suggests). If matrix T contains a strong D-feature, then it does not require elimination prior to Spell-Out, since it can be eliminated after Spell-Out before merger of C and T<sup>max</sup>. We therefore predict, counterfactually, that in such a language the subject (or rather FF<sub>SUBJ</sub>, the collection of its formal features) raises covertly. Similarly, if matrix T contains a strong V-feature, the verb does not need to raise prior to Spell-Out. Similar problems arise when strong <+*wh*> is present in C and C projects the root node, except that in that case the problem is to account for the presence of a *wh*-operator in SpecC and/or for adjunction of a verbal head to C (inversion).

On current assumptions about the location of strong features we cannot strengthen the elimination requirement so that a strong feature must be eliminated immediately upon entering the derivation. Keeping to the minimal assumption that Merge extends the target, this would make it impossible for an adjunct to intervene between a strong head and its checker. But if no adequate instant elimination requirement can be formulated, then it would appear that a strong feature merely requires elimination by an overt operation (i.e. prior to Spell-Out). This creates a problem with respect to uniformity, since we now face the problem of imposing this requirement without reintroducing something analogous to an S-Structure constraint. Also, if a strong feature merely requires overt elimination, then we no longer derive strict cyclicity, since the elimination of a strong feature does not need to follow immediately upon its introduction. In the following sections I take up each of these problems in turn, beginning with the problem of deriving strict cyclicity.

<sup>&</sup>lt;sup>4</sup>The same point has been made independently by Brody (1995c).

# 3.2 Strength and strict cyclicity

Let us begin by briefly reviewing how on the standard account strength manages to bar counter-cyclic movement. Counter-cyclic movement is the result of skipping a "potential" position that is later filled. A potential position is a checking position associated with a strong feature. If strong features have to be checked immediately, then such position have to be filled immediately. Hence, such a position cannot ever be skipped. The following examples illustrate the cases that belong to the standard repertoire:

- (4) a \*John<sub>1</sub> seems that it is certain  $t_1$  to win b \*To whom<sub>1</sub> do you wonder what<sub>2</sub> John gave  $t_1 t_2$ 
  - c \*who was  $[_{\alpha}$  a picture of  $t_{wh}$ ] taken  $t_{\alpha}$  by Bill

(4a) and (4b) are derivable if *John* and *to whom* move across a potential position later filled by *it* and *what* respectively. (4c) is a CED violation, but is derivable with no violation if passive follows *wh*-movement, because strong C can attract *who*. All these cases would be blocked straightforwardly, if strength required instant elimination, but we no longer have that option. As Chomsky notes, a case like (4c) could also be ruled out if we adopted a global economy condition selecting derivations with shorter moves, since *wh*-movement is "longer" in the counter-cyclic derivation than in the cyclic one.

At this point we should note that (4a) and (4b) are ruled out straightforwardly by the MLC if the counter-cyclic option is not taken. I give the MLC in (5):

(5) Minimal Link Condition

K attracts  $\alpha$  only if there is no  $\beta$ ,  $\beta$  closer to K than  $\alpha$ , such that K attracts  $\beta$ .

Consider (6), the structure of (4a) before *John* is moved to the matrix clause:

(6) seems that it is certain John to win

The MLC determines that *John* cannot raise to the matrix clause, since the strong D-feature in matrix I attracts the expletive *it*, which is closer to the target.

Comparing the counter-cyclic and cyclic versions of (4a) and (4b), one wonders whether it would not be preferable on conceptual grounds to capture both under a suitably generalized version of the MLC. This condition as it stands will not bar long-distance raising of *John* in (7):

# (7) seems that is certain John to win

The target (matrix I) can only attract *John* and is therefore allowed to do so. But suppose we modify the MLC so that a target K can only attract  $\alpha$  if there is no target L closer to  $\alpha$  which also attracts it. This essentially resurrects a suggestion made in Chomsky (1994) to extend the MLC to include the "potential specifier" of a head with a strong D-feature along with actual (filled) Spec. This revised version of the MLC is given in (8):

- (8) Minimal Link Condition (revised)
  - K attracts  $\alpha$  only if
  - (i) there is no  $\beta$ ,  $\beta$  closer to K than  $\alpha$ , such that K attracts  $\beta$  and
  - (ii) there is no L, L a target for  $\alpha$ , such that  $\alpha$  is closer to L than to K.

The MLC in (8) also excludes case (4c), as desired. The relevant structure is:

(9)  $C_{<+wh/D>}$  [<sub>IP</sub> was<sub><D></sub> taken [a picture of who] by Bill]

Neither *who* nor *a picture of who* can raise directly to strong C, since strong I is the closer target.<sup>5</sup>

We conclude that there is no need to rely on special properties associated with strength to derive cyclicity and that it might be preferable on conceptual grounds to derive it from a revised version of the MLC. If this is the correct route to take, then there is no need to insist that strong features must be eliminated instantly. All that is required is that a strong feature is eliminated by an overt operation. But how can we impose a restriction of this kind without jeopardizing uniformity?

<sup>&</sup>lt;sup>5</sup>Note incidentally that on both versions of the MLC, there is an alternative derivation from (9). Suppose *who* raises to strong I, checking its strong D-feature and its  $\phi$ -features, and then raises on to strong C. If the formal features of the residue of the complement can raise covertly to I, then the derivations for such examples as

Who was taken a picture of by Bill

How many people were seen pictures of by Bill

converge. This seems to be the right result, at least for some of my informants. In any case, movement of *who* to SpecCP followed by overt movement of the residue to SpecIP is barred, so that we correctly derive the ungrammaticality of (4c).

# 3.3 Uniformity and pied-piping

We concluded earlier that strong features trigger pied-piping, assuming the derivational economy condition in (1) holds. I repeat this condition here for convenience:

(1) HEOC

 $\alpha$  enters the numeration only if it has an effect on output.

The logic of the argument ran as follows. Pre-Spell-Out movement only occurs if it is triggered by the presence of a strong feature. If an application of Move prior to Spell-Out checks a strong feature by raising formal features only, then that operation does not have an effect on PF output. The LF output is the same no matter whether a strong feature is present or not. Therefore, the strong feature has no effect on output at all. Therefore, by (1), the strong feature cannot enter the numeration.

As mentioned earlier, Chomsky suggests that the HEOC bars the covert insertion of strong features, since in such cases the strong feature has no effect on either the LF or PF output. But it easy to see that this argument can be extended to bar the covert checking of a strong feature inserted *before* Spell-Out. By the same logic the presence of such a feature does not affect either the PF or the LF output. It therefore follows from the HEOC that strong features must be inserted and checked prior to Spell-Out. We conclude that the HEOC explains the special properties of strong features and therefore solves the associated uniformity problem.

# 4 The status of the HEOC

The aim of this paper was to show that the overt/covert distinction in the minimalist theory of Chomsky (1995) is grounded in independently motivated properties. I focused on two properties of the theory which appear to cause a problem for the assumption that derivations must be uniform, namely the obligatory nature of pied-piping with overt movement and the obligatory elimination of strong features prior to Spell-Out. I argued that both these properties can be derived from considerations of derivational economy, namely the principle that an item from the lexicon enters the numeration only if it has an effect on output (HEOC). It follows that we have found support for the overt/covert distinction to the extent that there exists independent motivation for the HEOC.

We have crucially relied on the argument that a strong feature must have an effect on PF output. To see for a particular strong feature whether it does, we must compare the derivations with and without the strong feature and see if the derived PF representations are different. Golan (1993), Reinhart (1993, 1995) and Fox (1994) suggest that such comparisons are also required for derivations which produce identical LF interpretations.<sup>6</sup> Their ideas, when considered in the context of Chomsky's (1995) theory, translate into the requirement that for convergent derivations from a numeration N to LF an item  $\alpha$  is included in N only if its presence has an effect on interpretation at LF. If something along these lines proves to be on the right track, then the HEOC has independent motivation.

Johnson and Lappin (1996) dismiss the HEOC as a viable principle on the grounds that it induces vast computational complexity when combined with the account of QR in Reinhart (1993, 1995).<sup>7</sup> It is difficult to evaluate their complexity argument, since they provide only a sketch of how they derive the complexity result from the theory of grammar. It is clear, however, that the authors are interested in establishing the complexity of the following Universal Recognition Problem:<sup>8</sup>

(10) Given an arbitrary minimalist grammar G and a sentence  $\alpha$ , is  $\alpha \in L(G)$ ?

Before we turn to Johnson and Lappin's work in more detail, let us first briefly recapitulate Reinhart's treatment of QR. She argues that QR may only apply to derive an LF with interpretation I if I cannot be derived without that application of QR. In other words, QR applies only if it changes the in-situ scope relations. Reinhart's original proposal violates a basic requirement of the minimalist program, since it allows instances of Move which are not motivated by feature checking. For this reason Chomsky (1995) reformulates her proposal somewhat. He suggests that QR involves raising of a quantificational feature [quant] to some functional head (T or v) that is a potential host. The idea is that the host has an optional affix feature allowing it to host [quant]. In such a theory the HEOC determines that an optional affix feature may only be present in the numeration if that gives rise an LF with an interpretation I which could not be derived if N did not contain the affix feature.

<sup>&</sup>lt;sup>6</sup>Where "identity" is to be taken as a narrow and readily computable relation of logical equivalence.

<sup>&</sup>lt;sup>7</sup>My discussion, like theirs, is based on Chomsky's (1995) theory.

<sup>&</sup>lt;sup>8</sup>This is my reading of their text. They do not explicitly state this recognition problem or prove its complexity.

Johnson and Lappin's argument that the combination of the HEOC and QR makes the Universal Recognition Problem in (10) very difficult hinges on their assumption that the number of derivations which a language user would have to compare in order to answer an instance of (10) is related to the number of quantifiers in the input sentence  $\alpha$  by a factorial function:

Restricting ourselves to cases in which all quantified NPs are contained in the same basic clause, the number of well-formed LFs for a clause containing k (1 < k) quantified NPs will be at least as high as the number of possible linear orderings of these NPs. Each linear ordering will correspond either to the *in situ* c-command pattern, or to a c-command configuration which results from successive adjunction of one or more NPs to T (TP) or v (VP). Even if some of these LFs are semantically equivalent, they are all the result of convergent derivations which must be considered in order to compute the set of possible reference sets associated with the specified numeration. For any set n (n > 0) elements, there are n! distinct linear orderings of this set. Therefore, for a clause containing k quantified NPs the lower cardinality bound on the set of convergent derivations for the numeration of this clause is at least k!... This result is sufficient to indicate the computational difficulties which the HEOC poses (Johnson and Lappin 1996: p. 22).

On the assumptions outlined above one would have to compare at least 5040 derivations for a sentence with 7 quantifiers such as (11a), whereas for (11b) there is just 1 convergent derivation.

- (11) a A student submitted two papers to every professor for five courses during three semesters at most universities in many cities.
  - b John submitted his paper to Mary for Logic 101 during October at Brandeis in Waltham.

The authors point out that there is no apparent reason for assuming such a radical difference in the complexity of determining the grammaticality of these two sentences, a point with which I find myself in complete agreement. But the overall argument leaves much to be desired.

First of all, determining the grammaticality of a grammatical input does not seem to require that one finds all convergent derivations from all potential numerations for the input sentence. It suffices to determine that there exists an optimal convergent derivation for the input sentence from the numeration containing 0 optional affix features. This is true because if there exists an optimal convergent derivation for a sentence wrt to some interpretation I involving QR, then there must also be an optimal convergent derivation for that sentence wrt some interpretation I' which does not involve QR. Johnson and Lappin should have based their argument on the worst case scenario, which is that the input sentence is ungrammatical. In that case, it might be argued that it is necessary to determine that all derivations from all potential numerations for the input sentence crash. If QR does indeed give rise to a combinatorial explosion of possible derivations, then serious complexity problems will certainly arise. The trouble is that there exists an errorfree heuristic which will do the job much quicker. The heuristic is based on the following observation: if there exists no optimal convergent derivation (wrt to some interpretation I) for the input sentence from the numeration containing 0 affix features, then there exists no optimal convergent derivation for the input sentence at all. Armed with this heuristic, solving an instance of the URP in (10) becomes quite straightforward. The existence of such a shortcut suggest that the underlying problem is not NP-hard and that it has additional structure not exploited by the computationally complex solution proposed by Johnson and Lappin.

Second, the argument is inconclusive if we do not specify what we mean by a "potential numeration". Johnson and Lappin tacitly assume that if a sentence contains k quantifiers, we should look at numerations containing a number of optional affix features ranging from 0 to k.

Indeed there must be some limit on the number of optional affix features that can be selected for a given sentence or the URP will not be decidable. One could simply keep on trying to find a convergent derivation by increasing the size of the numeration.

Third, it is assumed without motivation that QR can produce all possible c-command permutations for the quantifiers in a sentence. But the assumption seems incorrect. The MLC determines that multiple applications of QR within the same simple clause are ordered and yield just one LF.<sup>9</sup> This drastically reduces the number of possible derivations from O(n!) to O(n).

<sup>&</sup>lt;sup>9</sup>The argument is simple. Suppose T contains multiple affix features. At any point in the derivation only one QP can be closest to the features in the attracting head.

Let us also consider the recognition problem in (12), which is arguably more relevant to the interaction between QR and the HEOC:

(12) Given an arbitrary minimalist grammar G and a sentence  $\alpha$  with interpretation I derived from numeration N, is  $\alpha \in L(G)$ ?

Suppose we have a sentence  $\alpha$  with interpretation I, derived by a derivation D from a numeration N containing *k* instances of the optional affix feature triggering QR. This derivation is allowed by the HEOC only if I cannot be derived by a derivation D' from N', N'  $\subset$  N. In particular, if D' is based on a numeration N' containing fewer instances of the affix feature, then the HEOC rules out derivation D.<sup>10</sup> The recognition problem in (12) asks how difficult it is in the general case to determine that a derivation from N to I for a sentence  $\alpha$  is allowed by the HEOC. Suppose N contains *k* instances of the optional affix feature. These *k* instances of the affix feature will trigger exactly *k* instances of Move. As we said earlier, the MLC determines that multiple applications of QR within the same simple clause are ordered and yield just one LF. Therefore, in order to determine that *k* instances of the affix feature are required (and therefore permitted) in N in order to derive I. It follows that the number of derivations to be compared is a related to the number of affix features by a linear function, so that comparison of alternative derivations should not be very costly.<sup>11</sup>

It may be that the language user's comprehension device does not need to go to the trouble of comparing derivations at all where the interaction of covert operations (such as QR) with the HEOC are concerned. This is because the competing derivations have the following properties: (i) they are related to identical PF representations; (ii) they are related to identical interpretations. If a derivation from a numeration N can associate a

<sup>&</sup>lt;sup>10</sup>Notice that the HEOC as stated in (1) seems to require comparison of derivations from all possible alternative numerations N' of N (N'  $\subset$  N) to a given interpretation I. This is clearly not what we want since it would introduce very considerable unnecessary complexity. As Johnson and Lappin point out what is intended is that the range of alternative numerations for a reference set is limited to variation with respect to a highly restricted set of features.

<sup>&</sup>lt;sup>11</sup>It should be noted that the MLC may be too restrictive in allowing only one LF. This will be the case if the derived LF cannot be used to obtain more than one scope reading. But if multiple instances of the affix feature in a functional head allow multiple adjunction to that head, then we could resort to May's (1985) Scope Principle to give us all the relative scope relations. See Brody (1995c) for discussion of problems with the MLC.

sentence  $\alpha$  with an interpretation I, then the HEOC determines that there may be a more economical way to derive I from N', N'  $\subset$  N, but never that there is no way to derive I. If the language comprehension device can deduce off-line that the HEOC guarantees that an interpretation I it has found for a sentence  $\alpha$  is derivable irrespective of the economy considerations captured by the HEOC, then it should never have to go to the trouble of finding a most economical derivation for an interpretation I of a sentence  $\alpha$ . Of course this is not true for competing derivations which yield different PFs, since in that case a derivation has to be found which yields the correct PF for  $\alpha$ .

# References

Brody, M (1995a). Lexico-Logical Form. Cambridge: MIT Press.

- Brody, M (1995b). Projection and Phrase Structure. Ms University College London.
- Brody, M (1995c). Perfect Chains. Ms University College London. To appear in L Haegeman (ed) *Handbook of Syntax*. Kluwer.
- Chomsky, N (1994). Bare Phrase Structure. In G Webelhuth (ed) *Government and Binding Theory and the Minimalist Program*. Oxford: Blackwell.
- Chomsky, N (1995). The Minimalist Program. Cambridge: MIT Press.
- Fox, D (1994). Economy, Scope and Semantic Interpretation: Evidence from VP-Ellipsis. Ms MIT.
- Golan, V (1993). Node Crossing Economy, Superiority and D-Linking. Ms Tel Aviv University.
- Johnson, D and S Lappin (1996). A Critique of the Minimalist Program. Ms IBM TJ Watson Research Center and School of Oriental and African Studies, University of London.
- May, R (1985). Logical Form. Cambridge: MIT Press.
- Reinhart, T (1993). *Wh*-in-situ in the Framework of the Minimalist Program. Ms Tel Aviv University. Lecture at Utrecht Linguistics Colloquium.
- Reinhart, T (1995). Interface Strategies. OTS Working Papers, University of Utrecht.
- Watanabe, A (1992). Subjacency and S-Structure Movement of Wh-in-situ. Journal of East Asian Linguistics 1, 255-291.