

ANTISYMMETRY AND THE LEFTNESS CONDITION

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1. Introduction

Since Reinhart's (1984) influential study, it is commonly assumed that quantifier binding is subject to a configurational condition of c-command:

- (1) C-command condition

A pronoun P can be interpreted as bound by a Quantifier Phrase only if it is c-commanded by the variable bound by that QP.¹

This condition immediately explains the following subject/object asymmetry:

- (2) a. *Every woman* loves *her* children
b. LF: Every woman_i [_{IP} t_i [_{VP} loves her_i children]]
- (3) a. **Her* children love *every woman*
b. LF: Every woman_i [_{IP} her_i children [_{VP} love t_i]]

Larson (1988) argues that for the C-command condition to be satisfied, in multiple complement structures the first complement must asymmetrically c-command the second one:

- (4) I gave [*every worker*] [*his* paycheck]
(5) *I gave [*its* owner] [*every paycheck*]

On the other hand, Jackendoff (1990) points out that the contrast between (4) and (5) also follows from a condition stated in terms of linear precedence, which dates back to Chomsky (1976):

¹ Reinhart's original formulation requires that the QP c-command the pronoun from its S-structure position. In LF, after Quantifier Raising has taken place, this position is occupied by the variable.

(6) Leftness condition (Chomsky 1976: 342)

A variable cannot be the antecedent of a pronoun to its left.

This condition leaves completely underdetermined the c-command relation between the two complements in (4)-(5); furthermore, it subsumes the data in (2)-(3), independently of the c-command asymmetry between subject and object, which is uncontroversial.

Up to now, the two conditions seem to be equivalent. But actually they do not always make the same predictions. In the following section I shall review some well known empirical evidence which, discriminating their predictions, positively supports the Leftness condition over the C-command condition. Then, I will propose a reformulation of the Leftness condition based on Kayne's (1994) antisymmetry theory.

2. Empirical evidence

The C-command condition (1) on Q-binding makes two related predictions:

- (i) if the variable precedes the pronoun but is too deeply embedded to c-command it, Q-binding should be impossible.
- (ii) In a configuration in which a variable licenses a bound pronoun, Principle C is necessarily violated if the first position is filled by a pronoun and the second one by a coindexed referential expression (since Q-binding requires c-command, but Principle C requires anti-c-command).

On the other hand, the Leftness condition (6) predicts that Q-binding is possible in configurations of type (i), provided that the pronoun be in the scope of the QP that binds the variable in LF (Scope condition). Let us assume that QPs are assigned scope by May's (1985) rule of Quantifier Raising; the scope of the raised QP corresponds to its c-command domain in LF.²

With respect to (ii), Q-binding is not predicted to correlate with Principle C effects; in fact, Principle C is a configurational condition sensitive to c-command, but leftness does not necessarily imply c-command.

As is well known, a number of configurations falsify both the predictions of the C-command condition. These are reviewed in the following subsections.

² Note that any configuration that satisfies the C-command condition (1) will also satisfy the Scope condition: the QP necessarily c-commands the variable, which c-commands the pronoun, and by transitivity the QP also c-commands the pronoun. Thus, if one adopts (1) the Scope condition need not be assumed as an independent principle.

2.1. *Embedded QPs*

Starting from prediction (i), consider the possible Q-binding relations between two PP complements:

- (7) a. I heard [from *every mother*] [about *her* child] (Jackendoff 1990: 432)
 b. *I heard [from *her* mother] [about *every girl*]

The contrast in (7) shows a clear leftness effect. However, the C-command condition predicts that both examples should be ungrammatical: in fact, the QP is dominated by a PP node which prevents it from c-commanding the other complement, independently of the relation between the two PPs.

Of course, it is possible to assume that PP nodes do not count for c-command, and that the first complement asymmetrically c-commands the second one, so that condition (1) is satisfied in (7a), but not in (7b). But the invisibility of PP nodes constitutes an ad hoc stipulation.

A further counterexample is found in configurations of “inverse linking”:

- (8) a. [Somebody from *every city*] despises *it* (May 1985: 68)
 b. [Some tenant in *every apartment building*] has asked *its* owner to paint *the place* (Hornstein 1995: 101)
 c. LF: QP_i [NP N° [PP P° t_i]] ... *pronoun*_i ...

The QP embedded in the subject NP is extracted by Quantifier Raising and takes scope over the whole clause. But the C-command condition is violated, because the variable is dominated by (at least) a PP node and an NP node, and it fails to c-command the pronoun.³

A similar point can be made with respect to coordination structures like (9):

- (9) a. I [_{VP} took *every book*] and [_{VP} put *it* back on the shelf]
 b. LF: QP_i ... [_{VP} ...t_i ...] and [_{VP} ...*pron*_i ...]

In LF, the QP must take scope over both conjuncts by Quantifier Raising; but its variable remains embedded in the first VP conjunct and fails to c-command the pronoun in the second VP conjunct.

2.2. *Binding into adverbial clauses*

In all of the preceding configurations, it is clear that the surface position of the QP does not c-command the pronoun though preceding it. There is yet another con-

³ Hornstein (1995) proposes a different analysis, to be discussed in section 2.5.

figuration where c-command relations are controversial. This is exemplified in (10): a direct object QP binds a pronoun within a right-hand adverbial clause:

(10) I invited *nobody* [before *he* met you] (Manzini 1994)

If one adopts the traditional analysis whereby the adverbial clause is right-adjoined to VP, then (10) violates the C-command condition. Alternatively, Larson (1988; 1990: 621-624) and Stroik (1990) analyse the adverbial as the lowest complement within the VP; Hornstein (1995: 110) maintains that the adverbial is adjoined to VP, but he argues that the direct object checks its Case in Spec,AgrOP at LF and leaves a variable there. Under either approach, the direct object variable c-commands the adverbial clause and condition (1) is satisfied.

But here the second prediction crucially comes into play. As Williams (1994: 180-181) and Manzini (1994) point out, if the direct object c-commands the adverbial clause a Principle C violation should arise in sentences like (11), which are instead fully grammatical:⁴

(11) a. Mary shot *him* [before *John* could leave]
b. I told *her* [before *Mary* asked me]

In order to side-step this problem, proponents of the C-command condition may argue that in (11) the adverbial clause occupies a higher position than in (10), so that it is not c-commanded by the direct object (cf. Hornstein 1995: 110-111). But this freedom in the position of the adverbial makes the grammar less restrictive. Moreover, Brody (1994) has pointed out that in examples like (12) Q-binding and coreference are both possible; in this case the C-command condition (1) and Principle C impose contradictory requirements on the position of the adverbial clause:

(12) I sent each boy_i to her_k [in order to make Mary_k meet him_i]

The Leftness condition instead predicts the possibility of Q-binding in (10) and (12) even if the direct object does not c-command the adverbial clause; the lack of Principle C effects in (11) and (12) confirms that this principle is configurational, i.e. sensitive to c-command (Brody 1994; Manzini 1994; Williams 1994).

2.3. *Weak crossover*

The data in (7)-(12) suggest that a variable can be the antecedent of a bound pronoun to its right that it does not c-command. This configuration is schematically represented in (13):

⁴ In these configurations coreference is possible only if the R-expression is out of focus and informationally “given”. See the discussion in section 4.4.

(13) $QP_i \dots [\dots t_i \dots] \dots pro_i$

The Leftness condition correctly discriminates (13) from the configuration in (14), where the pronoun is to the left of the antecedent variable:

(14) * $QP_i \dots [\dots pro_i \dots] \dots t_i$

This is the well known weak crossover configuration; one concrete example is (3), repeated here:

- (15) a. **Her* children love *every woman*
b. LF: $Every\ woman_i [_{IP}\ her_i\ children\ [_{VP}\ love\ t_i]]$

The problem with the C-command condition (1) is that it does not discriminate (13) from (14), since in either configuration the variable does not c-command the pronoun. For Reinhart (1984), weak crossover is reduced to a violation of condition (1), and Q-binding is predicted to be impossible in (13) as in (14).

But this problem also arises for other approaches to weak crossover, like Koopman & Sportiche (1982) and Safir (1984), which require that the pronoun be locally A-bound (hence c-commanded) by the variable.⁵ In order to rule in (13), Safir assumes a mechanism of “indirect binding” whereby the phrase containing the variable inherits the index of the variable and licenses the lower pronoun.

The phenomenon of weak crossover is obviously much more complex than the representation in (14) suggests. I defer the discussion of some complicating factors to section 4, following the presentation of my proposal.

2.4. Summary

Summarizing, the reviewed evidence shows that the C-command condition (1) on Q-binding runs into the following problems:

- (i) Q-binding is possible in configurations where Principle C effects do not arise, suggesting that the first position does not c-command the second one;
- (ii) the C-command condition cannot easily discriminate the configurations in (i) from those that give rise to weak crossover.

On the other hand, the Leftness condition (combined with an independent Scope condition) correctly derives the relevant data.

⁵ If it is not, the QP locally A'-binds both the pronoun and the variable, in violation of the Bijection Principle (K&S) or of the Parallelism Constraint on Operator Binding (Safir). One exception is the PRO-gate configuration, to be discussed in section 4.6.

2.5. Hornstein (1995) on the Leftness condition

Hornstein (1995: 118-122) argues that in all of the grammatical instances of Q-binding in (7)-(12) the variable does in fact c-command the pronoun, in compliance with the C-command condition (1). This result is achieved on the basis of two crucial hypotheses: first, a specifier is adjoined and c-commands outside the maximal projection it is adjoined to (cf. Kayne 1994).⁶ Second, argumental DPs in English do not check their Case in the surface A position, but they covertly raise to the Spec of an Agr projection associated to the lexical head that they are arguments of.

Consider first Q-binding by a QP embedded in a PP, as in (7a). Hornstein argues that in LF the QP moves through the Spec of an AgrP dominating PP:

(16) $QP_i \dots [AgrP t_i [Agr+P^\circ [PP t_P t_i]]] \dots pro_i \dots$

Since Spec, AgrP is the Case position, the trace that it hosts qualifies as the variable, and it c-commands the bound pronoun.

This proposal also extends to “inverse linking” configurations like (8), repeated here, where the PP containing the QP is the modifier of a noun phrase:

(17) [Somebody from *every city*] despises *it*

Hornstein crucially assumes that this PP is right-adjoined to NP/DP:

(18) $[NP NP [AgrP Agr^\circ [PP P^\circ QP_i]]] \dots pro_i \dots$

As in (16), the QP raises to the Spec of the prepositional Agr, where it is only dominated by one segment of AgrP. Moreover, it is dominated by only one segment of NP, and since segments are invisible for the computation of c-command, it c-commands the bound pronoun lying outside NP.

Hornstein argues that his proposal correctly discriminates examples like (17) from those in (19a-b), where the PP is an argument of N° rather than a modifier, and it blocks Q-binding:

- (19) a. * [At least one picture of *every senator*] adorned *his* desk
 b. * [The AG’s investigation of *every senator*] threatened *his* career
 c. $[NP N^\circ [AgrP Agr^\circ [PP P^\circ QP_i]]] \dots pro_i \dots$

In fact, in (19c) Spec, AgrP is dominated by the whole NP projection, and the variable in that position cannot c-command outside NP.⁷

⁶ Or alternatively, functional projections are invisible for the computation of c-command. This alternative is equivalent for the purposes of the present discussion.

⁷ Hornstein points out that in configurations like (19) the QP can take sentential scope:
 (i) [At least one picture of every senator] was on the desk

Finally, in (10) the direct object QP moves through Spec,AgrOP, and leaves there a variable that c-commands the adverbial clause adjoined to VP:

(20) $QP_i \dots [_{AgrOP} t_i [_{VP} [_{VP} V^o t_i] [_{PP} \dots pro_i \dots]]$

As mentioned in section 2.2, this approach predicts a correlation of Q-binding with Principle C effects; in (11) the prediction is incorrect, but it can be avoided by assuming that the adverbial clause can be adjoined above AgrOP.

Similarly, on the basis of (18) the embedded R-expression in (21) should c-command the coindexed epithet, leading to a violation of Principle C:

(21) [Many people from *Pisa*] hate *the place*

Again, in (21) the PP may be adjoined to a lower projection than in (18), so that it does not c-command outside the NP. But note that in the same configuration the epithet can be bound by a QP embedded within PP, so that it must be and not be c-commanded by the antecedent variable at the same time:⁸

(22) [Somebody from *every midwestern city*] hates *the place*

There is also a related conceptual problem: in (17) the PP is restrictive, and it is natural to assume that it is c-commanded by the determiner. Given the by now standard hypothesis that the determiner heads its own maximal projection, the restrictive PP should be dominated by the whole DP category and fail to c-command outside it.

This remark does not apply to prenominal genitive QPs, which can be taken to be adjoined to DP (Hornstein 1995: 120; Kayne 1994: 25):

(23) [_{DP} *Everyone's* [_{DP} *mother*]] loves *him*

Note however that in languages like Italian a postnominal genitive position allows Q-binding, as shown in (24). Since this position is below the determiner and is dominated by DP, the C-command condition (1) will not be satisfied:

(24) [Il ritratto di *ogni senatore*] era sopra la *sua* scrivania

In conclusion, Hornstein's solution for apparent counterexamples to the C-command condition (1) leads to problems with Principle C. Despite this, the attempt to reduce the Leftness condition to a configurational principle is very interesting. In the next section I shall make a similar attempt, although along different lines.

Therefore, the problem does not arise from a violation of the Scope condition.

⁸ This point is clearly made by Hornstein & Weinberg (1990: 134), but it is ignored by Hornstein (1995), who apparently assumes that epithets are not subject to Principle C. Cf. also Safir (1996: 321).

3. A new perspective on the Leftness condition

3.1. Statement of the problem

Although the C-command condition (1) is often regarded as the standard hypothesis on Q-binding, various authors have argued against it on the basis of the evidence just reviewed; in reaction to Larson's (1988; 1990) view of phrase structure, some of them have revived the old Leftness condition (cf. Acquaviva 1995; Brody 1994; Jackendoff 1990; Manzini 1994; Williams 1994: 178-198, 230-254).⁹

But this recent revival of the Leftness condition has not been very successful. It is quite clear why this principle cannot be easily accepted: it is a completely non-configurational principle, and as such it seems to cast doubt on the importance that the GB tradition has always attributed to configurational relations. Furthermore, the Leftness condition cannot even be stated as a local 'surface filter' (in the sense of Chomsky & Lasnik 1977): in fact, it does not apply to the surface linear order of constituents, but it is sensitive to LF reconstruction (cf. Higginbotham 1980: 687):

(25) [Which of *his* pictures] does *every painter* like best *t*?

If one adopts the minimalist framework of Chomsky (1995: chapter 4), the Leftness condition cannot even be stated, because linear ordering takes place in the PF module only, whereas binding relations are carried out by the independent LF module, which by hypothesis only "sees" configurational relations.

Finally, the adoption of the Leftness condition on Q-binding leaves open the question of why coreference of a pronoun with an R-expression is instead sensitive to c-command, and not to linear order (cf. the grammaticality of (11), where the pronoun is to the left of the antecedent R-expression).

3.2. What is "leftness"?

A new perspective on the Leftness condition becomes possible if one adopts the antisymmetry theory of Kayne (1994). The core of this theory is summarized in the following definitions:

(26) C-command

X c-commands Y iff X and Y are categories and X excludes Y and every category that dominates X also dominates Y (Kayne 1994: 16)

⁹ Higginbotham (1983) proposes an analysis of Q-binding that does not assume the C-command condition; within his framework, Delfitto (1990) proposes an approach to weak crossover. The proposal that I will advance is related to these.

(27) Linear Correspondence Axiom

Let A be the set of ordered pairs of nodes $\langle X_i, Y_i \rangle$ in a tree such that X_i asymmetrically c -commands Y_i ;

let $d \langle X_i, Y_i \rangle$ be the set of ordered pairs of terminal symbols $\langle x_i, y_i \rangle$ such that x_i is dominated by X_i and y_i is dominated by Y_i ;

let $d(A)$ be the union of the images under d of all the ordered pairs $\langle X_i, Y_i \rangle$ in A ;

let T be the set of terminal symbols;

$d(A)$ is a linear ordering of T

(28) Mapping to linear precedence

For every pair $\langle x_i, y_i \rangle$, x_i precedes y_i in the string.

This theory imposes various restrictions on X -bar structures, which I will not summarize here. But there is one consequence that is particularly interesting in the present context: the definition of the function d in (27) and principle (28) jointly imply that in a given string a terminal symbol a precedes another terminal symbol b if in the corresponding tree some node dominating a asymmetrically c -commands some node dominating b .

Consider now the configurations of strong crossover (29) and weak crossover (30):

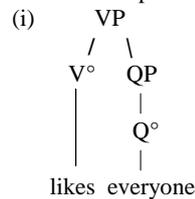
(29) **He* likes *everyone*

(30) *[Those who know *him*] like *everyone*

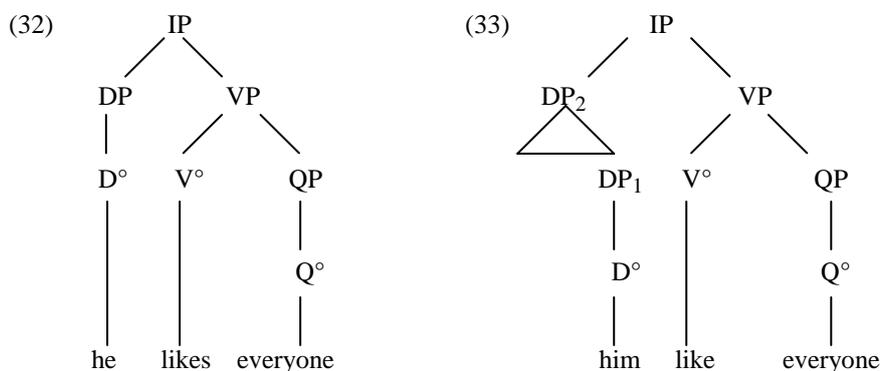
In both cases the pronoun precedes the quantifier *everyone*: hence some node dominating the pronoun asymmetrically c -commands some node dominating the quantifier.

Restricting our attention to maximal projections, the first relevant node dominating *everyone* is the maximal projection of the preterminal symbol dominating it (call it QP).¹⁰ Recall now that if a node X asymmetrically c -commands a node Y , it also

¹⁰ The nodes dominating *everyone* are the preterminal symbol Q° , the maximal projection QP, and whatever node dominates QP. By (26), the only node that asymmetrically c -commands a preterminal but not its maximal projection is a sister head, e.g. V° in (i):



asymmetrically c-commands all the nodes dominated by Y. With this in mind, the generalization about (29)-(30) can be restated as follows: since the pronoun linearly precedes the quantifier, some node dominating the pronoun asymmetrically c-commands at least the maximal projection QP of the quantifier (and possibly also other nodes dominating QP). In the strong crossover configuration (32), the c-commanding node is the maximal projection of the pronoun; in the weak crossover configuration (33), instead, the c-commanding node is a larger constituent containing the pronoun:



Up to now we have considered the c-command relations involving the QP. But by hypothesis, in LF Quantifier Raising moves the QP to a scope position that asymmetrically c-commands the pronoun, leaving a trace in the base argument position:

(34) *LF: Everyone_i he_i likes t_i

(35) *LF: Everyone_i [those who know him_i] like t_i

What is relevant, then, is the relation between the Q-bound pronoun and the base argument position of the QP. In LF, this position is filled by an empty category A'-bound by the QP, which is interpreted as a variable.

We are now in a position to reconsider the Leftness condition (6). The requirement that a bound pronoun not be to the left of the variable amounts to the following configurational constraint: neither the bound pronoun nor any category containing it can asymmetrically c-command the variable.

With respect to all the other nodes in the tree, we may disregard the preterminal symbol and take the maximal projection QP to be the first relevant node dominating *everyone*.

3.3. Denotational dependence

We have seen that the antisymmetry theory allows us to restate the Leftness condition as a configurational constraint: a variable cannot be c-commanded by a coindexed pronoun, nor by any phrase containing it. The next question is, why should this be the case?

In order to answer this question, let us consider more closely the nature of the relation that links the bound pronoun to the variable. The pronoun must co-vary with the variable: semantically, it is equivalent to another occurrence of that variable. But I assume crucially that from the syntactic viewpoint, the pronoun in itself is not a variable:¹¹ it is interpreted as such by inheriting the value of the real variable:

- (36) a. *Every woman t loves her children*
 b. $(\forall x: \text{woman}(x)) (x \text{ loves her children})$

Since the bound pronoun inherits the value of the variable under every possible assignment, let us say that it *denotationally depends* on the variable. As discussed by Higginbotham (1983: 401), this relation is intrinsically asymmetric, and it is best expressed by the syntactic relation of *linking*, which distinguishes the antecedent from the dependent element:

- (37) [Every woman] *t* loves her children
 ↑ _____|

In this approach, the pronoun is not in itself a syntactic variable at any level of representation, but it is interpreted by being linked to the variable.

Note that from this perspective the notion of denotational dependence can be generalized to the constituents containing the bound pronoun: in fact, the denotation of these constituents too depends on the value assigned to the variable. In (37), for instance, the denotation of the phrase [her children] varies according to the denotation of the bound pronoun, which in turn depends on the value of the variable. We may then say that the constituents containing the bound pronoun *indirectly depend* on the variable.

The indirect dependence of NPs containing a bound pronoun is nicely illustrated by Haik (1984: 191-192). She points out that these NPs are not possible antecedents for pronouns that lie outside the scope of the binding QP, e.g. in case of cross-sentential anaphora:

- (38) *Everyone_i likes [his_i wife]_j, and it's a pity I don't know her_j

¹¹ Cf. Delfitto (1990) for extensive discussion of this point.

A similar point about the denotational dependence of NPs containing a bound pronoun is made very clearly by Williams (1994: 244 ff.). Williams argues explicitly that in a weak crossover example like (3), repeated here, the offending dependence is not that between *her* and the QP, but rather that between *her children* and the QP:

(39) *[*Her children*] love *every woman*

However, Williams argues that this denotational dependence does not extend to categories other than NP. The reason is that if the bound pronoun is embedded in an argument clause rather than in an NP, no leftness effect arises:

(40) a. [*That he had been given no assignments*] upset *every clerk*
b. *[*His boss*] upset *every clerk* (adapted from Williams 1994: 238)

I believe that Williams is right in claiming that the subject clause in (40a) does not denotationally depend on the quantifier. But the reason, I think, is that the psychological verb *upset* induces a presupposition on the truth value of the subject clause; this is why the truth value of the clause is, loosely speaking, “independent” of the value assigned to the bound pronoun that it contains.¹²

Setting aside this case, I believe that the denotational dependence of the bound pronoun compositionally affects the denotation of the phrases that contain it (but do not contain the antecedent variable). This assumption will be crucial to my argument.

3.4. A restatement of the Leftness condition

I have arrived at an “antisymmetric” version of the Leftness condition, whereby an antecedent variable cannot be asymmetrically *c*-commanded by a linked pronoun, nor by any constituent containing it. I have argued that both the linked pronoun and the constituents containing it denotationally depend on the variable. The rationale of the Leftness condition is becoming clear: a dependent element cannot asymmetrically *c*-command the element that it depends on.

In order to make this idea more precise, let us introduce a few definitions:

(41) A pronoun linked to a variable directly depends on that variable for its denotation.

¹² But Lasnik & Stowell (1991: 689) perceive a leftness effect in the following example, featuring a factive subject:

(ii) *[*The fact that he owned a gun*] implicated *everyone*
I have no account for these contrasting judgements.

- (42) A constituent that contains a linked pronoun but not the antecedent variable¹³ indirectly depends on that variable for its denotation.¹⁴

The Leftness condition (6) can now be seen to be equivalent to the following anti-c-command condition:

- (43) Anti-c-command condition

If a constituent X asymmetrically c-commands a constituent Y, then X does not (directly or indirectly) depend on Y.

This condition is clearly reminiscent of Higginbotham's (1983) condition (25) on linking, reported here:

“(25) If X c-commands Y, then Y is not an antecedent of X”

This condition accounts for strong crossover, exemplified in (29) above, whose LF representation is (34), repeated here:

- (44) *everyone [_{IP} he [_{VP} likes *t*]]

The link connecting the pronoun to the variable violates both Higginbotham's (25) and condition (43).¹⁵

Higginbotham did not discuss any possible extension of his principle to deal with weak crossover. An extension has been attempted here through the notion of indirect dependence.

Besides condition (43), I assume that Q-binding is also subject to the Scope Condition:

- (45) Scope condition

A Q-bound pronoun must be in the scope of (i.e. c-commanded by) the binding QP in LF.

¹³ Note that the variable is linked to the raised QP; the constituents containing the variable “indirectly depend” on the QP - i.e., they constitute its scope.

¹⁴ With the possible exception of factive clauses (cf. the preceding section, and see section 4.6. on PRO gates).

Note that this generalization of the notion of referential dependence is very different from Higginbotham's (1983) definitions of antecedent and dependence (his (32) and (34)).

¹⁵ Linking the variable to the pronoun is excluded by Higginbotham's principle (26), according to which the interpretation of an expression is given in one and only one way. In (44), the variable is automatically linked to the QP by the movement rule, so that the further linking to the pronoun is impossible.

In the next section, I will discuss how the Anti-c-command condition (43), combined with the Scope condition (45), can account for the data presented in sections 1-2.

To conclude this part of the discussion, a qualification is necessary with respect to the notion of “denotational dependence” in (41)-(43). This notion is here restricted to dependencies involving a Q-bound pronoun. However, both Haik (1984: 192) and Williams (1994: 244-254) think of this as a specific case of a more general notion of dependence, which also includes existential NPs interpreted in the scope of other NPs. For Williams, this notion also includes implicit dependencies as in *every surgeon hates the hospital administrator*, where the denotation of the direct object depends on the value of the subject variable through a “non-obvious” function; and it also includes the functional interpretation of *wh-phrases* and quantifier scope interactions. Williams argues that all these types of dependence are subject to his version of the Leftness condition; I leave open the question whether they can also be accounted for under my proposed version in (43).

4. Reconsidering the empirical evidence

Let us now reconsider the data reviewed in sections 1-2 in the light of principles (43) and (45).

4.1. Asymmetries between arguments

Like the Leftness condition (6), the Anti-c-command condition (43) accounts for the subject/object asymmetry of (2)-(3), repeated here:

(46) Every woman [_{IP} *t* [_{VP} loves her children]]

(47) *Every woman [_{IP} [her children] [_{VP} love *t*]]

It is uncontroversial that in (47) the subject NP containing the linked pronoun asymmetrically c-commands the antecedent variable in the direct object position.

On the other hand, with respect to the double object construction in (4)-(5) condition (43) sides with the C-command condition (1) rather than with the Leftness condition (6) in requiring the postulation of a structural asymmetry:

(48) Every worker [_{IP} I gave *t* [*his* paycheck]]

(49) *Every paycheck [_{IP} I gave [*its* owner] *t*]

In (48), nothing requires that the first object (i.e. the variable) asymmetrically c-command the linked pronoun within the second object, because asymmetric c-command is not a necessary condition on linking (Higginbotham 1983: 402). However, the leftness effect in (49) can only be accounted for if the first object, contain-

ing the linked pronoun, asymmetrically c-commands the variable in the second object position and thus violates condition (43). Therefore, for our account to work there must be a structural asymmetry between the two objects. This is not surprising, since (43) is equivalent to the Leftness condition (6) only under the assumption of the antisymmetry theory, and the latter implies strict binary and rightward branching (cf. Kayne 1994: 69).

4.2. *Embedded QPs*

The same holds for the left-right asymmetry between PP complements in (7):

- (50) a. Every mother [I heard [from *t*] [about *her* child]]
 b. *Every girl [I heard [from *her* mother] [about *t*]]

Again, the leftness effect in (50b) follows from condition (43) only if the first PP asymmetrically c-commands the second one. However, the problem that (50a) raised with respect to the C-command condition (1) becomes irrelevant: the variable embedded within the first PP does not c-command the pronoun, but c-command is not required for linking to be possible.

Consider then “inverse linking” configurations like (8a), repeated here:

- (51) [Every city] [somebody from *t*] [_{IP} *t* despises it]

The linked pronoun is not c-commanded by the antecedent variable, but what is crucial here is that no constituent containing the pronoun c-commands the variable, so that condition (43) is respected.

In general, (43) does not impose any restriction on the level of embedding of a QP to the left of the pronoun. Any observed restriction must instead be derived from the Scope condition (45): a QP cannot be embedded in an island that blocks Quantifier Raising in LF. Consider for instance the QP embedded in a scope island in (52):

- (52) *[Your shouting at *everybody*] frightened *him*.

In this respect, the examples in (18), repeated here, are problematic:

- (53) a. [At least one picture of *every senator*] was on the desk
 b. *[At least one picture of *every senator*] adorned *his* desk

As argued by Hornstein (1995), (53a) shows that the embedded QP can take sentential scope (i.e., it can be scoped out of the containing NP); therefore, in (53b) too the Scope condition is satisfied. Condition (43) is satisfied as well, yet Q-binding is impossible. This problem remains open.

Finally, the coordination example (9) is also correctly ruled in if we assume (with Kayne 1994: 11-12) that coordination is asymmetric:

- (54) [Every book] I [_{&P} [_{VP} took *t*] [_{&P} and [_{VP} put it back on the shelf]]]

Condition (43) is satisfied only if the second conjunct, containing the linked pronoun, does not c-command the first conjunct, containing the variable (and hence the variable itself). On the other hand, the leftness effect in (55) suggests that the first conjunct asymmetrically c-commands the second one:

(55) *I [_{&P} [_{VP} took *it*] [_{&P} and [_{VP} put *every book* on the shelf]]]

4.3. Binding into adverbial clauses

In section 2.2, we observed a contradiction between the C-command condition (1) on Q-binding and Principle C with respect to the data in (10)-(11), repeated here:

(56) a. I invited *nobody* [before *he* met you]
b. LF: Nobody I invited *t* [before *he* met you]

(57) I told *her* [before *Mary* asked me]

For the time being, let us assume the standard version of Principle C (to be discussed in the next section). The possibility of coreference in (57) implies that the direct object pronoun does not c-command the adverbial clause, against what is predicted by Larson's (1988; 1990) complement analysis. In the present approach, this conclusion does not conflict with the possibility of Q-binding in (56), since c-command by the variable is not a necessary condition on linking.

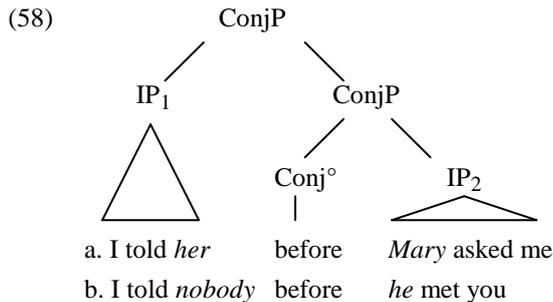
However, (56) raises the opposite problem: in order for condition (43) to be satisfied, the adverbial clause containing the pronoun must *not* c-command the direct object variable. This is inconsistent with the hypothesis that the adverbial clause is rightward adjoined to VP (or to some higher projection dominating the variable).

Note that in the present context there is an independent reason to reject the rightward adjunction analysis: it is incompatible with the antisymmetry theory. In fact, by definition (26) an adjoined phrase asymmetrically c-commands its host, and by (27)-(28) it linearly precedes its host; hence rightward adjunction does not exist (Kayne 1994: 33-36).

In conclusion, it is necessary to devise a new analysis in which the direct object does not c-command the right-hand adverbial nor vice versa. Let me sketch a tentative analysis of this type.

The fundamental idea, borrowed from Williams (1990: 278-79), is that rightward adverbial clauses are "quasi-coordinated" to the matrix clause. More precisely, I assume with Bonomi (1997) that the subordinating conjunction is a two-place connective taking two sentential arguments. Furthermore, I assume that the structure is asymmetric:

the conjunction takes the subordinate clause as an internal argument in the complement position, and the matrix clause as an external argument in Spec position.¹⁶



As required, in this structure the matrix direct object does not c-command the adverbial clause: thus Principle C is satisfied in (57). On the other hand, the matrix IP₁ as a whole asymmetrically c-commands the adverbial clause, so that the Anti-c-command condition is satisfied in (56).

Manzini (1994) points out that, although the adverbial clause is not c-commanded by the matrix direct object, it is c-commanded by the matrix subject:

(59) **She* knew me before I met *Mary*

This follows from the hypothesis that in (58) the matrix subject is in the highest Spec of IP₁ and c-commands outside it, by (26). The same point can be made with respect to coordination of two clauses:

(60) a. **[She helped me]* and *[I gave Mary a present]*
 b. *[I helped her]* and *[Mary gave me a present]*

Finally, note that in (56) the Scope condition must be satisfied as well: hence the QP embedded in IP₁ must take scope over the whole structure (58b).¹⁷

¹⁶ The proposal in (58) immediately raises the question of the status of left-hand adverbials:
 (i) Before *Mary* asked me, I told her the truth
 This suggests that the matrix clause is not generated in the Spec of the conjunction but raises there from a position below the subordinate clause. (The latter is not the direct complement of the conjunction, but it is included in a more complex structure selected by the conjunction). A proposal along these lines, compatible with the antisymmetry theory, can be found in Barbiers (1994) and Costa (1997: 59-65), according to whom the matrix clause moves into the Spec of a left-adjoined adverbial. For further elaboration of the proposal in (58), see (Bianchi, forthcoming).

4.4. Principle C effects

At this point of our discussion, it is necessary to reconsider the status of Principle C. This principle excludes the coindexing of a pronoun with a referential expression that it c-commands:

(61) Principle C

An R-expression must be A-free

This immediately accounts for the impossibility of coreference in (62):

(62) **She* respects *Zelda*

Principle C is an anti-c-command condition; therefore, we may wish to subsume it under the Anti-c-command condition (43). This is possible if we assume that in (62) the pronoun must be linked to the R-expression in order to corefer with it, as in Higginbotham (1983:402-403). Thus, the Principle C violation in (62) would be accounted for in the same way as the strong crossover in (34), repeated here:

(63) *Everyone_i he_j likes t_i

But this unification raises a problem. As is well known, in the analogue of a weak crossover configuration a pronoun can corefer with an R-expression to its right:

(64) [Those who know *her*] respect *Zelda*

In order for (64) not to be ruled out by (43), we have to assume that a pronoun dependent on an R-expression does not give rise to indirect dependence of the phrases that contain it.

A more general problem arises from the observation that Principle C constrains not only denotational dependencies, but also coreference between two R-expressions independently denoting the same individual (cf. Fiengo & May 1994: 84-91):

(65) **John* loves *John's* wife

This type of relation cannot be represented by linking, which distinguishes an antecedent and a dependent element.

A related problem emerges with epithets, as pointed out by H. Lasnik:

(66) **Alfred* thinks that *the guy* is a great cook

Even if we take the epithet to be dependent on the R-expression, the linking relation in (66) satisfies the Anti-c-command condition; yet a Principle C effect emerges.

¹⁷ I leave open the problem of the landing site of Quantifier Raising and of the apparent violation of the ATB constraint, here and in (54) above.

Thus, epithets too are subject to an anti-c-command constraint that cannot be reduced to (43).

In order to account for (65) and (66), we have to modify condition (43) so that it be sensitive not only to denotational dependence, but also to the relation between two expressions that independently refer to the same individual.

Let's say that the R-expressions in (65) and the R-expression and the epithet in (66) are *denotationally equal* in that they independently denote the same individuals. Condition (43) may then apply both to denotational dependence and equality:

- (67) Anti-c-command condition (revised)
- If X asymmetrically c-commands Y, then X cannot
 - (i) denotationally depend on Y (directly or indirectly)
 - (b) be denotationally equal to Y.

This now accounts for (65) and (66). In (63) too, the pronoun cannot either depend on, or be denotationally equal to, the R-expression that it c-commands. But we still have a problem with (64), where coreference is allowed. The hypothesis that prevails in the literature is that in (64) the pronoun does not depend on the R-expression, but it “accidentally” corefers with it.¹⁸ For instance, Williams (1994: 237) points out that in such configurations coreference is only possible if the R-expression is out of focus, namely if it is not new information; this means that there is a previous mention of the R-expression in the preceding discourse, and the pronoun depends on that previous mention rather than on the following one.¹⁹

¹⁸ Reinhart (1984) argues that in (62)-(64) binding is impossible because the pronoun is not c-commanded by its antecedent at S-structure. The exceptional status of (64) is due to the fact that it is an instance of “accidental” coreference between a pronoun and an R-expression which independently refer to the same individual. The impossibility of a similar accidental coreference in (62) is due to a pragmatic strategy: since (62) is a possible binding configuration, with one A-position c-commanding the other, if the speaker avoids the option of binding the hearer infers that he intends to convey disjoint reference (Reinhart 1983: 164-179). Thus, Reinhart rejects Principle C as a grammatical constraint and denies that (64) involves a syntactic dependence between the pronoun and the lower R-expression.

¹⁹ An alternative account, proposed by Chomsky (1976: 344) and widely assumed in the literature, is based on the assumption that a focussed R-expression is treated as a quasi-quantifier in LF, and moves to an A' position leaving a variable. The resulting configuration is one of weak crossover:

- (i) *[Those who know *her*] respect *ZELDA*
- (ii) *ZELDA* [those who know *her*] respect *t*

If we adopt this perspective, in (64) the pronoun and the R-expression are denotationally equal. Now, it is intuitively plausible that the notion of denotational equality does not generalize to the phrases containing the pronoun in the same way as denotational dependence does. The phrases containing the pronoun are not “indirectly equal” to the R-expression. Therefore, the phrase [those who know *her*] in (64) is invisible for condition (67) and no violation arises.

4.5. A further empirical consequence

Lasnik & Stowell (1991) point out that with respect to the weak crossover effect A' chains divide in two classes. On the one hand, *wh*-movement, restrictive relativization and Quantifier Raising show it (cf. (68)). On the other hand, parasitic gaps, clefts, topicalization, appositive relativization and COD constructions do not show it (cf. (69)):

- (68) a. **Who* does [*his* boss] dislike *t*?
b. *Every man *who* [*his* mother] loves *t*
c. * [*His* friends] should mistreat *no man*
- (69) a. *Who* did you stay with *t* before [*his* wife] had spoken to *e*?
b. It was *Jack* that I thought she described [*his* wife] to *e*
c. *This book*, I expect [*its* author] to buy *e*
d. John, *who* [*his* mother] loves *e*

The basic generalization that they draw is that in the first type of A' chain the “head” is a true Quantifier Phrase,²⁰ whereas in the second type of chain the A' antecedent is non-quantificational. They formalize this intuition by distinguishing two types of A'-bound empty category. In quantificational chains, the empty category qualifies as a variable; in non-quantificational chains, instead, the empty category qualifies as a *null epithet*, i.e. a null constant expression coreferential with the A' “head”. An overt epithet is exemplified in (70a); (70b) shows that the dependence between an overt epithet and its antecedent does not give rise to weak crossover:

- (70) a. [All of *Bill's* friends] love *the guy*
b. [All of *Bill's* friends] say [*his* mother] loves *the guy*

²⁰ “A true Quantifier Phrase is composed of a quantifier Q and a nominal term T defining a range R that Q quantifies over, such that R is a [nonempty and] nonsingleton set” (Lasnik & Stowell 1991: 704).

The proposed solution is then that the principle responsible for weak crossover (the Bijection principle or the PCOB) applies only to variables bound by true QPs, but not to null epithets.²¹

From the present perspective, the coreference relations in (69) and (70) can be assimilated to the one in (64): the R-expression and the null or overt epithet are denotationally equal, and condition (67) does not rule out the weak crossover configuration.²²

4.5. *PRO gates*

A well known exception to the weak crossover effect is the “PRO gate” configuration, pointed out by Higginbotham (1980: 688):

- (71) a. [PRO_i seeing his_i father] pleased every boy_i
b. LF: QP_i [PRO_i ... pro_i ...] ... t_i

I adopt the standard assumption that the pronoun here is linked to PRO. As for PRO itself, Safir (1996: 316) argues convincingly that it is not directly A'-bound by the QP, but it is controlled by the variable. This configuration is potentially problematic with respect to condition (67), since a constituent containing PRO (i.e. the infinitival clause) c-commands the variable. The simplest solution here is to assume that the relation of control is distinct from Q-binding and it does not give rise to indirect dependence. This is particularly plausible if we conceive of control as a relation between two thematic positions, indifferent to the quantificational nature of the constituents that fill those thematic positions.

5. *Summary*

To conclude, let me briefly summarize my argument.

21 Safir (1996: 320-322) argues that the empty category in (69) may be a null resumptive pronoun as well as a null epithet; this conclusion is based on a contextual definition of variables. He considers crucial a different feature: the empty category of the first type is the foot of a *derivational* chain, whereas the empty category of the second type is the foot of a *representational* chain.

On completely independent grounds, Postal (1994) argues that the empty category in A' chains of the second type is a resumptive definite pronoun, since it is excluded in a number of “antipronominal” contexts which also exclude overt definite pronouns.

22 Postal (1993) points out that even in the A' dependencies exemplified in (69) a weak crossover effect emerges if the “head” is quantificational. In this case, in fact, the empty category qualifies as a variable and the pronoun depends on it, giving rise to indirect dependence of the phrases containing it.

- I have reviewed some well known evidence which supports the Leftness condition (6) on Q-binding.
- I have argued that on the basis of the antisymmetry theory the Leftness condition can be recast as an Anti-c-command condition on denotational dependencies involving a variable: (a) a pronoun linked to a variable directly depends on it and cannot c-command it; (b) a phrase containing a linked pronoun indirectly depends on the antecedent variable and cannot c-command it.
- I have proposed that the Anti-c-command condition also applies to the relation of denotational equality, subsuming Principle C effects.
- As a result, the originally linear condition (6) is reformulated as a configurational condition; even in a framework like Chomsky's (1995: chapter 4), it can apply at the level of LF and be sensitive to reconstruction (cf. the discussion around (25)).

There are obviously many more problems to be considered: the role of resumptive pronouns is suspending the weak crossover effect (Safir 1984 and subsequent papers) and secondary (both weak and strong) crossover (Safir 1984, 1996, 1998; Postal 1993). Crossover phenomena are obviously much more complex than the present discussion reveals. However, I hope I have succeeded in suggesting a new perspective on these phenomena based on the antisymmetry theory. Whether this approach can be extended to more complex data is a question that remains open for future research.

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