This is to certify that the

thesis entitled

REVISED BARRIERS AND ECP

presented by

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has been accepted towards fulfillment
of the requirements for

Master's degree in Linguistics

Major professor

Date 8/3/90

REVISED BARRIERS AND ECP

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Linguistics
and Germanic, Slavic, Asian and African Languages

1990

ABSTRACT

REVISED BARRIERS AND ECP

By

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The goal of this paper is to compare certain variations of the definitions of government, proper government, barriers, and the ECP, and to explore the generalized definition of proper government and barriers and their application to the phenomena of the ECP related to Wh-movement and NP-movement. Chomsky's (1986) concept of barriers will be redefined to eliminate from the definition of barriers the stipulation that, by assuming that they are 'defective categories', IP and I' are excluded from barrierhood.

To avoid Lasnik/Saito's (1984) and Chomsky's (1986) inconsistent definition of the ECP, it will be redefined in terms of 'consistent proper government'. In particular, the algorithm of NP-index assignment will be introduced here to explain why relative clauses lack the that-trace effect, and will also be applied to a CNPC violation.

Dedicated to my mother, wife, and son

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A. Introduction

Chomsky (1981) introduces the GB (Government-Binding)-frame in which, as a central idea, he explores the Empty Category Principle (ECP) underlying the notion of (proper) government as a local condition, and tries to explain what we call the ResNIC phenomena with this principle. Since then, many studies have been developing the ECP; many alternative solutions have been suggested the ECP has been extended to a variety of grammatical phenomena, and the consequences have had a wide-ranged effect on the theory. The theory has been extended with Chomsky's (1986) introduction of the Barriers framework.

The goal or direction of this paper is to compare certain variations of the definitions of government, proper government, barriers, and the ECP, and to explore the generalized definition of proper government and its application to the phenomena of the ECP in GB-theory. In particular,I will take a close look at Wh-movement and NP-movement. In this section, I will describe how this paper is organized, and pose some questions about the ECP which I will hopefully answer in this paper.

To determine the distribution of empty categories and to explain and generalize the RESNIC phenomena using the notion of government, Chomsky (1981) introduces the Empty Category Principle. He defines the ECP in terms of proper government, which is a more restricted condition than the

government itself (See Chomsky 1981, p.273-275, Lasnik & Saito 1984, p.240):

(A1) ECP: $[_{NP}e]$ must be properly governed

(A2) X properly governs Y if and only if X governs Y, and i. X is a lexical governor e.g. N, A, V, and P, or

ii. X is coindexed with Y.

As we see, the ECP is defined in terms of proper government and given the two restrictions (i) and (ii) Proper government is defined in terms of government but in a more constrained way than government. Therefore, the definition of government is crucial to the definition of proper government, which will justify empty categories in a sentence. It is clearly important how we define government and restrict proper government.

In section 2 of this paper, I will reanalyze the concept of government and proper government and redefine them in a properly generalized way. In addition, I will explore Chomsky's (1986) concept of barriers which will play a keyrole in the definition of government and proper government.

In section 2.1, I will argue against Aoun/Sportiche's definition of government (Aoun and Sportiche (1983)) which has been widely accepted in GB-theory, and show why we need the concept of a barrier as introduced by Chomsky (1986).

In section 2.2 I will redefine the concept of barrierhood, which will be a very important concept for government. In defining a barrier, Chomsky (1986) excludes IP=Infl'' or S, and I'=Infl' from barrierhood by assuming that they are 'defective categories'. I will eliminate this stipulation from the definition of barrier and try to generalize barrierhood. In addition, unlike Chomsky's extensive application of barrierhood to movement[1], I will regard a barrier as a condition on government, not movement. (For movement, I will preserve Chomsky 1977's bounding nodes for Subjacency Principle.)

In section 2.3, first I will show why we need proper government to explain proper movement which leaves traces. Second, I will argue against Lasnik/Saito's and Chomsky's definitions of proper government. Based upon Aoun/Sportiche's concept of government, Lasnik/Saito (1984) defines the proper government inconsistently (Lasnik & Saito, p. 248):

(A3) X antecedent-governs Y if

a. x and y are coindexed

b. x c-commands y

c. there is no z (z = NP or S') such that x

Chomsky (1986) suggests that barriers should apply to both government and movement. See chap.4 and 6 for detail.

c-commands z and z dominates y, unless y is the head of z.

Even though the proper government is a restricted notion, or a subset of the case of, government, Lasnik/Saito define proper government in terms of lexical government, which is defined with the concept of government, and in terms of antecedent-government, which is defined using the concept of C-command not with the concept of government.

On the other hand, Chomsky (1986) introduces theta-government to the definition of proper government, but theta-government, which is defined in terms of theta-marking also shows some problems. (see P.31-32 for detail.)

To avoid the problems with these approaches, I will introduce the notion of proper C-command to proper government: whereas government is defined in terms of C-command, proper government is defined in terms of proper C-command.

In section 3 I will explore the ECP phenomena with the basic concepts of government and proper government defined in section 2. In particular, I will apply the redefined concept of proper government to Wh-movement and NP-movement.

In section 3.1, I will show what will make what we may call adjunct/obj asymmetries and subj/obj asymmetries. In this section, especially, I will redefine the ECP in terms of consistent proper government, which will be applied to

all the phenomena of the ECP. In section 3.2, I will explore why the subject behaves differently from adjuncts, referred to as argument/nonargument asymmetries. In particular, I will introduce here the algorithm of NP-index assignment to explain why relative clauses lack the that-trace effect, and will also apply it to a CNPC violation like.

(A4) * What do you believe the fact that Mary saw t?

I will suggest that the ungrammaticality of (A4) be related to the violation of CP-agreement through index assignment rather than to Subjacency. In section 3.3 I will clarify how the ECP is related to NP-movement. In section 1 I will discuss two types of movement which will be related to the difference between Wh-movement and NP-movement, and later to proper government.

1. TWO TYPES OF MOVE-ALPHA AND CHAINS

Before considering the nature of government and proper government, let us consider the types of movement which are relevant to the ECP. In this section, I will briefly discuss two types of move-alpha and their properties. First of all, I will describe how the types of move-alpha are different, and second, how and why they make NP-movement and Wh-movement different. In particular, I will describe in

more detail the properties and structure of adjunction, one of move-alpha, which is relevant to the Wh-movement and ECP.

In general, move-alpha is a rule which maps deep structure (DS) on to surface structure (SS), constrained by such principles as theta-theory, case-theory, scope, etc. In particular, theta-theory and Case theory affect this mapping, whereas scope[2] is more relevant to the mapping between SS and LF. In addition, Subjacency and the ECP constrain movement, which leaves traces. Moved elements and traces form chains and obey the binding principles at SS and the scope principle[3] at LF. Furthermore, movement applies only to a head or maximal category, since the X'-level is assumed to be invisible to movement.

Following Chomsky (1986), Lasnik & Uriagereka (1988) and others, there are, in general, two types of movement, substitution and adjunction. Substitution is category-to-category movement and obeys the structure-preserving principle, and adjunction is movement which adjoins a category to a category and doesn't obey the structure

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[2]Following Chomsky (1981), May (1985), and others, Wh-in-situ and quantifiers will undergo movement at LF to order to take scope for semantic interpretation, which is called LF-movement. In particular to determine wider or narrower scope among quantifiers and Wh-phrases, May suggests a scope principle. See footnote 3 for detail.

[3]May (1985)introduces the scope principle which will determine the scope of quantifiers and Wh-words at LF, being independent of the ECP. That is, when an LF-representation contains quantifiers, They will be interpreted in a relatively ordered way if they do not govern one another.

preserving principle. In addition, adjunction is optional. Therefore, if possible, move-alpha obeys the structure-preserving principle and carries out substitution; however, in case substitution violates some principle and adjunction is necessary to preserve it, adjunction will be triggered.

Substitution and adjunction cause a moved element and its traces to form a chain. Here we will indicate the way that they form a chain.

Let us consider the following:

(1) a. [$_S$I wonder [$_{S'}$who [$_S$Mary expects [$_{S'}$t' [$_S$Pro to see t]]]]]

b. [$_S$John seems [$_S$t'' to be expected [$_S$t' to be killed t]]]

If a chain is A-bound, then it is called an A-chain, and if it is A'-bound, then it is called an A'-chain[4].

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[4] According to Chomsky (1981 P.184-185),

I. Alpha is X-bound by betta iff alpha and betta are coindexed, betta c-commands alpha, and betta is in an X-position.

II. Alpha is a variable iff
(a) alpha = [$_{NP}$ e]
(b) alpha is in an A-position (hence bears an A-GF)
(c) there is a betta that is locally A'-binds alpha.

A-positions are phrase structure positions in which arguments may appear at D-structure, and A'-positions are phrase structure positions in which any arguments cannot appear at D-structure.

See Riemsdijk & Williams's (1986) sections 15.1, 15.2,

In (1a) "who" moves to the specifier[5] in S' through the specifier in the embedded S' by way of substitution; in (1b) "John" also moves by way of substitution. Thus, substitution forms A- or A'-chains.

On the other hand, adjunction movement forms only A'-chains, since, following Chomsky (1986), adjunction is possible only to a nonargument maximal projection. In other words, adjunction is possible only to an A'-position. Movement to the spec of S' can optionally allow adjunction movement[6] without violating the binding principles. Adjunction cannot apply to (1b), since the traces in (1b) should be according to the binding theory, and adjunction forms an A'-chain. Examples (2a) and (2b) illustrate substitution and adjunction movement, of 'who' respectively, in (1a):

(2) a. I wonder $[_{S'}$who $[_{S}t''''' [_{S}$Mary $[_{VP}t''''$
$[_{VP}$expects $[_{S'}t''' [_{S}t'' [_{S}$Pro $[_{VP}t' [_{VP}$to

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and 17.1 for detailed discussion.

[5]Chomsky (1986) suggests that there are two positions within S' (which he calls CP): a specifier and head. This results from the assumption that S' or CP and S or IP are both a headed projection. C(omp) is a head of CP or S', and I(nfl) is a head of S or IP. On this assumption, the subject NP is to be a specifier of IP, and CP also has a specifier at DS.

[6]Here, too, substitution or structure-preserving movement takes place prior to adjunction movement. As we will see in section 3.3, the unmarked trace in the Spec of the CP is substituted for by another movement rather than being adjoined to that Spec.

see t]]]]]]]]]]

b. I wonder [$_{S'}$who [$_{S}$Mary [$_{VP}$t''' [$_{VP}$expects [$_{S'}$t''

[$_{S}$Pro [$_{VP}$t' [$_{VP}$to see t]]]]]]]]

The difference between the representation of (2a) and the representation of (2b) at SS is that in (2a) "who" is adjoined to S and in (2b) it is not. Chomsky (1986) assumes that WH-phrases cannot be adjoined to S, since they have clausal scope over S. Here I will accept his assumption that only (2b) is correct.

As a representation of (1), (2b) obeys the ECP, which I will take up later[7].

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[7] This analysis raises a problem if we assume VP-adjunction as in (2.b.), then move-alpha will not violate Subjacency:

(I) I wonder [$_{S'}$who [$_{S}$Mary [$_{VP}$t''' [$_{VP}$believes [$_{NP}$the fact [$_{S'}$t'' that [$_{S}$John [$_{VP}$t' [$_{VP}$saw t]]]]]]]]]

In (I) there is only one bounding node NP between t''' and t'', and the sentence in (I) will not violate Subjacency; nevertheless, it is ungrammatical. (Chomsky (1986) suggests that a maximal projection with an oblique is a barrier to government and movement; in (I) the complement of a noun has an oblique case, and S' comes to bar the government of the trace in S', which is said to violate the ECP. He suggests that generalization of barriers for movement as well as government. However, I will propose defining barriers in a different way to avoid the stipulated statement of the barriers. See section 2.2.)

For this problem we will have three possibilities: one is to modify adjunction in a more restricted way to prevent a moved element from being adjoined to a VP; the second is to reformulate Subjacency to predict the ungrammaticality of (I); the third is to reanalyze constructions like (I). To take the first of these three choices, let us consider the following examples:

II.a * Which paper do [$_{S}$you [$_{VP}$t$_{i}$ [$_{VP}$believe [$_{S}$[$_{NP}$two sections of t] to be full of mistakes]]]]?

b Which paper do [$_{S}$you [$_{VP}$t$_{i}$ [$_{VP}$believe [$_{NP}$two sections of t]]]]?

To sum up, I will constrain the categories which allow adjunction (also see Chomsky 1986, p. 6):

(3) i. maximal projection[8]

ii. nonargument

iii. phoneticized category[9].

If we give up adjunction to VP altogether, then both (II.a) and (II.b) will violate Subjacency, since there are two bounding nodes between 'which paper' and its original trace. If we allow a trace t' of 'which paper' to be adjoined to a VP, however, (II.b) will no longer violate Subjacency for the reason that there is only one bounding node NP between t' and the original trace, and also only one bounding node S between 'which paper' and t'. On the other hand, (II.a) is still ungrammatical, since there are two bounding nodes S and NP between an adjoined trace t' and the original trace.

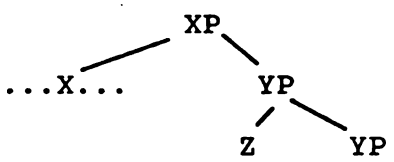
Now we encounter a dilemma: if we allow adjunction to a VP, we will wrongly predict that (I) would be grammatical, even though we explain the grammaticality of (II.b); if we do not allow adjunction to a VP, we will wrongly predict that (II.b) would be ungrammatical, although we can explain the ungrammaticality of (I). As we shall see just below and later in section 3, adjunction to a VP will have a wide explanation of grammaticality, together with government, proper government, and the ECP. In addition, this adjunction structure prevents Subjacency from incorrectly ruling out (II.b). For the serious problem of (I) I will, on the other hand, take the way of reanalysis. As we shall see in section 3, compared with a relative clause and the ECP phenomenon, (I) will seem to violate another principle rather than Subjacency. (See section 3 for detail.)

[8]As we have seen above in (2), Chomsky (1986) proposes that Wh-phrases should not be adjoined to IPs, even though IPs are maximal projections.

[9]Chomsky (1986) suggests the first two conditions on adjunction; however, (3.III.) will be necessary; that is, an empty category cannot be adjoined to. See section 3.3 for detail.

Finally, with respect to adjunction, let us consider phrase structure and the domination relation that adjunction will generate, which will have an important effect on government, proper government, and the ECP:

(4) $[_{XP} \ldots X \ldots [_{YP} Z\ [_{YP} \ldots]]]$



What category will dominate 'z' in the adjunction structure of (4)? According to May (1985) and Chomsky (1986), 'z' is dominated by 'xp', not by 'yp'. However, it also should be dominated by 'yp', in order to count as a constituent of 'yp'. To see this point, consider the following examples:

(5) a. Some student admires every professor, but John doesn't.

b. $[_s$ some student$_2$ $[_s$ e_2 $[_{vp}$ every professor$_3$ $[_{vp}$ admires $e_3]]]]$, but John doesn't $[_{vp}$ every professor$_3[_{vp}$ admire $e_3]]$

c. * $[_s$ every professor$_3$ $[_s$ some student$_2$ $[_s$ e_2 $[_{vp}$ admires $e_3]]]]$, but John doesn't $[_{vp}$ admire $e_3]$

Arguing that VP, and S, are among the positions to which quantified phrases can be adjoined at LF in the context of VP-deletion, Sag (1976), Williams (1977) and May (1985) state that sentences like "Some student admires every professor" are themselves ambiguous, but in a VP-deletion context, as in (5a), the ambiguous interpretation is impossible, and only a specific construal is available. The reason for this, in Williams's approach, is that such a construction is well-formed only when a VP that contains the every-phrase as in (5b) is reconstructed, classify considering deletion, and recoverability at LF. The problem with (5c) is that the second conjunct contains a free variable, since the scope of every professor is limited to the initial conjunct. No such problem arises in (5b), however, since the VP-adjoined phrase is reconstructed along with the rest of VP, all variables occurring in this conjunct are properly bound.

As this example shows, the quantifier adjoined to the VP works as a constituent of the VP, even though it goes through LF-movement and attaches itself to the VP. If the quantifier is dominated only by S, as defined by May (1985) and Chomsky (1986), it cannot be a constituent of the VP. Therefore, it should be dominated by the VP in a sense, too.

Here I will give the technical definition of domination which will be used in the definitions of government and proper government.

(6) i. X maximally dominates Y iff all segments[10] of X dominate Y.

ii. X minimally dominates Y iff any segment of X dominates Y.

In (5) 'xp' and 'YP' both dominate or minimally dominate 'Z'; however, 'XP' maximally dominates 'z', and 'yp' does not. In the following sections I will show the relationship between adjunction, government, proper government, and the ECP.

2. The Nature of Government, Proper Government, and Barriers

2.1 The definition and Configuration of Government

In this subsection, I will first compare two important theories of government: those of Aoun/Sportiche (1983) and Chomsky (1986). To compare these two theories properly, I will discuss the concept of a barrier which is implicit in Aoun/Sportiche's theory of government, but explicit Chomsky (1986), who uses different definition. Furthermore, I

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[10] The concept of a segment is issued for adjunction structures. Adjunction to a maximal category generates the same node itself. In other words, it is separated as two segments.

will show the reason that we need Chomsky's barriers rather than Aoun/Sportiche's. This will be an introduction to the concept of barrier for subsections 2.2 and 2.3, and section 3..

Aoun and Sportiche (1983) suggest the following definition of government as a conclusion of their comparison of previous definitions (e.g. Chomsky 1979, Chomsky 1980, Freidin and Lasnik 1979, Rouveret and Vergnaud 1980) (Aoun and Sportiche 1983, example (8)):

(7) X governs Y iff all maximal projections which dominate X also dominate Y, and all maximal projections which dominate Y also dominate X.

This definition implies that the governor governs the governee only within the maximal projections which dominate both of them, and that a governor does not govern any categories across a maximal projection. It means that the maximal projection is an "absolute" barrier to government. Hence if we rewrite (7) in terms of barriers, we get the following:

(8) i. X governs Y iff all maximal projections which dominate X also dominate Y, and there is no barrier for Y.

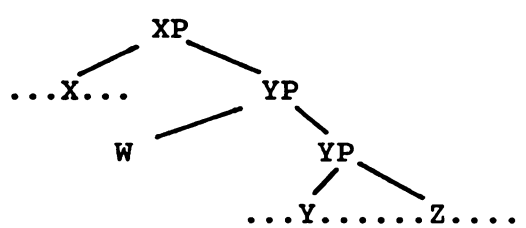
ii. All maximal projections are barriers to

government.

The definition of government here was very widely accepted in GB-theory. However, some modifications of (8) are necessary, since X'-theory has been further developed in some aspects.

First of all, (8) should be modified to account for government in a configuration which includes an adjunction such as in (9):

(9) $[_{xp} \ldots x \ldots [_{yp} W\ [_{yp} \ldots y\ .. z ..]]]$



If we assume that yp is a maximal projection or barrier in (9), and following (8) above, x cannot govern w, y or z, and w also cannot govern y and z. As I will show later, however, in an adjunction structure like (9), x must be able to govern w, but not y and z, and w must be able to govern x, too[11]. In addition, w must be able to govern z, which is dominated by yp.

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[11]May (1985) shows that in a structure of adjunction like (9), X and W should govern each other to permit the correct scope relations at LF. See chapter 3. by May (1985).

To solve these problems, let us redefine (8) in terms of domination, which was defined in (6):

(10) i. X governs Y iff all maximal projections which maximally dominate X also maximally dominate Y, and there is no barrier for Y;
ii. All maximal projections are barriers.

Here in adjunction structure (9), yp is divided into two parts or segments, and since only one segment of yp dominates w, yp does not maximally dominate w. Therefore, w is maximally dominated only by xp but not yp. Hence x can govern w according to the definition in (10). However, the problem still remains, because w cannot govern z if w is not maximally dominated by yp which maximally dominates z, since yp is a maximal projection to blocks government.

For this problem, we should find a way of allowing the adjoined maximal category to govern a category which is dominated by the adjoined category. For this I will define another concept "exclusion" for government, which is introduced by Chomsky 1986, (p. 9):

(11) X excludes Y iff X does not dominate Y at all.

Now we can define government again as follows:

(12) X governs Y iff All maximal projections which maximally dominate X also maximally dominate Y, and there is no barrier for Y which excludes X.

Now, in an adjunction structure such as (9), w governs z, since w and z are both maximally dominated by a maximal projection xp and the maximal projection yp does not exclude X, and hence yp does not block government of z by w.

Even though we could modify the definition of government in (8) we would still have problems with the category S. Let us consider the following:

(13) John believed [$_s$him to love Mary].

In (13) "him" receives Case from "believed". In order to do so the verb "believed" should govern "him". To allow the verb to govern "him", 'S' should not be a maximal projection, as Chomsky (1981) proposes. That is, S' is the maximal projection of S, and S is not a maximal projection. Then, as defined in (8), "believed" can govern "him" and assign Case to it.

However, Stowell (1981) and Pesetsky (1982) argue that S is a projection of Infl. Chomsky (1986) proposes that S is a maximal projection of Infl and that S' is a maximal projection of Comp. Therefore, there are two possible

configurations for (13):

(14) A. $[_{IP}$Comp $[_{I'}$NP Infl $[_{VP}$ ...]]]

a'. John believes $[_{I'}$him $[_{I}$to] $[_{VP}$love Mary]] ->
IP-deletion

B. $[_{CP}$Comp $[_{IP}$NP $[_{I'}$Infl $[_{VP}$ ...]]]]

b'. John believes $[_{IP}$him $[_{I'}$to love Mary]] ->
CP-deletion

If we assume that the structure of (13) is (14a), then the definition in (8) can work, since the verb "believed" governs "him" across I' after IP-deletion. However, it does not work for (14b), since the verb cannot govern "him" across the maximal projection IP, even though the CP is deleted.

Before choosing one structure of the two in (14), let us consider an example adapted from Kayne (1985):

(15) a. * I consider $[_{S}[_{S}$Mikie being unhappy] to be unpleasant]

b. I consider $[_{S}[_{S}$Pro being unhappy] to be unpleasant]

If S is not a maximal projection, then "consider" governs "Mikie", and (4a) should be grammatical; "consider" could also govern PRO and render the sentence ungrammatical,

since PRO cannot be governed, as Chomsky (1981 and 1982) argues. Hence we will accept the argument that S is the maximal projection of Infl and that S' is the maximal projection of Comp. Even so if, S is a maximal projection, IP as termed by Chomsky (1986), it cannot be a barrier, even though it is a maximal projection.

To solve this problem, Chomsky (1986) proposes that a barrier be determined not absolutely but contextually. Hence, the same category is said to be sometimes a barrier and sometimes not a barrier. Chomsky (1986) defines government in terms of a barrier which is defined relatively. Chomsky's definition of government is actually of the same form as in (12) which includes adjunction structures by modifying (8). The only difference from (12) is that "barrier" is defined relatively (Chomsky 1986, p. 14):

(16) X is a barrier for Y iff

i. X is the first maximal projection that maximally dominates a BC for Y.

ii. X=BC or blocking category for Y except for IP

or

(17) X is a BC for Y iff

i. X maximally dominates Y and

ii. X is a maximal projection that is not L-marked.

(18) X L-marks Y iff (Chomsky 1986, p. 24 (47))

i. X is a lexical head (i.e. N, V, A, P,) and

ii. (a) Y is a maximal projection that X theta-marks, or

(b) Y is a head of a maximal projection that X theta-marks, or

(c) Y is a SPEC of a maximal projection that X theta-marks if X=IP or CP (=SPEC-Head Agreement).

(19) X theta-marks Y iff X and Y are sisters in X'-theory. (Chomsky 1986, p. 14)

Returning to (13), the maximal projection IP is no longer a barrier for "him", since the verb L-marks IP, and the verb "believed" governs it and assigns Case to it. In (15) the lower IP is a barrier, since it is not L-marked at all and is a BC and barrier, following (16) through (18). Hence the verb cannot govern "Mikie" and cannot assign Case to it, either.

Now we can include both (13) and (15) by defining barrier in a relative way, which differs from Aoun and Sportiche, who consider a maximal projection as an absolute barrier to government.

In sum, even though the definition of barrier in (16) stipulates IP and I' and is not generalized properly, it seems to be desirable that a barrier be defined in a relative way, since Comp and Infl are categorial heads, and

consequently, CP and IP are maximal projections. In the next section, we look into the characteristics and problems of the definition of barrier in (16), and redefine it properly.

2.2 Barriers

Here, I will indicate problems with Chomsky's definition of barrier, redefine barrierhood, and show the adequacy in of this new definition application to the ECP[12].

As discussed so far, there are two ways to define barriers to make government a local condition. One is to define a barrier as absolute, implicitly proposed by Aoun and Sportiche (1983), and the other is to define a barrier as relative, proposed by Chomsky (1986). As we have seen, Aoun and Sportiche's approach encounters a problem with exceptional Case assignment etc. by proposing that maximal projections are absolute barriers to government. In addition, it has a great effect on ECP phenomena. For example, consider the following:

(20) $[_{CP}$who $[_{IP}$t saw Mary]]?

As we will see later in detail, here the trace of 'who'

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[12]Chomsky (1986) extends the notion of barrier to movement by generalizing the barrier to apply to bounding nodes for movement. However, I will apply the definition of barrier given here to government only.

which is posited in the subject position does not have a lexical governor which properly governs it; hence it needs to be antecedent-governed to avoid violating the ECP. However, since IP is a maximal projection and blocks government, 'who' cannot antecedent-govern its trace. Nevertheless, (20) is still grammatical.

As seen in (16) through (18), Chomsky (1986) defines a blocking category in terms of L-marking first, and in turn defines a barrier in terms of blocking categories (with one exception for IP). However, ultimately he does not solve the basic problem with IP. When he defines a barrier, IP is a defective category as a barrier and considered exceptional. For example, in (20) IP is not L-marked and so should have been a barrier. But if IP were a barrier, then the trace in the subject also could not be properly governed, and the result would be the same as Aoun and Sportiche predict, as seen above. Therefore, Chomsky (1986) treats IP as a defective category with respect to barrierhood.

In addition, Chomsky (1986) adds the following minimality condition[13] in order to include the X'-level as a barrier (Chomsky 1986, p. 42):

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[13] According to Chomsky (1986 P.43), minimality condition prevents 'saw' from governing 'tom', since N' is a barrier by virtue of minimality condition:

I. They saw [$_{NP}$Bill's [$_{N'}$picture of Tom]]

(21) X' is a barrier for a category Y if the head X governs (or head-governs) Y.

In (22), I' is a barrier to government under the minimality condition, and (22) should be ungrammatical. However, (22) is grammatical.

(22) $[_{CP}$Why do $[_{IP}$you $[_{I'}$infl $[_{VP}$leave t]]]]

That is, I' is a barrier and this blocks government, 'why' cannot govern its trace, and the example (22) should be ungrammatical.

If Chomsky 1986 (p. 48) regards IP and I' as exceptional or 'defective', his proposal would be very weak and, besides, there is almost no difference between Aoun/Sportiche's and Chomsky's. As we have seen so far, the big problem is related to IP, which is regarded as a maximal projection. That is, IP is problematic under the absolute concept of a barrier; however, it still poses problem for the relative concept of barrier which Chomsky 1986 defines for government. In addition, another concept of a barrier which he calls the 'minimality condition' also excludes I' from being a barrier by regarding it as a defective category.

Here I will propose another definition of barrier in order to eliminate this ad hoc exception.

Before defining a barrier directly, I will reconsider the concept of 'L-marking', in terms of which I will define a barrier. Chomsky 1986 defines 'L-mark' as in (18), regarding 'L-mark' as lexical marking. However, I will define 'L-mark' as indicating lexically inserted items at DS. Hence we can include the complementizer 'that', 'for', etc. as an L-marking category. However, Infl is a bunch of features, not a lexical item, hence it is excluded as an L-marking category.

Furthermore, let us assume that L-marking assigns [+l] to a category which is L-marked, and assigns [-l] to a category which is not L-marked. In addition, let us assume that a head has the same features as its maximal projection through percolation. Then, L-marking can be defined as follows:

(23) X L-marks Y iff
  i. X is a lexically inserted head (N, V, A, P, or Complementizer), and
  ii. a projection of X immediately maximally dominates Y.

Now we can define a barrier in terms of L-marking.

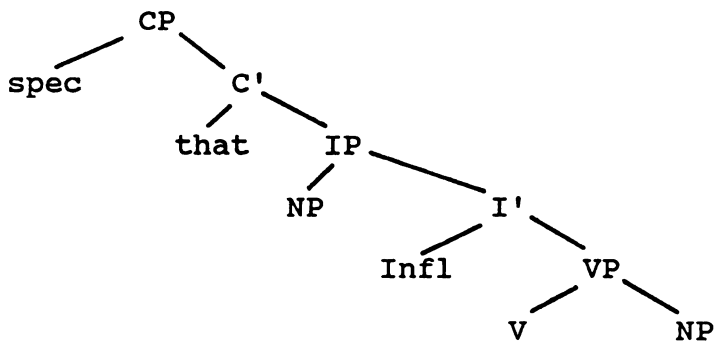
(24) X is a barrier for Y iff
  i. X immediately dominates Y, and Y has [+l], or

ii. X is a maximal projection and dominates Y, and Y has [-l], or

iii. X is a maximal projection of a lexically inserted head Z and Z has [-l], and X dominates Y, and Z.

Let us look at how these three parts will work for the following configuration: (I will discuss how the barriers defined here will work in section 3. in detail.)

(25) $[_{CP}$Spec $[_{C'}$that $[_{IP}$NP $[_{I'}$Infl $[_{VP}$V NP]]]]]



First of all, VP is a barrier for NP` by(I), since V L-marks NP' and VP immediately dominates it. The condition (I.) in (24) has the same effect as the minimality condition Chomsky 1986 defines. Second, IP is a barrier for VP: I cannot l-mark VP, since AGR of I is a bunch of features, not a lexically inserted head. Hence, VP with [-l] is dominated by IP, which is thus a barrier for VP by (II). Third, C' is a barrier for IP, since 'that' L-marks IP and

IP obtains [+l], and C' immediately dominates IP. If C is empty, then CP is a barrier instead of C', since an empty C cannot l-mark IP and IP is assigned [-l], and CP dominates IP as a maximal projection.

As we see, we have treated IP and I' properly as inheritant, not inherent barriers by extending and redefining L-marking. In the next section I will show how the concept of barrier defined here will also work for the ECP.

2.3 Proper Government

Chomsky 1981 and 1982 introduces a stronger condition than government, called proper government, in order to constrain the distribution of traces. In this subsection, I will first show why we need such a more constrained condition on government for traces, and, especially, I will focus on why and how we define antecedent-government since it is an inconsistent and debatable component of proper government. Second, I will argue against previous definitions of proper government, and redefine it properly before discussion of the ECP in section 3.

Let us consider the empty categories in the following:

(26) a. * $[_{CP}$who$_i$ is it probable $[_{CP}[_{IP}e_i$ to go to the party every day]]]?

b. * $[_{IP}$Tom$_i$ is probable $[_{CP}[_{IP}e_i$ to go to the

party every day]]].

c. [$_{IP}$it$_i$ is probable [$_{CP}$[$_{IP}$e$_j$ to go to the party every day]]].

(27) a. [$_{CP}$who$_i$ does Tom believe [$_{IP}$e$_i$ to go to the party every day]]?

b. [$_{IP}$Tom$_i$ is believed [$_{IP}$e$_i$ to go to the party every day]].

c. * [$_{IP}$Tom$_i$ believes [$_{IP}$e$_j$ to go to the party every day]].

In (26) the empty categories cannot be indexically related to 'who' or 'Tom', (or cannot have coreferential interpretations with them), whereas the empty categories in (27) have such semantic interpretations. In other words, movement is not possible in (26), and conversely, it must occur as in (27), except for (27c). Chomsky 1981 and 1982 observes that empty categories occur in complementary distribution and distinguishes between them by describing their contextual environments, defined in terms of government.

For example, Chomsky 1982 (p. 34-36):

(28) trace condition: traces must be governed.

(29) Pro condition: PRO may not be governed.

The empty category (e.g. EC) in (26) is not governed by

'likely', since CP blocks government; in (27) it is governed by 'believe' by virtue of CP-deletion (or S'-deletion[14]). Hence, the EC in (26) is a PRO, and the EC in (27) is a trace. However the trace condition is too weak to explain such examples as:

(30) * $[_{CP}\text{who}_i$ do you think $[_{CP}$that $[_{IP}e_i$ saw Mary]]]?

Here the trace of 'who' is governed by Infl, and satisfies the trace condition in (28); nevertheless, (30) is ungrammatical. Therefore, according to Chomsky 1981, a stricter condition is necessary in order for the trace condition to rule out sentences such as (30):

(31) a nonpronominal empty category (e.g. a trace) must be properly governed.

(32) a. X properly governs Y iff X lexically governs Y.

b. X lexically governs Y iff X governs Y, and X=a lexical head (e.g. N, V, A, and P).

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[14] Bar-reduction such as s'-deletion seems to be determined by the property of a particular lexical entry in the lexicon. In (26), bar-reduction does not occur for 'probable'; however, it is possible for 'believe' in (27).

I. John is likely $[_{IP}$t to win].

II. * It is likely $[_{IP}$Pro to win].

III. It is probable $[_{CP}$Pro to win].

IV. * John is probable $[_{CP}$t to win].

'likely' and 'probable' have different lexical properties with respect to bar-reduction. That is, a bar-reduction is determined in lexicon.

(30) can now be ruled out by defining proper government in terms of a more restricted nation of government called lexical government, since the trace of 'who' is governed but not lexically governed because Infl is not a lexical head. However, this move gives the wrong result for the following case:

(33) $[_{CP}Who_i$ do you think $[_{CP}[_{IP}e_i$ saw Mary]]]?

According to (32), (33) should be ungrammatical, since the trace of 'who' is not lexically governed: the verb 'think' cannot govern the trace, because CP is a maximal projection which blocks government. However, (33) is completely grammatical. Therefore, condition (32) is too strong. To solve this problem, Chomsky (1981) needs to redefine proper government. Let us assume that there is some relationship which we will call antecedent-government between the Wh-word and the trace in a relevant sense to which we will return later.

(34) X properly governs Y iff
  i. x lexically governs Y, or
  ii. X antecedent-governs Y.

(35) X antecedent-governs Y iff X is coindexed with Y in a relevant sense.

Now, (33) can be represented as follows:

(36) $[_{CP}\text{who}_i$ do $[_{IP}$you think $[_{CP}t_i$ $[_{IP}t_i$ Infl saw Mary]]]]?

The original trace is antecedent-governed by the intermediate trace in Comp; the intermediate trace is also antecedent-governed (or might be lexically governed) in a sense. Then, we can predict the grammaticality of (36).

Note that proper government is defined disjunctively in terms of lexical government and antecedent-government. Hence, at least one of the two conditions (lexical government and antecedent-government) should be satisfied, in order not to violate the ECP.

Since Chomsky 1981 introduced the Empty Category Principle in GB-theory, many studies have attempted to construct the proper formulation of the ECP and to extend the scope of the ECP. The original definition of the ECP is as follows (see Chomsky 1981, p. 273-275, Lasnik and Saito 1984, p. 240):

(37) Empty Category Principle: A nonpronominal empty category must be properly governed.

(38) X properly governs Y iff:

i. X lexically governs Y, or

ii. X antecedent-governs Y.

(39) X lexically governs Y iff X governs Y, and X is a lexical item (N, V, A, and P).

(40) X antecedent-governs Y iff X is coindexed with Y, and X and Y have some relevant relation.

Here let us take a close look at the configuration of antecedent-government which is expressed as 'some relevant relation' in (40).

Lasnik and Saito 1984 (p. 240 and p. 248) define proper government as follows:

(41) X properly governs y iff
i. x lexically governs y, and
ii. x antecedent-governs y.

Lasnik and Saito 1984 define lexical government in the same way as defined in (39), according to the notion of government defined in (8). However, they propose that antecedent-government consists in the coindexing and C-commanding relations, independent of the concept of the government (Lasnik and Saito 1984, p. 248):

(42) X antecedent-governs Y iff X is coindexed with Y, and X C-commands Y, and there are no barriers CP and NP such that X C-commands the barrier, and the

barrier dominates Y, unless y is the head of the barriers.[15]

In addition, they assume that all maximal projections are barriers to government, and that among them only CP and NP are barriers to antecedent-government. By avoiding the generalization of lexical government and antecedent-government, they fail to define proper government as a more restricted subset of government.

On the other hand, Chomsky 1986 (pp. 17, 19) defines proper government in a different way from Lasnik and Saito (1984), as follows:

(43) x properly governs y iff
  i. x theta-governs y, or
  ii. x antecedent-governs y.

(44) X theta-governs Y iff X governs Y, and X theta-marks Y.

(45) X antecedent-governs Y iff X governs Y, and X is coindexed with Y.

Chomsky 1986 defines antecedent-government in terms of

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[15]Here Lasnik and Saito (1984) follows Aoun/Sportiche's concept of government; hence they implicitly use a concept of an absolute barrier which is a maximal projection. Among all maximal projections, especially, CP and IP are implicitly regarded as an absolute barrier for the antecedent-government.

government, not in terms of C-command, and so defines proper government in a more consistent way than Lasnik/Saito (1984) do. However, he proposes that proper government be defined in terms of theta-government instead of lexical government; theta-government is in turn defined in terms of theta-marking, as in (19). At this time, however, Theta-government for proper government seems to result in some problems. According to Chomsky (1986), VPs can be theta-marked by Infl, and theta-governed (Chomsky 1986, p.20, example (36)):

(46) $[_{IP}[_{VP}$fix the car$]_I$, $[_{IP}$wonder $[_{CP}$whether $[_{IP}$he $[_{I'}$will $t_I]]]]]$

Here the VP 'fix the car' is adjoined to IP through movement, and leaves a trace behind. Then, the trace should obey the ECP and be properly governed. Since it cannot be antecedent-governed because of the Wh-island, it should be theta-governed; here Infl can theta-govern the trace of VP, for it is a sister of a VP, and theta-marks it. If VP is theta-governed by an Infl, it would be correct, considering (46); however, it is strange for an Infl to theta-mark a VP, because it then assigns a theta-role to the VP, and a VP can therefore be an argument.

Furthermore, this analysis results in a problem with VP-adjunction. Following Chomsky (1986), as in (3),

adjunction movement is possible only through a nonargument. However, VP-adjunction is obligatory in Chomsky's analysis in order to allow antecedent-government, even though the VP is theta-marked and is therefore an argument.

In addition, Chomsky (1986) defines the theta-marker as a head category in X'-theory. Therefore, we could also assume that C also theta-governs IP because it is a sister of IP. If this is correct, the following should be grammatical:

(47) * $[_{IP}[_{IP}$he saw Mary$]_i$ $[_{IP}$John wonder $[_{CP}$whether $t_i]]]$

Now let us redefine proper government to avoid these problems and generalize lexical and antecedent-government. But before redefining proper government, let us consider the concept of C-command, in which terms I will define proper government. Differing from Reinhart (1983), Aoun and Sportiche (1983) and May (1985) base the definition of C-command on the notion of a maximal projection (Aoun & Sportiche 1983, example (42):

(48) X C-commands Y iff all maximal projections which maximally dominate X also maximally dominate Y, and X itself does not dominate Y.

This concept is the same as M-command, which is used by Chomsky (1986 P.9) when he defines government. Here I will accept this definition of C-command and redefine government in these terms:

(49) X governs Y iff
  i. X is a head or a maximal projection, and
  ii. X C-commands Y, and there is no barrier for Y that excludes X.

Actually, this definition has the same effect as in (12). If we assume that proper government is a more restricted subset of government, then we can define proper government in terms of proper C-command, which likewise is a restricted case of C-command.

(50) X properly C-commands Y iff a projection which immediately minimally dominates X also dominates Y, and x itself does not dominate y.

(51) X properly governs Y iff
  i. X properly head-governs Y, or,
  ii. X properly antecedent-governs Y.

(52) X properly head-governs Y iff

i. X is a lexical head [16] or a coindexed head with Y, and

ii. X properly C-commands Y, and there is no barrier for y that excludes x.

(53) X properly antecedent-governs Y iff

i. X is coindexed with Y, and

ii. X properly C-commands Y, and there is no barrier for y that excludes x.

Here we will be able to have all lexical heads as proper governors as well as Infl, assuming that Infl has an index in agreement with the NP in subject position, and indexed categories (e.g. heads or maximal projections) for antecedent-government. We will exclude C as a proper governor (at least at SS), however; because C is assumed to have no index[17]. In addition, proper C-command will work for the ECP in the same way as Chomsky's theta-government.

In the following sections, I will show how this concept

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[16] A 'lexical head' here will be assumed to be a head which bears the characteristics of feature assignment. On this assumption, a noun, a verb and a preposition are 'lexical'; a noun assigns its index to its complement, and verbs and prepositions assign their cases to their complements. However, adjectives like 'likely' are not lexical, since they have no characteristics of feature assignment in English. With this concept of a 'lexical' head we consider Infl to be a lexical head, too, since it has an index. See section 3.2 for index assignment.

[17] the complementizer can be a proper governor at LF, since it can obtain an index by virtue of CP-agreement at LF. See section 3. for details.

will work for the ECP and other linguistic phenomena.

3. The EMPTY CATEGORY PRINCIPLE

We have assumed the existence of the empty categories pro, PRO, empty operators, and traces in the theory of grammar. PRO, and empty operators are, in general, generated in D-Structure, and have the pronominal feature. However, traces are generated in S-Structure and have the anaphoric feature. In addition, traces occur where they are governable, unlike other empty categories. For this reason Lasnik and Saito (1984, p. 240) defined the Empty Category Principle as follows:

(54) The nonpronominal empty categories (e.g. traces) must be properly governed.

I will initially assume that this definition is correct and apply it in conjunction with the notions of the government[18] proper government and barriers ,which we have defined before. Furthermore, I will show how adjunction and substitution will be incorporated into the ECP. In addition to these definitions, for the ECP I will accept Lasnik/Saito's 1984 (p. 257) gamma-feature assignment and

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[18] I will later argue against (54), and substitute consistent proper government for it.

Chomsky's 1986 (p. 24-26) CP-Spec-head agreement. (See section 3.1 for details.) Following Lasnik and Saito (1984), traces must be assigned +Gamma when they are properly governed, and this gamma-feature which is assigned to a trace is maintained at all levels of the grammar. Furthermore, Gamma-marking occurs at different levels for the traces of arguments and those of nonarguments: that is, the trace of an argument must be g-marked at SS, and the trace of a non argument must be g-marked at LF.

Lasnik and Saito 1984 assume the following filters at LF:

(55) * t if it has [-g]

Then, the ECP predicts the grammaticality of a sentence by checking whether traces are assigned [+g] or [-g]. Using such assumptions I will start to explore the ECP phenomena.

3.1 Subject, Object and Adjunct asymmetries

In this subsection, I will show how and why Wh-traces show different properties according to their positions in a sentence. First of all, I will explain the difference between Wh-traces of adjuncts and objects, and further make clear the difference between Wh-traces of subjects and objects. For subj/obj asymmetries, I will argue against the ECP as defined in (54), and redefine in terms of consistent

proper government. In particular, I will show how CP-agreement will work to explain weak and strong violations, rejecting Lasnik/Saito (1984)'s rule of Affect-alpha.

Huang (1982) and Lasnik and Saito (1984) using the ECP, try to extensively explain the asymmetries which objects and adjuncts show.

First of all, let us consider the different ways in which adjuncts and objects will undergo movement, which will show the properties which are relevant to proper government. Consider two representations of the following example:

(56) a. $[_{CP}$who did $[_{IP}$you $[_{VP}$see t]]]

b. $[_{CP}$who did $[_{IP}$you $[_{VP}$t'$[_{VP}$see t]]]]

In (56a) the trace t is properly head-governed by the verb "see", and obeys the ECP. Here two movements are possible[19]. However, in (56b), trace adjoined to VP is redundant, since the representation does not violate any principle without the adjoined trace. However, let us now consider adjunct movement, as in (57):

(57) a. $[_{CP}$why did $[_{IP}$you $[_{VP}$see John]]]

b. $[_{CP}$why did $[_{IP}$you $[_{VP}$t' $[_{VP}$see John t]]]]

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[19]Later in a revised structure representation of the Wh-movement of objects I will eliminate (56.b) for the adjunction of the Wh-movement of objects, which will violate the ECP.

Here the adjunct "why" cannot be properly governed by any lexical or indexed head, since the verb 'see' does not properly C-command "why": the structure of (57) at DS is represented as follows:

(58) ... $[_{VP}[_{V'}$see john] why]

Therefore, the original trace of 'why' in (57) should be properly antecedent-governed; for this, 'why' should undergo adjunction to the VP. Unless there is a trace t' adjoined to VP as in (57b), the trace t cannot be properly antecedent-governed nor be assigned [+g], since IP dominates the VP with [-l], and is a barrier for VP. Therefore, "why" properly governs the elements within IP, but not within VP.

If there is an adjoined trace t', it can properly C-command VP and also antecedent-govern and [+g]-mark the trace t. Hence, adjunction is obligatory in case of adjunct movement to avoid violating the ECP.

Under these structural assumptions, let us now consider asymmetries of objects and adjuncts in multiple WH-movement:

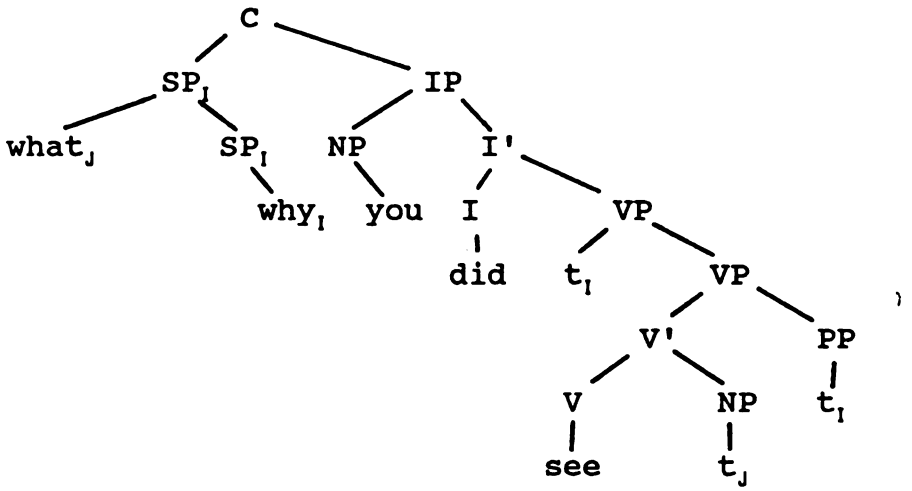
(59) a. $[_{CP}$why did $[_{IP}$you $[_{VP}$t $[_{VP}[_{V'}$see what] t]]]]

-> SS

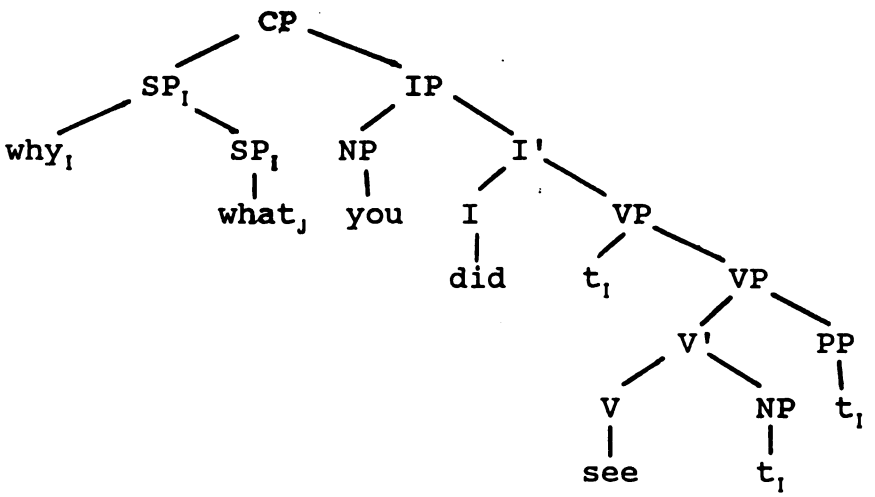
b. * $[_{CP}$what did $[_{IP}$you $[_{VP}[_{V'}$see t] why]]]?

In (59a), the noncomplement Wh-phrase moves to the CP, rather than the complement Wh-phrase; otherwise, the sentence is ungrammatical as in (59b), since its trace cannot be properly governed. (59a, b) can be represented at LF as (60a, b), respectively;

(60) a'. $[_{CP}[_{SP}\text{what}_J\ [_{SP}\text{why}_I]]_I$ did $[_{IP}\text{you}\ [_{VP}t_I$ $[_{VP}[_{V'}\text{see}\ t_J]\ t_I]]]]$



b'.* $[_{CP}[_{SP}\text{why}_I\ [_{SP}\text{what}_J]]_J$ did $[_{IP}\text{you}$ $[_{VP}t_I\ [_{VP}[_{V'}\text{see}\ t_J]\ t_I]]]]$



If we accept the assumption that all wh-phrases move to the CP at LF in (60a), in order to represent scope relations, then "what" is adjoined to the Spec at LF, since 'why' is already posited in the Spec at SS; here the trace of 'what' is properly governed by the verb, and the trace of 'why' is properly governed by Spec which is coindexed with 'why' through percolation. On the other hand, in (60b) the trace of 'why' cannot be properly governed by 'why' by adjoining itself to the Spec at LF; in this case Spec is branched, and not coindexed with 'why', and 'why' cannot properly C-command and so properly govern its trace, and hence will violate the ECP.

If we do not interpret the concept of domination as in (7), we will predict that (60b) is grammatical, since, following the previous definition of domination (Chomsky (1986) and May (1985), the CP is a maximal projection, and 'why' governs its trace and antecedent-governs its trace.

Let us turn now to the following:

(61) a. $[_{CP}$What did $[_{IP}$you say $[_{CP}$t' that $[_{IP}$he saw t]]]]

b. $[_{CP}$why did $[_{IP}$you $[_{VP}$say $[_{CP}$t'' $[_{C'}$that $[_{IP}$John $[_{VP}$t' $[_{VP}[_{V'}$left]t]]]]

In (61a) t is properly governed by the verb "saw", and is [+g]-marked, and the intermediate trace in the CP is also

properly governed by 'say' and [+g]-marked[20].

However, there are some problems. In (61b) the trace of the adjunct cannot be properly head-governed since it is a noncomplement. Therefore it must be properly antecedent-governed. The trace t is antecedent-governed by t' which is adjoined to VP. Even though t'' is properly head-governed by 'say', however, the t' adjoined to VP itself cannot be properly antecedent-governed by t'' in CP, since CP has a head, "that", and C' blocks government by virtue of (24i). To deal with this problem, Lasnik and Saito (1984, sec. 3.2) assume that there is deletion of nonsemantic elements at LF which they call affect-alpha. In addition, the traces of arguments must be g-marked at S-Structure, and the traces of nonarguments must be g-marked at LF. Then, the complementizer "that" can be deleted at LF, if we assume that a complementizer is a nonsemantic

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[20] According to Lasnik and Saito (1984) and Chomsky (1986), the trace t' in CP cannot be lexically governed (or theta-governed) by the verb "say". Hence it should be antecedent-governed. Following Lasnik and Saito (1984), the trace in CP is antecedent-governed by the WH-phrase in CP of the matrix sentence.

Chomsky (1986) assumes that the trace adjoined to VP antecedent-governs the trace within CP in the following example:

I $[_{CP}$what did $[_{IP}$you $[_{VP}$t'' $[_{VP}$say $[_{CP}$t' that $[_{IP}$he saw t]]]]]]

However, let us assume here that if the CP is not a barrier the elements within the CP are accessible to a proper governor, as it is accessible to a governor.

element; t'' in CP can properly antecedent-govern t' at LF, and [+g]-marks it, because adjuncts are not arguments.

If we can solve such problems without such an arbitrary deletion rule at LF[21], it will surely be a better solution. First of all, I will also assume that the traces of arguments like subject or object are g-marked at S-Structure and that the traces of nonarguments are g-marked at LF, following Lasnik and Saito (1984)[22]. Furthermore, I will assume that there are spec-head agreements called CP-spec-head agreement and IP-spec-head agreement, as Chomsky (1986) has proposed. Just as Infl agrees with the NP spec of IP, and shares some feature with it, the head of CP agrees with the spec of CP and shares some feature with it, including the index. Furthermore, I will assume that IP-Spec-head agreement occurs at S-structure and that CP-Spec-Head agreement occurs at LF.

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[21]Hubert Haider (1986) discusses the problems of Affect-alpha that Lasnik and Saito (1984) suggested.

[22]Note that a trace in an argument position should be g-marked at SS, not an argument chain and that a trace in a nonargument position should be g-marked at LF, not a nonargument. For example:

I $[_{CP}$who do $[_{IP}$you $[_{VP}$t'' $[_{VP}$think $[_{CP}$t' $[_{IP}$t saw Mary]]]]]]

The original trace t of 'who' should be g-marked at SS, since it is in an argument position; however, the traces t' in the embedded CP and t'' adjoined to the VP should be g-marked at LF, since they are both in nonargument positions.

Then, t'' and "that" in (61b) can have the same index, and the head of CP "that" can properly antecedent-govern the trace t' adjoined to VP at LF. If we assume spec-head agreement also at LF, then we don't have to assume Lasnik and Saito's deletion rule at LF.

CP-Spec-Head agreement is relevant in other cases, too.

(62) a. ? $[_{CP}$what do $[_{IP}$you wonder $[_{CP}$t' $[_{C'}$whether $[_{IP}$he saw t]]]]]

b. * $[_{CP}$why do $[_{IP}$you $[_{VP}$t''' $[_{VP}$wonder $[_{CP}$t'' $[_{C'}$whether $[_{IP}$he $[_{VP}$t' $[_{VP}$left t]]]]]]]]]

We have assumed that there is spec position in CP and that WH-phrases move to the spec position. Then, "whether" is the head of CP as a complementizer, and therefore the spec position is empty and "who" or "why" can move through it. In (62.a) t is properly head-governed, and t' is also properly head-governed by "wonder". They do not violate the ECP. Furthermore, WH-movement in this case does not violate Subjacency. The selectional restriction of the verb is also satisfied, since 'wonder' is subcategorizes for a CP with the feature [+Wh], and the CP in (62) has [+Wh] by virtue of sharing some feature with its head 'whether'. Nevertheless, is ungrammatical. However, if we assume CP-spec-head agreement at LF, then we can easily solve this problem. Under spec-head agreement some

feature is shared. In the case of (62.a) the trace t' in spec agrees with the head "whether". Following Lasnik and Saito (1984), however, the trace has the [-WH] feature[23]. In (62), then, CP-spec-head agreement will result in feature conflict, since the trace in spec has the [-WH] feature and the head "whether" has the [+WH] feature. Therefore, sentence (62.a) violates spec-head agreement at LF and is ungrammatical, even though the trace in CP is properly head-governed and the sentence satisfies the ECP.

In the case of (62b) there is no spec-head agreement at LF, and "whether" cannot share its index with the trace t''. Therefore, t' cannot be antecedent-governed. For this reason (62.b) violates the ECP and spec-head agreement at LF. Spec-head agreement, along with the ECP, also explains weak violations like (62.a) and strong violations like (62.b).

Let us consider additional examples of weak violations and strong violations:

(63.) a. ? [[$_{CP}$what do [$_{IP}$you wonder [$_{CP}$who saw t]]]

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[23] Here is an example to show that a trace has [-Wh] feature:

I. a. [$_{CP}$what do [$_{IP}$you wonder [$_{CP}$t' [$_{IP}$he saw t]]]]
b. [$_{CP}$do [$_{IP}$you wonder [$_{CP}$what [$_{IP}$he saw t]]]]

The verb "wonder" should have [+WH] as its complement because of the selectional restriction. (I.b) satisfies this selectional restriction and is grammatical; however, (I.a) is ungrammatical, since the trace in CP has [-WH] and does not satisfy the selectional restriction.

b. * [$_{CP}$why do [$_{IP}$you [$_{VP}$t'' [$_{VP}$wonder [$_{CP}$who [$_{VP}$t' [$_{VP}$left t]]]]]]]

In these examples, the WH-phrases cannot move through the embedded spec in CP, since "who" occupies the spec position. In (63.a) the trace t properly head-governed by the verb, and does not violate the ECP. It violates only Subjacency. However, in (63.b) t'' cannot properly antecedent-govern t', and it violates the ECP, and in addition also violates Subjacency. Therefore sentence (63.b) is worse than (63.a). As we have seen, object-adjunct asymmetries are easily explained within the ECP if we assume adjunction, a level of g-marking, and spec-head agreements. In particular, spec-head agreement at LF makes it possible for the elements in the embedded CP to be lexically governed by the higher verb. In earlier works, if the elements in CP are properly head-governed, there is ungrammaticality. However, we can eliminate such predictions of ungrammaticality by means of spec-head agreements as in (62).

Now that we have a problem with selectional restrictions by assuming CP-agreement, let us take a close look at selectional restrictions at SS, which will trigger syntactic Wh-movement at SS in English. English-like languages have syntactic Wh-movement to satisfy the selectional restriction as in (63); otherwise such an

example would be ungrammatical, * "I wonder John saw what". If we assume CP-Spec agreement at LF, then sentences like (63) do not satisfy the selectional restriction; the CP in (63) has an empty head and cannot have the feature [+Wh] at SS, even though 'who' occupies the Spec. We cannot assume either that CP-Spec agreement is possible at SS; To address such problems, I will assume the following:

(64) a category with [+Wh] must contain a [+Wh]-feature at SS.

(65) X contains Y iff X maximally dominates Y, and there is no Z such that X dominates Z and Z dominates Y.

Now we can predict the grammaticality in (63) by virtue of (64) and (65).

Like adjuncts, the subjects of tensed clauses show asymmetries with objects, as follows:

(66) a. ?? [$_{CP}$what do [$_{IP}$you wonder [$_{CP}$t whether [$_{IP}$John saw t]]]?

b. * [$_{CP}$who do [$_{IP}$you wonder [$_{CP}$t [$_{C'}$whether [$_{IP}$t saw John]]]]?

(67) a. [$_{CP}$what do [$_{IP}$you say [$_{CP}$t that [$_{IP}$John saw t]]]?

b. * [$_{CP}$who do [$_{IP}$you say [$_{CP}$t [$_{C'}$that [$_{IP}$t saw John]]]]?

c. [$_{CP}$why do [$_{IP}$you say [$_{CP}$t [$_{C'}$that [$_{IP}$John [$_{VP}$[t

$[_{VP}[_{V'}$saw Mary] t]]]]]]?

These phenomena seem to result from the ECP, because the subjects, like adjuncts, have no indexed or lexical head to properly govern them; therefore they need to be properly antecedent-governed to avoid violating the ECP.

As we saw earlier in example (62), the sentence in (66.b.) is ungrammatical because it violates the ECP: regardless of whether 'who' moves to the CP directly or through the CP of the embedded clause, neither 'who' nor its intermediate trace can properly govern the original trace. Since the trace of 'what' is properly head-governed by the verb 'saw', however, (66.a.) violates only Subjacency or CP-Spec agreement, regardless of the ECP; it is a weak violation as in example (62.a).

Returning to subj/obj asymmetries, now the fact that the subject is antecedent-governed for the ECP will show superiority as the adjunct does:

(68) a. $[_{CP}$who $[_{IP}$t saw what]]?

b. * $[_{CP}$what does $[_{IP}$who see t]]?

Here 'who' is adjoined to the spec at LF in the case of (68b), and does not properly C-command or properly govern its trace; it violates the ECP. The LF-representations are as follows:

(69) a'. $[_{CP}[_{SP}\text{what}_J\ [_{SP}\text{who}_I]]_I\ [_{IP}t_I\ \text{saw}\ t_J]]$

b'. * $[_{CP}[_{SP}\text{who}_I\ [_{SP}\text{what}_J]]_J\ [_{IP}t_I\ \text{saw}\ t_J]]$

Let us consider the following carefully, however:

(70) a. $[_{CP}$who did $[_{IP}$you say $[_{CP}t'\ [_{IP}t\ [_{VP}$saw what$]]]]]$ (SS)

b. * $[_{CP}$what did $[_{IP}$you say $[_{CP}[_{IP}$who saw t$]]]]$ (SS)

c. * $[_{CP}[_{SP}\text{who}_i\ [_{SP}\text{what}]]$ did $[_{IP}$you say $[_{CP}t'_i\ [_{IP}t_i$ saw$]]]]$ (LF)

In (70.a.) the trace t is properly antecedent-governed by t', and t' is properly head-governed by "say"; thus (70.a) satisfies the ECP. On the other hand, 'who' (70.b) is a Wh-in-situ at SS; therefore, at LF it undergoes LF-movement, and generates structure (70.c.) at LF. Like in (70.a), in (70.c.) the trace t_i is properly antecedent-governed by the trace t', which is properly head-governed by 'say' at LF; thus the sentence (70.b.) does not violate any principle. Nevertheless, it is ungrammatical. To solve this problem, we will redefine the ECP:

(71) Consistent Proper Government

i. all the traces in a chain must be properly-governed, or

ii. all the traces in a chain must be properly antecedent-governed.

That is, in (70.c.) the trace t is properly antecedent-governed by t'. Therefore, the trace t' should also be antecedent-governed because t' forms a chain with t and 'who'. Even though the structure of (70.b.) is changed as (72) at LF, it does not satisfy (71) for the ECP, and we can predict the ungrammaticality of (70.b):

(72) $[_{CP}[_{SP}who_I\ [_{SP}what_J]]$ do $[_{IP}$you $[_{VP}t_I\ [_{VP}$say $[_{CP}t_I$ $[_{IP}t\ [_{VP}$saw $t_J]]]]]]]]]$

In (72), the trace adjoined to the VP of the matrix clause cannot be properly antecedent-governed by 'who', even though the intermediate trace in the embedded CP is properly antecedent-governed by it.

By modifying the ECP as (71), we should also modify the representations we have discussed before. First of all, (70.a) should be changed as (70.a') to satisfy the ECP in (71):

(70.a') $[_{CP}$who did $[_{IP}$you $[_{VP}t''\ [_{VP}$say $[_{CP}t'\ [_{IP}t\ [_{VP}$saw what$]]]]]]]$

Second, let us consider how complement Wh-movement

works with (71).

(73) a. What did you see?

b. * [$_{CP}$what did [$_{IP}$you [$_{VP}$t [$_{VP}$see t]]]]

c. [$_{Cp}$what did [$_{IP}$you see t]]

Following the above analysis, the representation of (73.b.) is ill-formed, since the chain [what, t', t] is not consistently properly governed; t is lexically governed by the verb 'see', and t' is antecedent-governed by 'what'. Hence (73.c.) is assumed to be an acceptable representation.

Returning to (61.b.), the chain [why, t'', t, t] is not consistently properly governed, because t'' is properly head-governed by the verb 'say'. To avoid inconsistent proper government, we should represent (61.b.) as follows:

(74) [$_{CP}$why did [$_{IP}$you [$_{VP}$t''' [$_{VP}$say [$_{CP}$t'' [$_{C'}$that [$_{IP}$he [$_{VP}$t' [$_{VP}$[$_{V'}$left] t]]]]]]]]]

Thus, the lack of a head-governor makes the subject behave like an adjunct. If the subject is properly governed by a head as in an exceptional case-marking structure, however, it behaves in the same way as the object:

(75) ?? who do you wonder whether John expects t to see Mary?

Here (75) does not violate the ECP; rather it violates Subjacency or CP-Spec agreement. The original trace of 'who' is properly head-governed by 'expects'. Therefore (75) is a weak violation.

Even though the adjunct and subject are both properly antecedent-governed, the adjunct does not show the that-trace effect. I will refer to these asymmetries as argument and nonargument asymmetries, following Lasnik/Saito (1984). In the next section I will discuss argument/nonargument asymmetries in detail.

3.2 Argument and Nonargument Asymmetries

In this section, I will present the phenomena which are related to the Wh-trace of subjects, and will show why the wh-traces of subjects behave differently from adjuncts and objects. First of all, I will explain why the that-trace effect occurs only with the Wh-traces of subjects, and why subject relative clauses do not show the that-trace effect. In particular, I will introduce "unmarked trace substitution" for multiple wh-traces of subjects and adjuncts.

3.2.1 that-trace effect[24]

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[24] Chomsky and Lasnik (1977) suggest that structure $[_{CP}$... that $[_{IP}$t ...]] should be ungrammatical, like (67.b); it is called that-trace effect.

Here we will consider why subjects show the that-trace effect but objects and adjuncts do not. Furthermore, we will consider why relative clauses show no that-trace effects, even though their structure is similar to the structure in which the subject WH-phrase moves to the spec in CP as in (76):

(76) the dog $[_{CP}$that $[_{IP}$t bites John]]

Subjects have the properties of both Objects and Adjuncts. In particular subjects are arguments, like objects, and have no head-governor, like adjuncts. These properties will make subjects behave differently from objects and adjuncts.

Let us consider the following:

(77) a. * $[_{CP}$who did $[_{IP}$you $[_{VP}$t'' $[_{VP}$say $[_{CP}$t' $[_{C'}$that $[_{IP}$t saw him]]]]]]]

b. $[_{CP}$why did $[_{IP}$you $[_{VP}$t''' $[_{VP}$say $[_{CP}$t'' $[_{C'}$that $[_{IP}$John $[_{VP}$t' $[_{VP}$saw him]]]]]]]]]t

Here (77a) involves movement of a subject ([...that [t...]]), and (77b) movement of an adjunct. Why does the Subject show the that-trace effect but not the adjunct? This results from the fact that it is an argument. In (77.b.) the trace t' is properly antecedent-governed at LF

after CP-spec-head agreement because "why" is a nonargument. However, in (77.a.) t must be antecedent-governed at S-structure, since it is an argument. At S-structure CP-spec-head agreement does not occur and "that" cannot bear the same index as the spec t', and cannot antecedent-govern the trace t at S-structure. Therefore, t receives [-g]-feature at S-structure, and this feature is maintained at LF. Even though the head of CP agrees with and shares its index with its spec at LF, the feature [-g] cannot be changed, and the sentence is ungrammatical. However, 'why' is a nonargument and hence CP-agreement makes 'that' properly antecedent-govern the adjoined trace, and [+g]-mark it at LF[25].

Along with CP-Spec-head agreement, the distinction between the argument/nonargument g-marking levels contributes to an explanation of a variety of ECP phenomena. In addition, they contribute to presenting the properties of subjects, objects, and adjuncts. These properties may be summarized in the following table:

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[25]In addition, we can explain the following examples

I.a $[_{CP}$who do $[_{IP}$you $[_{VP}$t $[_{VP}$think $[_{CP}$ t $[_{C'}$that $[_{IP}$ he $[_{VP}$t $[_{VP}$says $[_{CP}$t $[_{IP}$t saw Mary]]]]]]]

b.* $[_{CP}$who do $[_{IP}$you $[_{VP}$t $[_{VP}$think $[_{CP}$t $[_{IP}$he $[_{VP}$t $[_{VP}$says $[_{CP}$t $[_{C'}$that $[_{IP}$t saw Mary]]]]]]]]]

Here in (I.a.) the original trace is [+g]-marked by the intermediate trace in the lowest CP. However, other traces are posited in nonargument position, and are g-marked at LF. Hence this example does not show the that-trace effect.

However, in (I.b.) the original trace is [-g]-marked at sS because of the existence of 'that', as we expected.

(78)	Argument	Complement	G-marking level
Subj	+	-	SS
Obj	+	+	SS
Adjunct	-	-	LF

Now let us consider why the relative clause in (76) does not show the that trace effect. Chomsky 1986 (p. 27) assumes that CP-spec-head agreement at S-structure enables the head "that' to share an index with the empty operator in Spec. Then, "that" can antecedent-govern the trace t_i. However how can we explain (77.a.), following Chomsky's suggestion that CP-agreement occurs at LF? If the CP-spec-head agreement occurs at S-structure, then t' and "that" will have the same index at S-structure and "that" will antecedent-govern t. This is the wrong result, as we have seen so far.

To address this problem, I propose the following feature assignment:

(79) X assigns its features to Y only once iff x governs Y, and X is the nearest governor.

For example, in (80.a) the verb 'believe' governs the IP and the NP within the IP; however, it assigns Case to the IP, not to the NP subject.

(80) a. John believe $[_{IP}$him $[_{I'}$to $[_{VP}$love Mary]]]

b. John consider $[_{IP}$Her $[_{I'}$'Infl^0 $[_{AP}$intelligent]]]

If we assume that a maximal projection shares its features with its head, and that IP-Spec agreement is possible at SS, we can explain naturally how the NP can have accusative Case. That is, the IP is assigned accusative Case by the verb 'believe', and Infl can be shared with its maximal projection IP through percolation. Therefore Infl receives accusative Case from IP. Furthermore, the NP in the Spec of IP will also have accusative Case through IP-Spec-head agreement at SS. Hence it will not violate Case theory.

Returning to subject relative clauses, in (81a) the NP governs the CP, and assigns its features (e.g. an index) to it[26].

(81) a. $[_{NP}$the dog$_I$ $[_{CP}O_I$ $[_{C'}$that$_I$ $[_{IP}t_I$ bites John]]]]

b. * $[_{NP}$the dog$_I$ $[_{CP}O_J$ $[_{C'}$that$_I$ $[_{IP}t_J$ bite John]]]]

Then, the head 'that' can have the same index as the NP through percolation. Then, 'that' properly governs the trace of the NP within the IP, and will satisfy the ECP.

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[26]Let us assume that a verb has a case and assigns it to its complement, and at the same time that a noun originally has an index and assigns it to its complement. Furthermore, the assigned feature i is assumed to be not assigned to more than one category.

The empty operator and the NP should be coindexed (maybe at DS or at SS); otherwise, the sentence would be ungrammatical as in (81.b.).

As we have seen so far, CP-Spec-Head agreement should be available only at LF for the ECP, and IP-Spec-agreement should be available at least at SS for Case theory. Also, the distinctive levels at which g-marking is relevant are also a good device to explain ECP-phenomena.

In the next section, I will be going further for more evidence of argument/nonargument asymmetries in the structures of multi-Wh-phrases.

3.2.2 Multi-Wh Phrases

In the previous sections, I discussed subject/object and adjunct/object asymmetries, which may be generalized as Complement/noncomplement asymmetries, as in Huang (1982). Among these phenomena, multi-Wh constructions formed by a subject/object or adjunct/object pair have shown that the subject or the adjunct moves prior to the object or complement; we might refer to these as superiority effects, as termed by Chomsky. Such asymmetries are determined by whether a category is properly head-governed or properly antecedent-governed. Furthermore, the distinction between g-marking levels has been shown to have an effect on the that-trace effect called subj/adjunct asymmetries or argument/nonargument asymmetries.

First, let us look closely at the multi-Wh constructions which consist only of properly antecedent-governed Wh-phrases.

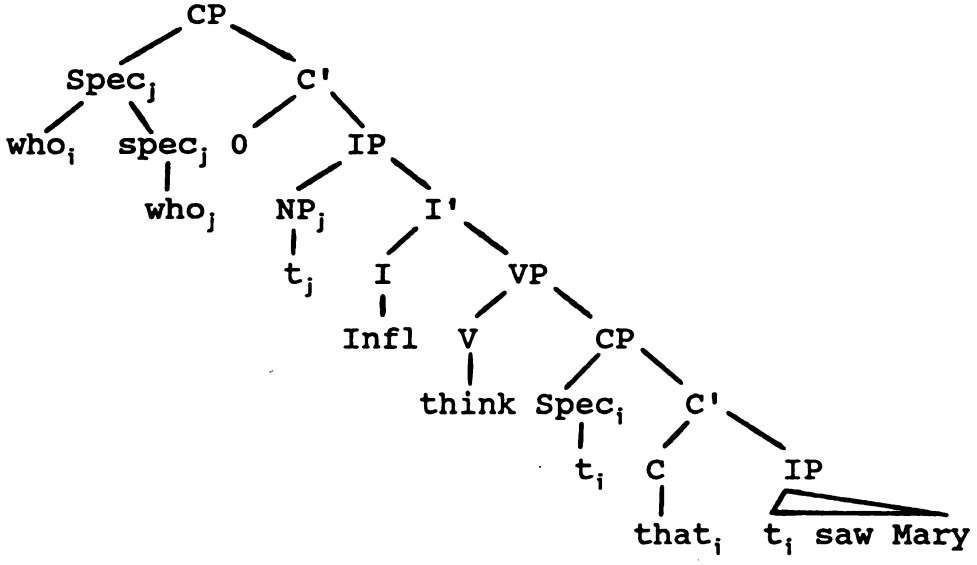
(82) Who thinks that who saw Mary?

Now, we might doubt the grammaticality of (82); the subjects 'who' in the main clause and in the embedded sentence might be thought to be properly antecedent-governed, as we have seen so far. Then, it should have been ungrammatical, but actually, it is grammatical. In addition, (82) does not show the that-trace effect.

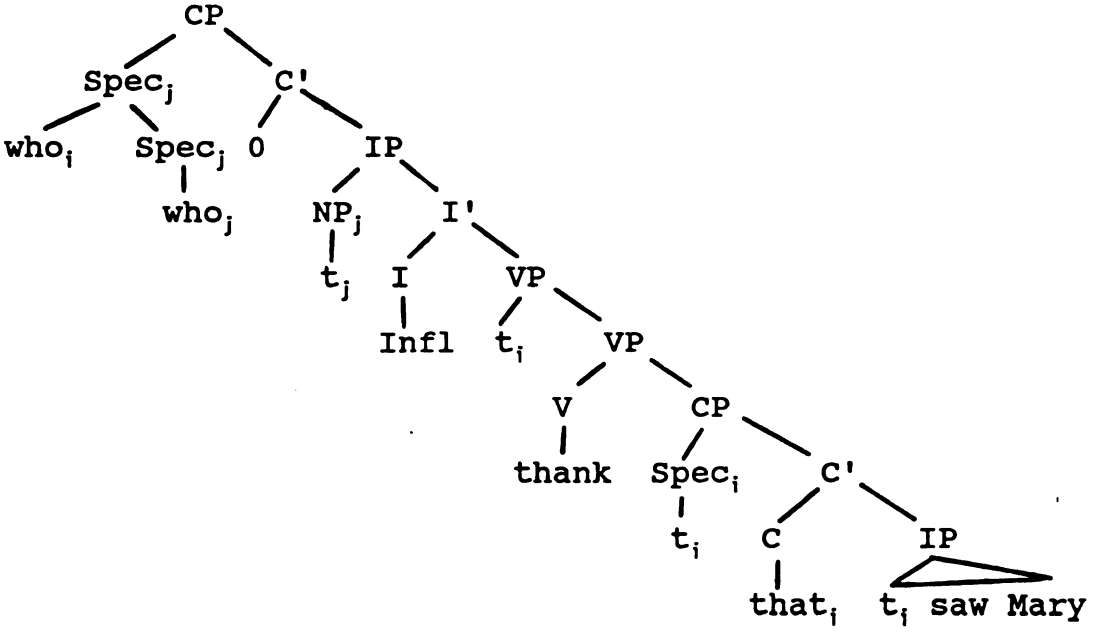
However, we can explain the grammaticality of (82) by virtue of consistent proper government as in (71), CP-agreement at LF and indexed head-government. We have assumed that the Wh-in-situ moves to the Spec of the CP at LF for scope, in which case its target position should contain [+Wh]. The structure of (82) could be represented at LF in (83).

Among these representations at LF, only (83.a.) is well-formed and obeys the ECP. That is, (83.d.) violates the Extended Projection Principle, by Chomsky (1981) proposed; that is, the verb 'think' subcategorizes not for a [+Wh] but for a [-Wh] feature for CP. (83.b.) and (83.c.) do not satisfy the ECP; however, (83a) does.

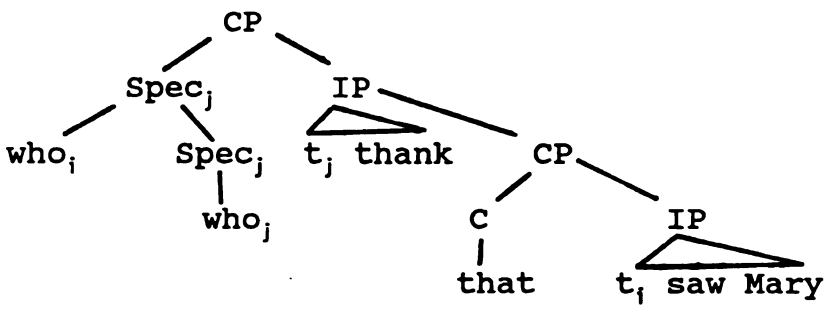
(83) a. $[_{CP}[\text{spwho}_i\ [_{sp}\text{who}_j]]_j\ [_{IP}t_j\ [_{I'}\text{Infl}\ [_{VP}\text{think}\ [_{CP}t_i\ [_{C'}\text{that}_i\ [t_i\ \text{saw Mary}]]]]]]]$



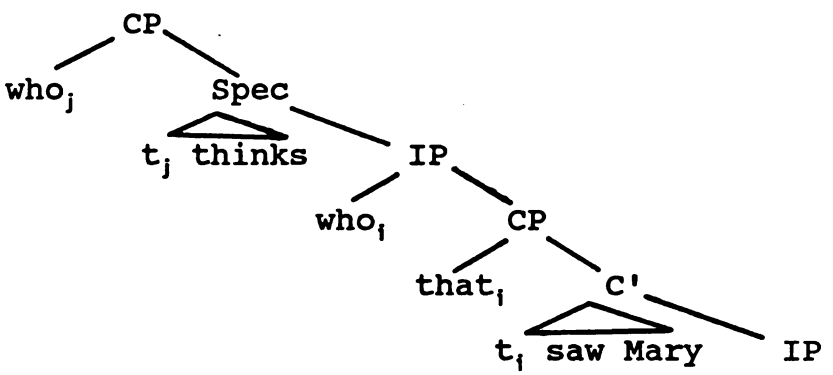
b. $[_{CP}[_{SP}\text{who}_i\ [_{sp}\text{who}_j]]_j\ [_{IP}t_j\ [_{I'}\text{Infl}\ [_{VP}t_i\ [_{VP}\text{think}\ [_{CP}t_i\ [_{C'}\text{that}_i\ [_{IP}t_i\ \text{saw Mary}]]]]]]]]$



c. $[_{CP}[_{SP}who_i\ [_{SP}who_j]]]_j\ [_{IP}t_j$ think that $[_{IP}t_i$ saw Mary]]]



d. $[_{CP}[who_j\ [_{IP}t_j$ thinks $[_{CP}who_i\ [_{C'}that_i\ [_{IP}t_i$ saw Mary]]]]]]



In (83a) the head 'that' of the embedded CP has, by means of CP-agreement, the same index as its Spec, which contains the trace of 'who'. Since the head 'that' can head-govern the original trace of 'who$_i$'. To preserve consistent proper government, it moves directly to the Spec without being adjoined to the main VP. The trace ti in the embedded CP is also properly head-governed by the verb 'think', and therefore all the traces in the chain of 'whoi' are consistently properly head-governed and satisfy the ECP.

However, in (83b.) the trace adjoined to the VP cannot be properly governed; the original trace in (83c), too, is not properly governed at all.

Compared with (82), (84) is clearly ungrammatical:

(84) * who does who think that saw Mary?

The structure at SS is as follows:

(85) * $[_{CP}\text{who}_i\ [_{IP}\text{who}\ [_{VP}t_i\ [_{VP}\text{thinks}\ [_{CP}t_i\ [_{C'}\text{that}\ [_{IP}t_i$ saw Mary]]]]]]]

Here the original trace t_i of 'whoi' is [-g]-marked at SS since the existence of the head 'that' of the CP bars proper government. Thus, the trace with [-g] violates the ECP, even though the head 'that' agrees with the spec and obtains an index. In addition, at LF, the Wh-in-situ does not satisfy the ECP either, since the adjoined 'who' through LF-movement cannot properly antecedent-govern the original trace:

(86) * $[_{CP}[_{SP}\text{who}_j\ [_{SP}\text{who}_i]]\ [_{IP}t_j\ [_{VP}t_i\ [_{VP}\text{thinks}\ \ldots]]]]$ (LF)

Now we still have another problem with this analysis. Let us consider the following:

(87) a. * How do you think that who saw Mary?

b. * Who do you think that saw mary how?

(87b) is ungrammatical, since in S-structure (88) of (87b) the original trace of 'who_I' is [-g]-marked at SS (e.g. a that-trace effect), and will violate the ECP at LF, whatever the LF-representation of (87b) is after 'how' moves at LF.

(88) $[_{CP}who_i$ do $[_{IP}$you $[_{VP}t_i$ $[_{VP}$think $[_{CP}t_i$ $[_{C'}$that $[t_i$ $[_{VP}[_{V'}$saw Mary] how]]]]]]] (SS)

Even though there is no complementizer 'that' in (87b), (87b) is ungrammatical, since the trace of 'how is not properly governed at all.

However, (87a) has the following structure at SS:

(89) $[_{CP}$how do $[_{IP}$you $[_{VP}t_I$ $[_{VP}$think $[_{CP}t_I$ $[_{C'}$that $[_{IP}$who $[_{VP}t_I$ $[_{VP}[_{V'}$saw Mary] $t_I]]]]]]]]]$

Here the traces of 'how' is not yet g-marked at SS, since it is an adjunct; it is [g]-marked at LF. After the LF-movement of Wh-in-situ 'who', it has the following possible representations at LF:

(90) a. $[_{CP}[_{SP}who_J$ $[_{SP}how_I]]]_I$ $[_{IP}$you $[_{VP}t_I$ $[_{VP}$think

$[_{CP}t_J\ [_{C'}that_J\ [_{IP}t_j\ [_{VP}t_I\ [_{VP}[_{V'}saw\ Mary]$
$t_I]]]]]]]]$

b. $[_{CP}[_{SP}who_J\ [_{SP}how_I]]_I\ [_{IP}you\ [_{VP}t_I\ [_{VP}think\ [_{CP}t_I$
$[_{CP}t_I\ [_{IP}t_J\ [_{VP}t_I\ [_{VP}[_{V'}saw\ Mary]\ t_I]]]]]]]]$

c. $[_{CP}[_{SP}who_J\ [_{SP}how_I]]_I\ [_{IP}you\ [_{VP}t_I\ [_{VP}t_J\ [_{VP}think$
$[_{CP}t_I\ [_{C'}that_I\ [_{IP}t_J\ [_{VP}t_I\ [_{VP}[_{V'}saw\ Mary]$
$t_I]]]]]$

(90b) shows one step movement of 'who' to the Spec; however, the trace cannot be properly governed. In (90c) 'who' skips the embedded CP and adjoins itself to the main VP; the trace of 'who' here is not properly governed either. In (90a) the chain of 'who' is properly head-governed, and satisfies the ECP; however, the chain of 'how' is not properly governed this time. That is, when 'who' moves to the Spec of the Main CP at LF, it substitutes for the trace of 'how' in the Spec of the embedded CP. No g-marked trace of 'how' allows such substitution movement of 'who' as in (90a). Among the representations at LF, I will assume that (90.a.) is correct, compared with the analysis of (82).[27]

On the other hand, a g-marked trace is assumed not to

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[27]Let us also consider the example:

I. a.* who thinks that who said that who saw Mary?

b. $[_{CP}$who $[_{IP}$t thinks that $[_{IP}$who said that $[_{IP}$who saw Mary?]]]] (SS)

Compared with (82), one of the Wh-in-situ movements will violate the ECP at LF, since cyclic movement will make the later Wh-phrase substitute for the trace of the earlier Wh-phrase in the embedded CP.

be subject to substitution at all. To justify this assumption, let us reconsider (68) and (69). In (69b) 'who' cannot be substituted for the trace of 'what' through LF-movement, since the trace of 'what' in the embedded CP has the [+g]-feature. Therefore, the original trace of 'who' does not satisfy proper government. Without this assumption, (69b) would be grammatical unexpectedly. Therefore, substitution for unmarked traces correctly predicts grammaticality of the relevant examples[28].

3.3 NP-movement

So far we have discussed Wh-movement, which forms A'-chains. At this point,let us consider NP-movement, which forms A-chains, in terms of the ECP.

(91) a. John is likely to win.

b. $[_{IP}John_I\ [_{I'}Infl_I\ [_{VP}be_I\ [_{Ap}likely_I\ [_{IP}t_I$ to win.$]]]]]]$

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[28]The empty category with g-marking is related to the wanna-contraction at the PF:

I a. who do you wanna love?

b. $[_{CP}$who do $[_{IP}$you want $[_{CP}t'\ [_{IP}$PRO to drink $t^{+g}]]]]$

II a.* Who do you wanna go home?

b. $[_{CP}$who do $[_{IP}$you want $[_{CP}t'\ [_{IP}t^{+g}\ [_{VP}$to go home$]]]]]$

Here the g-marked trace is visible, and blocks contraction; however, the unmarked trace is invisible to contraction. In accordance with footnote 22, only an argument position is g-marked at ss, and a nonargument position is g-marked at LF. Hence the trace in CP is not g-marked and thus does not contain the g-marking feature at PF, either.

Here the adjective 'likely' is not lexical, since it originally has no case or index to assign. Then, 'John' should move to a case-assigned position, to preserve the Case Filter, and its trace is properly head-governed for the ECP, and forms an A-chain. Therefore, adjunction movement is barred here because of the Binding Theory.

However, IP-agreement makes 'John' and Infl share their features, including the index of the NP 'John'. Then, the inflected verb 'be' obtains the index of Infl, and transfers it to the AP. Now 'likely' is indexed and coindexed with 'John' as well its trace. Then, 'likely' can properly head- or antecedent-govern the trace of 'John', and it obeys the ECP.

On the other hand, in (92), affixes transmit the index of subject NP to the verbs to which they are attached[29], and the verbs can obtain the same index from Infl. Then, the passivized verbs properly coindex the head- or antecedent-govern the trace.

(92) a. John is killed t.

b. The city has been destroyed t.

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[29] It is not clear how affixes hop; it was called Affix Hopping in traditional transformational Grammar. Chomsky (1986) proposes head movement for inflected verbs. However, this proposal does not cover affixing hopping for passivization, progressive, and perfective. Here I will leave the question open.

Now let us look at cyclic NP-movement as in (93):

(93) a. John seems to be expected to be killed.

b. * John seems that it is expected to be killed.

(94) a. $[_{IP}John_i\ [_{I'}Infl_I\ [_{VP}seem_I\ [_{IP}t_i\ [_{I'}Infl_I\ [_{VP}be_I\ [_{VP}expected_I\ [_{IP}t_i\ [_{I'}Infl_I\ [_{VP}be_I\ [_{VP}killed_I\ t_I]]]]]]]]]]]$

b. * $[_{IP}John_I\ [_{I'}Infl_I\ [_{VP}seemI\ [_{CP}that\ [_{IP}it_J\ [_{I'}Infl_J\ [_{VP}be_J\ [_{VP}expected_J\ [_{IP}t_I\ [_{I'}Infl_I\ [_{VP}be_I\ [_{VP}killed_I\ t_I]]]]]]]]]]]]$

In (94a), which is the structure of (93a), the NP 'John' cyclically moves to the subject position in the main clause through the embedded subject position. Such cyclic NP-movement and IP-agreement at SS enables the Infls to share the same indexes with the subjects. Furthermore, the Infls assign their indexes to the verbs 'be', which will transfer them (or carry out this process through affix hopping) to the main verb which properly governs the traces. However, in (94b), the representation of (93b), 'John' does not move cyclically, and the second Infl cannot obtain the index which 'John' has. The result is that 'expected' cannot properly govern the trace of its complement, and it violates the ECP.

4. SUMMARY AND CONCLUSION

In this paper we have discussed some important concepts of government, proper government, and ECP, and applied them to the ECP phenomena.

First of all, we have define barriers in a generalized way, and eliminated Chomsky's concept that IP and I' are defective 'category'.

Second, we have substituted 'C-command' for Chomsky's (1986) 'm-command', and 'proper c-command' for Chomsky's (1986) 'c-command'; we have defined government in terms c-command, and proper government in terms of proper c-command.

Third, we have showed that the ECP in (54) is not proper to explain some grammatical phenomena, and thus, in a more restricted way, defined the ECP as (71). As a consequence, the type of complement Wh-movement is different from noncomplement Wh-movement. That is, to obey the ECP which is defined in terms of consistent proper government, complement Wh-movements take substitution, and noncomplement Wh-movements take adjunction.

Fourth, we have suggested NP-indexing algorithm and showed the consequence; as we have seen in footnote 7), we could keep Subjacency out of dilemma by virtue of NP-indexing algorithm, and NP-indexing, together with CP-agreement at LF, has effect on that-trace effect and the ECP.

Finally, we have showed how NP-indexing and NP-movement work together for the ECP.

However, the ECP has still left some questions open. First of all, the ECP does not give a good answer to how quantifier raising (QR) work together with the EC, even though the ECP and QR apply at LF, they are sure to be closely related, and the ECP also has effect on QR (Hornstein 1984, p. 66):

(95) Someone believes that Franks likes everyone.

Here 'someone' is interpreted as having a wide scope over 'everyone', but not vice versa, even though the ECP allows 'everyone' to be extracted out of the embedded sentence.

Second, With the ECP we do not have a solution to multiple Wh-questions yet (Chomsky 1984a, p. 238):

(96) a. John wonders what who bought where.

b. * John wonders what who bought at the store.

For further research we should extend the ECP to such phenomena.

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