THEMATIC MINIMALITY*

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1. Introduction

1.1. Preamble

The relation between the theory of extraction and other aspects of syntactic theory is a two-way one. On the one hand, the existence of a particular kind of extraction violation (whether ECP or subjacency) in a given context C can be used as an argument that C has structure S, where the postulation of structure S will subsume the extraction violation under a known case. In this way extraction can be a tool for investigating syntactic structure. On the other hand, syntactic structure furnishes the basic notions in terms of which extraction constraints are defined.

This situation can be illustrated with the notion of subject. The existence of subject-condition effects with certain NPs can constitute evidence that the NPs in question are subjects. Such a move explains the extraction violation and provides evidence about syntactic structure. This can be particularly important in the case of putative small clauses (cf. in particular Kayne (1984)). Thus the following data are taken to show that NP* is the subject of a small clause:

(1) a. ??Which car did you hammer [$_{NP*}$ the fender of] straight?
     b. *Which country did you drink [$_{NP*}$ the capital of] dry?
     c. *Which guru do you consider [$_{NP*}$ admirers of] misguided?
     d. *Which man did Mary make [$_{NP*}$ friends of] angry?

So here an extraction violation provides an important indication of syntactic structure. On the other hand, the constraint in question is formulated in terms of the notion "subject," itself a notion defined in terms of syntactic structure. This brief example shows how the theory of extraction and the general theory of syntax may fruitfully interact.

Our purpose in this paper is to develop an account of the extraction properties of predicates. Our central proposal is that predicates cannot be extracted across other predicates. The proposal is advanced primarily for its intrinsic

interest and what we see as its empirical value, of course, but also in the belief that this aspect of the theory of extraction interacts with the theory of predicates, i.e. θ-theory, in the way outlined above. Thus we hope to use θ-theory and the theory of extraction so as to shed light on each other. We will return to this point in the conclusion.

We formulate our constraint by extending and adapting the recent proposals for the relativization of Chomsky's (1986b) Minimality Condition made by Rizzi (1987), (1988). Thus the overall goal of our paper is to clarify, from a new empirical perspective, the relations between θ-theory and the ECP.

1.2. θ-theory and the ECP

The earliest formulations of the ECP (e.g. Chomsky (1981:273)) required that traces have to be either governed by a lexical head or governed by an antecedent. Stowell reformulated lexical government as θ-government, proposing that θ-government was coindexing between a trace and a position in the governing verb's θ-grid. This led to the assumption, widely held until recently, that θ-theory had a direct role to play in determining the well-formedness of traces. The two notions of antecedent governement and θ-government, taken either disjunctively or conjunctively, were assumed to define proper government in a number of works (see for example Lasnik & Saito (1984) and the references given there).

More recently, however, evidence has been found which suggests that the θ-government requirement is too weak. Certain classes of sentences apparently violate the ECP even though the θ-government requirement is satisfied. We will limit discussion here to just one case, the "super-passive" construction discussed in Chomsky (1986b:74f.), which seems to offer striking evidence that the θ-government requirement is insufficient. We illustrate the phenomenon with the following paradigm from Baker (1988):

(2) a.   It seems [that John has been told t [that S]].
     b.   John seems [t to have been told t [that S]].
     c.   *John seems [that it has been told t [that S]].

                                        (Baker's (123)), p. 359).

Chomsky notes in his discussion of this type of example that the extreme ungrammaticality of (2c) cannot be attributed to a violation of Principle A of the Binding Theory, as it is well-known that expletives are rather weak specified subjects. Compare (3) with (2c):

(3)   ?They$_i$ thought [that it amused me [that [stories about each other$_i$] had been sold to the press]].

Neither can the violation in (2c) be attributed to subjacency, because no barriers are crossed. Chomsky concludes:

> Suppose, then, that for A-bound trace, proper government reduces to antecedent government, θ-government being excluded. Recall that given the option of VP-adjunction that we have assumed throughout, the object of a Verb is always antecedent-governed after A'-movement, namely by the trace adjoined to the VP of which it is the object. Therefore, θ-government can also be eliminated from the definition of "proper government" for A'-bound trace governed by a verb.
> (pp. 77-8).

This conclusion has been fairly widely accepted.

With the abandonment of the θ-government component of proper government, it appears that θ-theory has no direct role to play in determining the distribution of empty categories (however, as we will see in Section 5, Rizzi (1988) nevertheless reserves a more indirect role for θ-theory). What we wish to argue in this paper is that θ-theory does play a role in the determination of the proper government of traces in one important and little-discussed class of cases: that of traces of θ-assigning categories. Our central proposal is a constraint which we can informally phrase as follows:

(4) No θ-assigner can intervene between a moved θ-assigning category and its trace.

We will see that the best way to formalize this generalization is to state it in terms of the Relativized Minimality Condition of Rizzi (1987, 1988), which we introduce below. Accordingly, we refer to (4) henceforth as the "θ-minimality condition."

1.3. Organisation of Paper

The paper is organized as follows: in the next Section, after distinguishing the various positional classes of APs that exist in English, we discuss the core cases of impossible AP-extraction and show how they can be accounted for in terms of the θ-minimality condition in (4). We then integrate the θ-minimality condition with Rizzi's proposed Relativized Minimality Condition. Section 3 discusses further cases of θ-minimality involving subject-oriented Adverbs and adnominal-Adjective extraction. Finally, in Section 4, we consider the relation between θ-minimality and θ-theory more generally. It is in this section

that the remarks in 1.1. are most relevant: we will suggest that θ-minimality requires us to adopt an elaborated theory of θ-chains, one which allows that chains can be the abstract representation of θ-assigners (predicates) as well as of θ-assignees (arguments). In these terms, we suggest a particular conception of certain kinds of reanalysis operation.

2. Extracting Adjectives

2.1. Types of AP

The basic phenomenon we are interested in is the extraction of various kinds of AP. A number of subtypes of APs can be distinguished in English. In addition to adnominal APs of the kind shown in (5), there are several types of non-adnominal AP, illustrated and named in (6):

(5)   John bought a **big** house.

(6)   a.   John left the room **sad**.   -- circumstantial
      b.   John drank the beer **flat**.   -- depictive
      c.   John hammered the metal **flat**. -- transitive result
      d.   John ran the pavement **thin**.   -- intrans. result
      e.   John considers Bill **crazy**.   -- epistemic
      f.   John made Bill **happy**.   -- causative

The names of the various non-adnominal APs are not intended as characterizations of the semantic properties of these APs. What is important is that a number of syntactic properties can be shown to distinguish these types of AP:
a) *NP in place of AP*: circumstantials, transitive resultatives, epistemics and causatives allow NP in place of AP:

(7)   a.   John left the room a happy man.
      b.   *John drank the beer a cold brew.
      c.   They elected John president.
      d.   *John ran the pavement a flat surface.
      e.   John considers Bill a lucky guy.
      f.   Mary made John a happy man.

This test thus distinguishes depictives and intransitive resultatives from all the other kinds of AP.
b) *Subject Predication*: Only circumstantials can be predicated with a non-derived subject, as can be seen from the examples in (6). So this property distin-

guishes circumstantials from transitive resultatives, epistemics and causatives.

c) *Subject Condition*: we take the presence of subject-condition effects on the postverbal NP as a test for the small-clausehood of the postverbal NP-AP sequence. The examples in (1) show that a piece of the postverbal NP cannot be extracted where it precedes a resultative, epistemic or causative AP. This test distinguishes depictives from intransitive resultatives, as (8) shows:

(8) a. Which animal did you eat the flesh of raw?
     b. *Who did you dance the friends of sick?

(8) and (1) together indicate that depictive APs do not form small clauses, while epistemics, causatives and both kinds of resultatives do.

d) *VP in place of AP*. Only causatives allow a VP small-clause complement:

(9) a. John made Mary clean the car.
     b. *John considers Mary know the answer.
     c. *John hammered the metal break it.

This distinguishes causatives from epistemics and transitive resultatives.

e) *Tense*. It remains to distinguish epistemics from transitive resultatives. Some APs are interpreted as temporally dependent on the main predicate, in that the time the property described by the AP holds is construed as a function of the tense of the main predicate. The resultatives are temporally dependent on the main predicate: in (6c) the time of flatness is a function of the tense of the main predicate. This is not the case in (6e). So this test distinguishes transitive resultatives from epistemics.

The above tests allow us to distinguish all the types of AP in (9). This typology of APs will be relevant in what follows as different types of AP have different extraction properties.

2.2. AP-extraction

The central fact that we are concerned with is that transitive resultatives, epistemics and causatives allow short extraction of the AP, while the other kinds of AP discussed above do not:

(10) a. ?*How happy did John leave the room?
     b. ?*How raw did John eat the meat?
     c. *How flat did John run the pavement?

(11) a. How flat did John hammer the metal?
     b. How intelligent does John consider Bill?

c. How happy did John make Mary?

(The contrast between (10b) and (11a,c) is noted in Chomsky (1986b:81ff.)). The slight contrast between (10a,b) and (10c) may be due to the fact that (10c) involves an additional CED effect.

The general contrast between (10) and (11) suggests the following:

(12) Traces of non-selected APs fail to be antecedent-governed.

In that case, (12) adequately accounts for the contrast between (10) and (11), since the APs in (10) are not selected while those in (11) are.

The generalization in (12) is rather problematic, however. Clearly it does not have any real explanatory depth, in that it gives us no hint as to why traces of non-selected APs should have this peculiar property. We will deal with this problem in the next section. A more immediate objection relates to the fact that only APs are claimed to be subject to the requirement. For example, it is unclear why the related class of adjunct adverbials succeeds in being antecedent-governed in cases of short extraction, as shown in (13):

(13) a. Why did John leave the room?
     b. How did John fix the car?

Antecedent-government of the adjunct traces is possible here, although it is well-known that this relation is subject to fairly stringent constraints; cf. Chomsky (1986b), Huang (1982), Lasnik & Saito (1984), Rizzi (1987), among others. It is not clear why (12) should apparently single out adjectival adjuncts and yet spare adverbials.

In fact, however, (12) is empirically incorrect as it stands, since it is stated as a constraint limited to APs. However, (12) holds of traces of categories in predicative position in general, cf:

(14) a. *How happy a man did John leave the room?
        (cf. John left the room a happy man).
     b. *In how bad a mood did John leave the room?
        (cf. John left the room in a bad mood).

(14a) shows that a predicative NP cannot be extracted to the nearest Comp, and (14b) shows the same thing for a predicative PP. So these examples are exactly parallel to (10a), except that the category of the extracted element is different.

We can meet the above two objections if we state (12) as a constraint on predicates. We intend "predicate" here in the Fregean sense of category with an

(17) ...X..[$_Y$...W...Z..]

Here, if W governs Z then the Minimality Condition prevents X from governing Z even if X satisfies all the other criteria for governing Z. The Minimality Condition is particularly important for the computation of antecedent-government relations; thus an intervening governor may block government of a trace by its antecedent, leading potentially to a violation of the ECP.

Rizzi proposes that the Minimality Condition be relativized such that the nature of both W and Z is taken into account. The Relativized Minimality Condition (RM) is defined as follows:

(18) *Relativized minimality*: in the configuration (17),
X α-governs Z only if there is no W such that:
(i) W is an typical potential a-governor for Z;
(ii) W intervenes between X and Z.

(19) gives Rizzi's definition of the class of typical potential a-governors:

(19) a. W is a typical potential head-governor for Z = for Z a head, W is a head which m-commands Z;
     b. W is a typical potential antecedent-governor for Z =
         i. ... in an A'-chain, W is an A'-specifier c-commanding Z.
         ii. ... in an A-chain, W is an A-specifier c-commanding Z.
         iii. ... in an X°-chain, W is a head c-commanding Z.

We can incorporate (16) into this framework in the following way:

(20) In the configuration (17) X antecedent-governs X only if there is no W such that:
(iv) Z is a θ-assigner and W is a potential θ-assigner for Z.

(21) W is a potential θ-assigner for Z iff W° is a θ-assigner and W^n mutually c-commands Z ($n \geq o$).

As indicated, (20) is to be taken as an addendum to the basic relativized minimality condition of (18). In this way we express the idea that the ban on antecedent-government of a predicate-trace across another predicate is one instantiation of the general minimality condition.

(21) contains our definition of the structural environment for θ-role assignment. This is fairly standard in that θ-assignment is defined in terms of sisterhood. Two things should be noted, however: (i) we refer to potential rather

than actual θ-assignment; (ii) any projection of a θ-assigning head "counts" for (potential) θ-assignment (cf. Chomsky (1986b:19)). Since (21) is crucial for the proper functioning of (20) we will have occasion to revise it as we proceed.

(20) predicts that no AP-trace can be antecedent-governed over a V-projection. Let us see in more detail how this works in the bad examples in (10). In (22) we give a schematic version of the relevant parts of the structures in (10a,b):

(22) $[_{CP} AP_i ... [_{VP} V^n t_i]]$

Here (21) defines V^n as a potential θ-assigner for the position occupied by the AP-trace t_i, since V is a θ-assigner and a projection of V -- V' in (10a), V° in (10b) -- mutually c-commands t_i. Therefore, V stops the moved AP from antecedent-governing the AP-trace. This means that the AP-trace is ill-formed and the sentence is ruled out. The non-AP predicate traces of (14) are ruled out in exactly the same way. The contrast between (10) and (13) holds as before as we continue to assume that APs are θ-assigners but adverbials are not.

What now accounts for the contrast between (10) and (11)? In (11), just as in (10), antecedent-government is blocked by θ-minimality. In order to account for these complement-noncomplement asymmetries, we could assume that θ-government in something like Stowell's original sense is at work, effectively "saving" the complement APs from the effects of the θ-minimality condition. However, two things show that, despite initial appearances, epistemic, causative and resultative complements are not θ-governed.

First, the APs of (11) act like adjuncts with respect to *wh*-islands and inner-islands:

(23) a. **How flat didn't John hammer the metal?
     b. *How flat do you wonder whether John hammered the metal?

(24) a. **How stupid doesn't Bill consider Pete?
     b. *How stupid do you wonder whether Bill considers Pete?

(25) a. **How happy didn't John make Mary?
     b. *How happy do you wonder whether John made Mary?

The traces in (23 - 25) fail to be antecedent-governed both by an A'-antecedent (due to the intervening A'-specifier, cf. (19b,i)) and by a θ-assigner (due to the intervening θ-assigner, cf. (20)). This account correctly predicts the ungrammaticality of these examples. However, if we were to assume that the traces were θ-governed, there would be no way to rule out these sentences. So this suggests that the grammaticality of (10) is not to be attributed to the fact

that the AP-trace is θ-governed.

The second problem for the idea that the traces of argument APs are θ-go-verned arises in connection with double-AP sequences. There are various lo-gically possible sequences of predicative APs, but those which concern us in particular here are sequences consisting of a complement AP (resultative or epistemic) and a non-complement AP (circumstantial or depictive). In these cases, extraction of an epistemic AP from a predicate containing a non-com-plement AP is bad:

(26) a. John considers Bill happy poor.
     b. *How happy does John consider Bill t poor?

(27) a. John hammered the metal flat hot.
     b. *How flat did John hammer the metal t hot?

(28) a. John ironed his trousers smooth wet.
     b. *How smooth did John iron his trousers t wet?

We assign the following structure to these examples:

(29) [$_{IP}$ NP [$_{VP}$ V [$_{AP1}$ NP AP1 AP2]]].

We thus assume that the non-complement AP (AP$_2$) is attached at the same structural level as that of the head of the small-clause (AP1). We must assu-me this structure, since we have proposed that mutual c-command is a condi-tion on θ-role assignment. In (26 - 28) the non-argument AP θ-marks the subject of the small clause. Thus, (29) is the only structure in which AP2 mu-tually c-commands the small-clause subject.

If the AP1 predicate is extracted in a structure like (29), θ-minimality will be violated on two counts: V will count as an intervening θ-assigner, as it do-es in (10), but the non-complement AP will also count as an intervening θ-as-signer. Thus, as in (23 - 25) there is an element blocking antecedent-government in addition to the governing Verb. The ungrammati-cality of (26 - 28) shows that the AP-trace is ill-formed here. Thus, again, it cannot be θ-governed by the Verb.

The same point can be made with the following sentences:

(30) a. Mary isn't as happy as Bill considers her *ec* poor.
     b. Mary isn't as happy as Bill considers her.
     c. Mary isn't as happy poor as Bill considers her.

(30a) is impossible as a comparative. Thus *ec* here cannot be a properly-gover-

ned trace, so *consider* is unable to θ-govern this trace, as in (26 - 28). Note that (30a) allows a subdeletion interpretation; we take this to show either that subdeletion does not involve *wh*-movement, or that the moved element is not a θ-assigner. The latter assumption is quite plausible; *ec* is probably an empty operator with the interpretation "*x* much."

(30b) contrasts minimally with the comparative reading of (30a), showing that the "extra" AP is what blocks this interpretation in (30a). Finally, the fact that both APs can be fronted together in (30c) suggests that they form a constituent; this is consistent with the structure we proposed in (29).

Consider next the case of extraction of a complement AP where there is a circumstantial AP present (the examples involve resultatives only, as it seems that the types of Verbs that take epistemic or causative AP-complements are incompatible with circumstantial modification):

(31) a. ??John pounded the metal flat angry.
     b. *How flat did John pound the metal t angry?

(32) a. ??John ironed his trousers smooth naked.
     b. *How smooth did John iron his trousers t naked?

Although the (a)-examples are already somewhat questionable, there is a detectable degradation under extraction. So these cases provide a further instance where the presence of a non-complement AP seems to block extraction of a complement AP.

We conclude from the above discussion that traces of (parts of) complement APs are not θ-governed. Therefore, examples like (11) must involve configurations in which θ-minimality for some reason does not prevent antecedent-government of the trace. However, examples like (26 - 28) show that these traces can be subject to θ-minimality if a further intervening θ-assigner is added in addition to the verb.

Why does θ-minimality not apply in these constructions? There are two possible answers to this question. On the one hand, we could assume that some kind of reanalysis process effectively unites the two θ-assigners, so that the Verb does not count as an intervener for the extraction of the adjective. Alternatively, we could assume that the verb does not count as a potential θ-assigner for the predicate of the small clause, since the latter is not the sister of the verb, but rather the whole small clause is. The second of these two answers seems to be the most straightforward, since on the one hand we are not then required to elaborate a theory of reanalysis, and, on the other hand, sisterhood seems to be the prime configuration of θ-assignment; it is not natural for a relation based on θ-assignment to be able to "see" inside a θ-marked category.

The proposals in (20) and (21) form the theoretical core of this article. To re-

peat: our central idea is that θ-assigners can block the extraction of other θ-assigners. This is our basic proposal for the extension of the minimality condition to cover θ-assigning categories. We will return to the issue of the theoretical status of this condition in Section 5. However, first we turn to a range of empirical consequences of θ-minimality as proposed here.

3. Further Cases

3.1. Extracting Adverbs

We saw earlier that extraction of adverbials of the type that correspond to *how* and *why* is not subject to θ-minimality (cf. the contrast between (10) and (13) above). We suggested that this is due to a difference in thematic properties between Adjectives and Adverbs, in that the former are θ-assigners while the latter are not. This idea raises two questions: first, is it a general property of Adverbs that they are not θ-assigners, and therefore not subject to θ-minimality? second, what is the relation between non-θ-assigning Adverbs and the predicate they modify if it is not a thematic one?

In this section we will see first that there is one class of Adverbs which clearly assign a θ-role to an NP and so obey θ-minimality, and second that, given a slight reformulation of (21), we can regard all other Adverbs as θ-marking the predicate they modify and explain why their traces are not subject to θ-minimality. We also discuss the total non-extractability of speaker-oriented Adverbs, accounting for this in terms of Rizzi's head-government requirement on traces.

3.1.1. Subject-oriented Adverbs. The first point concerns the class variously known as subject- or agent-oriented Adverbs, originally discussed in Jackendoff (1972). These are exemplified in (33):

(33) a. John climbed the wall deliberately.
     b. Mary voluntarily sank the boat.

These Adverbs clearly have a semantic relation with the subject or agent of the clause in which they appear. Zubizarreta (1982) argues that this relation is a kind of θ-role assignment. Zubizarreta points out that examples like (33) have paraphrases of the type in (34) where the semantic relation between the Adverb and the subject is brought out more clearly:

(34) a. It was deliberate of John to climb the wall.
     b. It was voluntary of Mary to sink the boat.

It seems that these Adverbs assign an Agent θ-role, as modification of a derived subject can lead to effects of "secondary agentivity." Moreover, these Adverbs can also modify an "implicit" subject, notably in passives. Both of these phenomena are illustrated in (35):

(35) a. Mary was willingly arrested.
      b. The boat was deliberately sunk.

A further piece of motivation for Zubizarreta's claim that subject-oriented Adverbs assign θ-roles is that they cannot co-occur with expletive subjects:

(36) *There deliberately seemed to be a riot.

We concur with Zabizarreta's conclusion that these Adverbs assign θ-roles.

Certain Adverbs are, however, ambiguous between a manner interpretation and a subject-oriented interpretation. We take this ambiguity to reside in the optional assignment of a θ-role to a subject or agent NP; if the Adverb θ-marks an NP the subject-oriented interpretation ensues, and if it does not do so the Adverb has a manner interpretation. An example of such an Adverb is *cleverly*, as illustrated in (37):

(37) John cleverly picked the lock.
      i.   John picked the lock in a clever manner (manner).
      ii. John was clever to pick the lock (subject-oriented).

On the manner reading in (37i), *cleverly* modifies the action of picking a lock; on the subject-oriented reading of (37ii), *cleverly* modifies *John*.

Chomsky (1986b:92) points out that Adverbs like *cleverly* lose the possibility of a subject-oriented reading under extraction:

(38) How cleverly did John pick the lock?

(38) can only be a question about the cleverness of the action of picking the lock: it cannot be a question about John's cleverness.

We can explain this subtle and surprising fact straightforwardly in terms of θ-minimality. The trace of a subject-oriented Adverb is the trace of a θ-assigner, and so must be θ-governed to satisfy the ECP. Such a trace is in a position mutually c-commanding a projection of V, and so V counts as a potential θ-assigner for the Adverb by the definition in (21). So the moved Adverb cannot antecedent-govern its trace, and the subject-oriented interpretation of (38) is blocked. The manner interpretation is nevertheless available since we continue to assume that manner Adverbs do not assign θ-roles, and so are not

subject to θ-minimality. Thus the θ-minimality proposal accounts neatly for the lack of ambiguity of (38).

We now expect that examples containing Adverbs which only allow a subject-oriented interpretation cannot be extracted over a Verb, i.e. cannot be extracted at all:
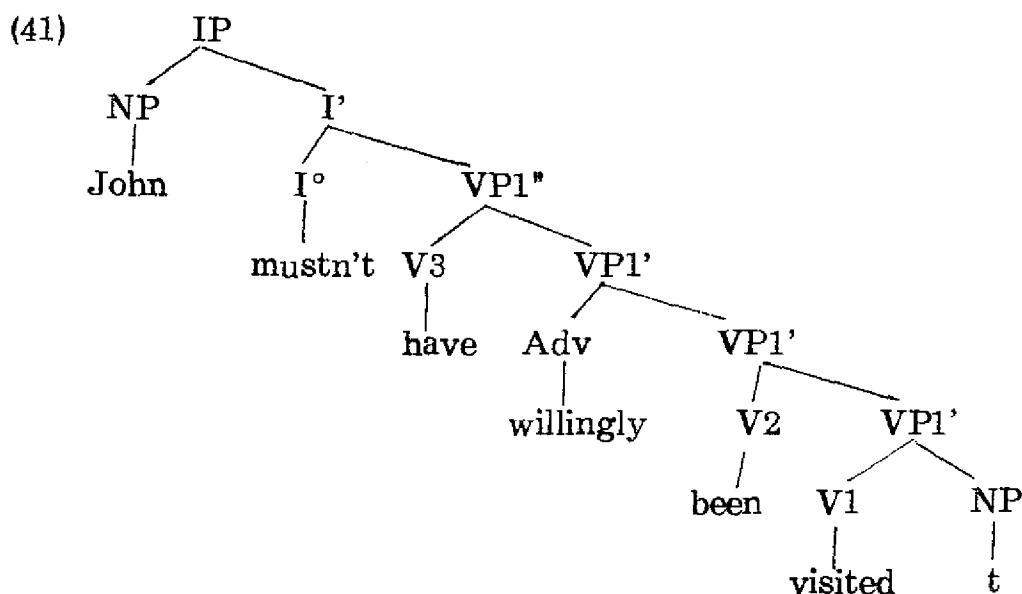
(39) a. *How deliberately was the boat sunk?
     b. *How willingly was Mary arrested?

The prediction seems to be correct.

Our account of the non-extractability of subject-oriented Adverbs is straightforward except for one thing: subject-oriented Adverbs can occupy positions relative to the main Verb which do not seem to be sister positions to a projection of that Verb. In particular, they can appear before any of the auxiliaries in a complex sequence:

(40) a. John mustn't willingly have visited the doctor for years.
     b. John mustn't have willingly been visited for years.
     c. John mustn't have been willingly visited for years.

(The interpretation varies in these examples: the "deeper" the Adverb is in the

(41)

```
                IP
              /    \
            NP      I'
            |      /   \
          John   I°     VP1"
                 |     /    \
              mustn't V3     VP1'
                      |     /   \
                   have  Adv    VP1'
                         |     /    \
                    willingly V2     VP1'
                              |     /    \
                           been   V1     NP
                                  |      |
                              visited    t
```

auxiliary sequence, the more strongly a construal with the implicit argument is favoured (cf. Roberts (1987: 3.2.1.2.)).

Since extraction of these Adverbs is uniformly bad (with the required inter-

pretation), we must assume that none of the possible base positions shown in (40) can contain an antecedent-governed trace. If we adopt the structure for auxiliary sequences which involves stacked VPs proposed in Ross (1969), then if we are to rule out extraction from all the base positions for subject-oriented Adverbs in (40) in terms of θ-minimality, (21) requires that every VP-adjoined position in the sequence of auxiliaries be sister to the projection of a θ-assigner. In other words, every VP in the sequence of auxiliaries must be the projection of a θ-assigner. There are two ways to bring about this result: (i) assume that auxiliaries assign θ-roles; (ii) assume that the basic difference between auxiliaries and main Verbs is that the former do not assign θ-roles but the latter do, and that auxiliaries form VPs which at the relevant level of representation have as their head the main Verb, not the auxiliary.

The first proposal straightforwardly gives us the required result. The second alternative amounts to the idea that, at the relevant level the structure of (40b), for example, is as follows:

An operation which we will call "Aux Reanalysis" relabels the projections of the auxiliaries such that they count as projections of the main Verb. This operation guarantees that in all the examples in (40) the Adverb is sister of a projection of a θ-assigner, i.e. the main Verb, even if auxiliaries do not assign θ-roles. The operation of Aux Reanalysis thus has the consequence that extraction of a subject-oriented Adverb from any of the positions in (40) will produce an ungrammatical sentence by leaving a trace which cannot be antecedent-governed.

Note that the Projection Principle, as it is normally understood, prevents θ-assigning heads from undergoing reanalysis. This means that the two proposed solutions to the problem posed by (40) are exclusive: auxiliaries cannot both be θ-assigners and undergo reanalysis.

We tentatively choose the second proposal for ruling out extractions of subject-oriented Adverbs on the grounds that the assumption that auxiliaries assign θ-roles is a rather implausible one; it is hard to see what the thematic relation between an auxiliary and its complement VP might be, and auxiliaries do not really seem to have a predicate-argument structure. In Roberts (in progress), I argue that certain facts related to V^n-fronting support the postulation of Aux Reanalysis, strengthening the case for the second solution to the above problem.

3.1.2. Manner Adverbs.
Here we address the question of the thematic properties of manner Adverbs. Concerning the contrast between (10) and (13), we said that these Adverbs differ from predicative Adjectives in not assigning a θ-role. However, since we are following the general proposals of Higginbotham (1985) in identifying the saturation of positions in predicate-argument struc-

ture with θ-role assignment, and since manner Adverbs have a predicate-argument structure, it does not seem right to say that these Adverbs are not θ-assigners. We will now propose a way of maintaining the idea that all Adverbs are θ-assigners, while keeping the distinction between manner adverbs and subject-oriented adverbs in that the traces of manner adverbs are nevertheless not subject to θ-minimality while traces of adjectives are.

Our proposal is to add the following proviso to (21):

(42) ... and WP is not θ-marked by Z.

(42) really derives from the postulate, which seems to be generally implicit in discussions of θ-theory, that θ-role assignment is asymmetric. Let us assume that this is true as a matter of principle (Higginbotham (1985) builds this in to his theory by banning θ-assignment to θ-assigners, a move that we do not wish to make precisely because of properties of manner Adverbs). In that case, no category W can be a potential θ-assigner for another category Z if Z actually θ-marks W. This is exactly what (42) says.

Although the idea that θ-assignment is asymmetric is fairly plausible, there is one class of cases which seems problematic. Certain verbs select manner adverbs as their complements, for example *word, behave*, etc. To the extent that selection implies θ-role assignment, we must assume that these verbs θ-mark their adverbial complements. However, the adverbs themselves must θ-mark something, too. We assume that in these cases the adverbs θ-mark V' rather than V°. So in a predicate like *word the letter carefully, carefully* θ-marks *word the letter* rather than just *word*, while *word* θ-marks *carefully*. Recall that we are assuming that $X°$ can θ-mark the sister of X^n (cf. (21)), so there is no problem with assuming that *word* θ-marks the sister of V'.

Adopting (42) allows us to make the natural assumption that manner Adverbs θ-mark the VPs which they modify. In terms of (21) and (42), VP then corresponds to WP and the Adverb to Z. By (21) alone, VP would thus count as a potential θ-assigner for the Adverb, since it is the projection of a θ-assigner which is a sister to the adverb. However, (42) ensures that, since the adverb θ-marks the VP, VP is not a potential θ-assigner for the adverb. This is true even in the case of selected adverbs like those just discussed, where V actually θ-marks the adverb; Rizzi (1988) shows that selected adverbs have exactly the extraction properties of manner adverbs more generally. (42) allows us to maintain that manner adverbs are not subject to θ-minimality, even though they do in fact assign θ-roles. The difference between (10) and (13) now resides in the fact that manner adverbs θ-mark their potential θ-assigner V', so V' no longer in fact counts as a potential θ-assigner as θ-assignment is asymmetric. On the other hand, non-selected APs θ-mark some NP in the clause, so V' counts as a potential θ-assigner for such APs and their extraction is blocked.

3.1.3. Speaker-oriented Adverbs. To complete the picture we should add a word about speaker-oriented Adverbs, like *evidently, fortunately,* etc. These adverbs cannot be extracted at all, although (43c,d) show that there is no semantic difficulty:

(43) a. *How evidently did the butler do it?
  b. *How fortunately did we leave in time?
  c. How evident was it that the butler did it?
  d. How fortunate was it that we left on time?

(44a,b) show that these Adverbs cannot appear in VP, unlike subject-oriented Adverbs:

(44) a. *John must be evidently waiting for us.
  b. *To have unfortunately been waiting for hours...

Subject-oriented Adverbs can also occur in the more peripheral positions characteristic of speaker-oriented Adverbs, i.e. pre-I and sentence-initially:

(45) a. John deliberately didn't visit the doctor.
  b. Deliberately, John didn't visit the doctor.

It seems that pre-I and sentence-initial positions are not sites from which anything can be moved. This assumption explains the non-extractability of speaker-oriented Adverbs straightforwardly in terms of their base position. We account for the impossibility of extraction from these positions by adding the following clause to the ECP (from Rizzi (1988), cf. also Kayne (1984)):

(46) t must be canonically governed by a c-commanding head.

The head-government requirement means that traces must be governed by a head in the "canonical" direction of the language (left-to-right in English). This requirement is met in most of the examples we have considered by a governing Verb. However, in (43a,b) and (44) the base position of the Adverb is not canonically head-governed (except possibly by C, but here we adopt Rizzi's assumption that C cannot head-govern). It is this requirement which prevents extraction of the speaker-oriented Adverbs in (43a,b) and of subject-oriented Adverbs from their base-positions in (44). Adverbs extracted from within VP are head-governed by either by I or by V, we assume.

Speaker-oriented Adverbs are presumably also θ-assigners. In fact, they θ-mark IP, like their adjectival counterparts (cf. (40c,d)). However, questions of

θ-minimality are irrelevant, since these Adverbs can never be extracted due to the head-government requirement on traces.

The above paragraphs show how θ-minimality applies to Adverbs. We have seen that subject-oriented Adverbs fall straightforwardly under the proposals made in previous sections for predicative Adjectives. We outlined certain consequences of this assumption for the analysis of the auxiliary system which are intailed by the θ-minimality approach. We also saw that speaker-oriented Adverbs cannot be extracted because of the head-government requirement, and that manner Adverbs can be considered as θ-assigners. Manner Adverbs are not subject to θ-minimality in the same way as other categories because they θ-mark their sister V^n, which means that the latter does not in fact count as a potential θ-assigner.

3.2. Adnominal APs

In this section we deal with the behaviour of adnominal APs. The paradigm we are concerned with is (47):

(47) a. You bought [a [wh big] house].
    b. How big a house did you buy?
    c. *How big did you buy a house?
    d. *A how big house did you buy?

(47) illustrates the basic properties of extracted adnominal APs. Starting from a DS like (47a), an SS like (47b) obligatorily results. The question that we will attempt to answer here is: why is only (47b) possible as the SS for (47a)? Other imaginable SSs derived from (47a), i.e. (47c) and (47d), are impossible. We will show that θ-minimality has a role to play in the explanation of this paradigm.

The natural proposal for the relative order of the questioned AP and the determiner in (47b) is that the AP has moved from its base position immediately preceding the head Noun to a position preceding the determiner. In order to account for this, it is tempting to adopt the "DP hypothesis" of Fukui & Speas (1986), Abney (1987) which states that Determiners are capable of heading their own projections, DPs, and that what are usually considered NPs are in fact DPs with NP complements. We could thus take the predeterminer position occupied by the AP in (47b) to be SpecDP, giving the structure in (48):

(48) [DP [AP¡ How big] [D'[D° a] [NP t¡ [N' house]]]]

However, a striking aspect of this construction is that the only determiner which can appear is *a(n)*:

(49) a. *How big the house did he buy?
     b. *How beautiful those girls did he see?
     c. *How nice three men did she meet?
     d. *How strong beer did they drink?

It is hard to see how to account for this restriction in terms of a DP analysis. Instead, then, we will assume that the AP occupies the SpecNP position in (49b) and that a precondition for this movement is cliticization of the Determiner so that the Determiner vacates the SpecNP position. Due to its phonological lightness, the only Determiner which is able to cliticize is *a(n)*. Note also that phonologically null articles are unable to cliticize, as shown in (49d).

(47b) derives from (47a), then, by movement of AP to SpecNP followed by *wh*-movement of the whole NP. Two questions now arise. First, why is AP-to-Spec movement obligatory? Failure of this movement, followed by pied-piping, gives (47d). Second, why is pied-piping of NP obligatory? Failure of pied-piping gives (47c).

θ-minimality is directly relevant for the ungrammaticality of (47c). We assume that adnominal APs, like non-adnominal ones, assign a θ-role. However, they assign a θ-role to N' rather than to NP. Moreover, we assume that N' is a potential θ-assigner; this is consistent with our proposal that any category capable of having an unsaturated position in predicate-argument structure is a potential θ-assigner. It is widely assumed that N's are predicates, and so they have an unsaturated position in their argument structure (cf. Higginbotham (1985) and Williams (1980), among others).

With these ideas in mind, consider the following substructure of (47c):

(50) *[$_{AP_i}$ How big] ... [$_{NP}$ a t$_i$ [$_{N'}$ house]

Here, in terms of the definitions in (21), N' is a potential θ-assigner, and is sister to the AP-trace. Therefore N' counts as a potential θ-governor for the trace, and so blocks antecedent-government of it by the fronted AP. So θ-minimality rules out (47c). Notice that this is true whether AP moves in one step or through SpecNP. A trace in the base-position cannot be antecedent-governed by the moved AP because it is sister to N', and, for the same reason, neither can a trace in SpecNP.

(47d) is ruled out by a different constraint, which seems to be peculiar to English:

(51) Only categories with a [+wh] Spec can undergo *wh*-movement (except a PP immediately dominating NP, and with increasing marginality, NP immediately dominating PP).

It is unclear why (51) holds, but it seems to be a correct generalization for English, as (52) shows:

(52) a. *The height of the lettering on the covers of which reports does the government prescribe?
     b. ?? The lettering on the covers of which reports does the government prescribe the height of?
     c. ?The covers of which reports does the government prescribe the height of the lettering on?
     d. Which reports does the government prescribe the height of the lettering on the cover of?

Notice that heads of relatives are not subject to the same constraint:

(53) a. (?) The reports, the height of the lettering on the covers of which the government prescribes...
     b. (?) The reports, the lettering on the covers of which the government prescribes the height of...
     c. The reports, the covers of which the government prescribes the height of the lettering on,...
     d. The reports which the government prescribes the height of the lettering on the covers of...

(cf. Ross (1967/1986: 11-12).

We do not suppose that (51) is a principle of UG. However, discussion of what it derives from, and what explains the contrast between (52) and (53), would take us too far afield. The important point is that it seems to represent a valid generalization, at least for interrogatives (and for other types of *wh*-movement, as we will see directly).

Now, any NP can be base-generated with a [+wh] Spec. In (47a), the NP containing the AP with a [+wh] Spec must have such a Spec. If not, either the AP will "strand" the NP, in violation of θ-minimality and give (47c) as we just saw, or the NP will pied-pipe without a [+wh] feature in its Spec, giving (47d). But the latter movement violates (51). Hence no well-formed SS can derive from (47a) unless NP has a [+wh] Spec and is pied-piped with the AP. On the additional assumption that there can be only one *wh*-operator per moved category, we can rule out the case where (51) is satisfied by the appearance of a separate *wh*-word in Spec NP at DS (**which how big house*; this isn't like *which pictures of who* because *how big* can't extract at LF, due to θ-minimality, or possibly standard RM). So the AP must move to SpecNP to "spell out" this feature. We conclude that θ-minimality and the requirement in (51) are

together able to explain the paradigm in (47). A remaining problem, however, is that the contrast between (52) and (53) suggests that relatives like *A however big house he bought* should be better than (47d), which does not seem to be true.

Two other points are worth making in this connection. First, the paradigm of (47) holds for other types of *wh*-movement of APs, notably that triggered by intensifiers like *too*, etc. This is illustrated in (54):

(54) a. This is too big a house for me to afford.
     b. *This is too big for me to afford a house.
     c. *This is a too big house for me to afford.

Clearly this is what we expect, to the extent that this kind of *wh*-movement is the same as that involved in questions (note that this again suggests that relatives are somewhat exceptional with respect to pied-piping). These examples illustrate further the empirical coverage of θ-minimality.

Second, APs cannot front with their complements (although *easy-to-please* complements accept fronting relatively well):

(55) a. *How crazy about his wife a man is John?
     b. *How angry at the government a woman is Joan?
     c. ?How easy to please a man is John?
     d. *How eager to please a man is John?

The *easy-to-please* complement seems able to extrapose either to NP, in (56a), or to IP, in (56b):

(56) a. How easy a man to please is John?
     b. How easy a man is John to please?

Note that (56b) seems to violate the Right Roof Constraint, in that the complement of *easy* extaposes to NP and then to IP. Other cases of CP-extraposition cannot move CP out of NP all the way to IP (*The picture of [the man t] was published [to look for]*). Also, control Adjectives and PP-taking Adjectives do not allow either type of extraposition, especially the second type:

(57) a. *How crazy a man about his wife is John?
     b. *How crazy a man is John about his wife?

(58) a. *How eager a man to please is John?
     b. *How eager a man is John to please?

We can account for the facts in (57) and (58) by assuming that the PP or IP extraposes obligatorily from AP, leaving an AP-internal trace. The ungrammaticality of these sentences suggests that the landing site of extraposition is lower than SpecNP, leading to a violation of antecedent-government of the extraposition trace which, after *wh*-movement, is contained in the AP in SpecNP. So we assume that the (a) examples involve extraposition to N'. In the (b) examples, the PP or IP is extraposed to the main IP; this position is still too low for antecedent-government of the trace inside AP, which is turn is in SpecCP. It is possible that the *easy-to-please* examples act differently due to the relative well-formedness of examples like (55c). If extraposition from AP can take place after fronting in these cases, the examples in (56) will result (although (56b) remains a Right-Roof violation). It is unclear why *easy-to-please* complements do not have to extrapose before *wh*-movement while control and PP complements must, but it seems to be generally true that *easy-to-please* complements do not have to extrapose in a number of environments where other complements to adjectives must. Cf. (55c) and (59):

(59) a. ?John is an easy to please man.
      b. *John is a crazy about his wife man.
      c. *John is an eager to please man.

Our account of (47) in terms of θ-minimality relies on the assumption that N' is a potential θ-assigner. Although reasonable in itself, this assumption raises an important issue. If N' is a potential θ-assigner, then, by the definition in (21), so is NP. On the basis of what we have said so far, this means that NPs can block extractions of θ-assigners. One case of this which is particularly important is that of Verb Raising. Emonds (1978) argued that French has a rule raising finite Verbs to Infl, while (Modern) English lacks such a rule. Without going into the details of the data Emonds' proposal accounts for, notice that movement of a Verb to I violates θ-minimality if NPs are potential thematic interveners (this is true for both transitive and intransitive Verbs assuming that subjects are base-generated in VP). Clearly, θ-minimality makes an excessively strong prediction here. However, the proviso in (42) to the definition in (21) solves the problem: (42) states that X cannot be a potential θ-assigner for Y if Y θ-marks X. This is exactly the situation that holds between a Verb and its NP arguments, so the problem described above is avoided by the postulation of (42), which, as we saw, has independent motivation. In general, NPs are more rarely thematic interveners than other categories because they are typically arguments.

However, we must also ensure that Verbs can raise where there is a secondary predicate (e.g. a circumstantial or depictive AP or a predicative NP of the kind in (14)) in VP. Here (42) is not relevant as the Verb does not θ-mark

the AP or NP. The best solution to this problem seems to be to simply assume that head-to-head movement is not subject to θ-minimality. The Minimality Condition simply prevents head-to-head movement from "skipping" other heads.

In this section we have accounted for the peculiar extraction properties of adnominal APs in terms of θ-minimality and the condition in (51). The fact that θ-minimality is important in accounting for this hitherto unexplained set of data adds further support to the inclusion of such a principle in linguistic theory.

4. θ-minimality and θ-theory

4.1. Chain-formation

Having seen how θ-minimality works, and some of its direct empirical consequences concerning the extraction of θ-assigners, as well as its indirect consequences concerning the assumptions about θ-theory the condition has led us to make, we turn in this section to the question of what underlies this condition. This will lead us to consider more closely certain aspects of θ-theory, in particular the nature of chains.

We begin our discussion with an elaboration of the system proposed in Rizzi (1988), which we introduced in 2.3. What we are interested in is Rizzi's conception of the role of θ-theory in determining the well-formedness of traces. To see this, we need some background concerning the role of referential indices and chain-formation in Rizzi's approach.

Rizzi treats the argument-nonargument contrast as a contrast in referentiality (cf. Aoun (1985), Cinque (1984)). He suggests that only referential categories have referential indices. This permits referential categories to participate in binding relations, but prevents non-referential categories from doing so. If binding is unavailable, the only relation that the theory makes available for establishing a dependency is government. Therefore non-referential traces have to link with their antecedents through a chain of antecedent-governors.

Moreover, Rizzi restricts the ECP to the simple condition on head-government that we gave as (46), and derives the conditions on antecedente from chain-formation. Well-formed chains are defined as follows:

(60) *Chains*: $(a_1, ..., a_n)$ is a chain iff a_i antecedent-governs a_{i+1}

Hence non-referential traces form chains with their antecedents, the exact structural condition on chain links being determined by RM. Referential *wh*-traces do not need to form chains, as they have indices and are therefore bound by their operators.

NP-traces, since they are not themselves argumental, must be related to their antecedents via the formation of a well-formed θ-chain. Here the condition is also RM, which guarantees that no well-formed chain can be formed across an A-position specifier, i.e. a subject. Since A-chains are abstract representations of arguments, the θ-criterion applies to these chains as well. Consider how the θ-criterion and the above definition of chains interact in (61):

(61) *John$_i$ is believed he likes t$_i$.

If the index on *he* $\neq$ *i*, the chain (*John*, t) is ill-formed because *he* counts as an intervening A-specifier. So indirectly the θ-criterion is violated. If *he* has index *i* the chain (*John*, *he*, t) directly violates the θ-criterion, as it contains two arguments.

Applying Rizzi's proposals to the case of extraction of θ-assigners, we see that θ-assigners are predicates and therefore non-referential. Therefore a chain of antecedent-governors must be formed between the moved predicate and the non-referential trace it leaves behind. This leads to the postulation of chains formed by θ-assigners. Thus consider (62), where NP is θ-marked by both AP and V:

(62) AP [+θ] [$_{VP}$ ... V[+θ] ... NP ... t]

Let us see what the various possibilities for deriving a well-formed structure here are.

What Rizzi's system tells us is that the non-referential AP-trace must form a chain with something. Θ-minimality tells us that it cannot form a chain directly with AP because AP does not antecedent-govern it, because of the intervening θ-assigner, V. This is the basic case of θ-minimality rephrased in terms of chain-formation.

However, θ-minimality does not prevent the AP-trace from forming a chain with V. In that case, it would count as a Verb trace. What prevents this? We can understand the Projection Principle as requiring particular structural relations to hold between θ-assigners and their arguments, and thus as governing the formation of chains of θ-assigners. For example, in (62) the Projection Principle requires both AP and V to head chains a link of which mutually c-commands NP (at all levels of representation) since NP is to be interpreted as an argument of both AP and V. The moved AP does not mutually c-command NP in its moved position, so in order to satisfy the requirement imposed by the Projection Principle it must form a chain with t. Hence, even if t is allowed to count as a verbal trace (and it is possible that the Projection Principle may in fact rule this out too), the structure will be ill-formed if just the chain (V, t) is formed since AP be unable to be interpreted as having NP as its ar-

gument.

The only other possibility is formation of the chain (AP, V, t). This will yield a well-formed representation in that the antecedent-government condition on chain-formation (which in this case is sensitive to θ-assigners) is not violated. However, such a chain contains two θ-assigners, AP and V; arguably such a chain, like the converse case of a chain containing two arguments, violates the spirit if not the letter of the θ-criterion. If this is so, then no well-formed chain can result in (62). (Alternatively, it may be possible that certain "reanalysis" operations involve the formation of a chain containing two θ-assigners; we will not explore this possibility here, however).

5. Conclusion

The basic goal of this paper has been the investigation of the extraction properties of certain predicative, i.e. θ-assigning, categories, in the hope that the theory of extraction and θ-theory could shed some light on each other. Our basic proposal, which we have articulated in terms of the Relativized Minimality framework being developed by Rizzi (1987, 1988), is that predicates cannot be extracted across other predicates.

In developing our theory of the extraction of predicates, we elaborated a number of principles of θ-assignment. The most important of these are (i) that θ-assignment takes place under sisterhood; (ii) that θ-role assignment is asymmetric; (iii) θ-assigners can form "θ-chains" of a particular kind.

On the empirical side, we saw how the θ-minimality condition accounts for the following facts: (i) the impossibility of extracting circumstantial, depictive and intransitive resultative APs; (ii) the impossibility of extracting subject-oriented Adverbs; (iii) the peculiar properties of adnominal-AdjP extraction. In each case, our proposals led to an increased understanding of the general properties of the construction. Thus we effectively arrived at an outline theory of a number of aspects of the syntax of English Adjectives and Adverbs.

Above all because of what we consider its empirical value, then, we propose that the θ-minimality condition, or something very like it, is a principle of UG.

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