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On the structural position of time clauses*

1. Introduction

An important problem for recent theories of X-bar structure is the syntactic position of complex adverbials, like e.g. time clauses. These adverbials were usually analysed as adjoined to a verbal or inflectional projection within the clause that they modify. However, the possibility of adjunction is severely restricted in recent approaches to X-bar theory, in particular in Kayne's (1994) antisymmetry theory. Kayne's proposal excludes right-adjunction and also restricts left-adjunction to at most one Spec position per maximal projection. These limitations raise some substantial problems for the adjunction analysis of complex adverbials.

An alternative that has been proposed in the literature is the "complement analysis" by Larson (1988; 1990) and Stroik (1990). On this account, complex adverbials are structurally indistinguishable from verbal complements; this solution is compatible with the antisymmetry theory (cf. Kayne 1994: 69-71).

The aim of this paper is to critically examine the empirical evidence that bears on the structural relation of complex adverbials to the matrix constituents, so as to evaluate the predictions of the two above mentioned approaches. The discussion will be restricted to one type of complex adverbial, namely time clauses.

To begin with, let us consider the linear positions that time clauses can occupy in a string. Examples (1)-(5) below show that they can appear in a clause-initial position, characterized by a topic-like intonation contour. Furthermore, they may occur in a sentence-final position included in the same intonation unit as the main clause (6)-(10). Finally, they may occupy a sentence-final position intonationally separated from the main clause, as is tipical of right-dislocated phrases; the intonation break is indicated in (11)-(15) by a comma.

(1) Prima di partire, Gianni mi ha telefonato
(2) Dopo che Gianni è uscito, ho cominciato a lavorare
(3) Quando entra il capo, Gianni si mette a lavorare
(4) Mentre io riposavo, lui ha lavato i piatti
(5) (Non) appena mi ha visto, mi è corso incontro

(6) Gianni mi ha telefonato prima di partire
(7) Ho cominciato a lavorare dopo che Gianni è uscito
(8) Gianni si mette a lavorare quando entra il capo
(9) Lui ha lavato i piatti mentre io riposavo
(10) Mi è corso incontro (non) appena mi ha visto

(11) Gianni mi ha telefonato, prima di partire
(12) Ho cominciato a lavorare, dopo che Gianni è uscito
(13) Gianni si mette a lavorare, quando entra il capo
(14) Lui ha lavato i piatti, mentre io riposavo
(15) ? Mi è corso incontro, (non) appena mi ha visto

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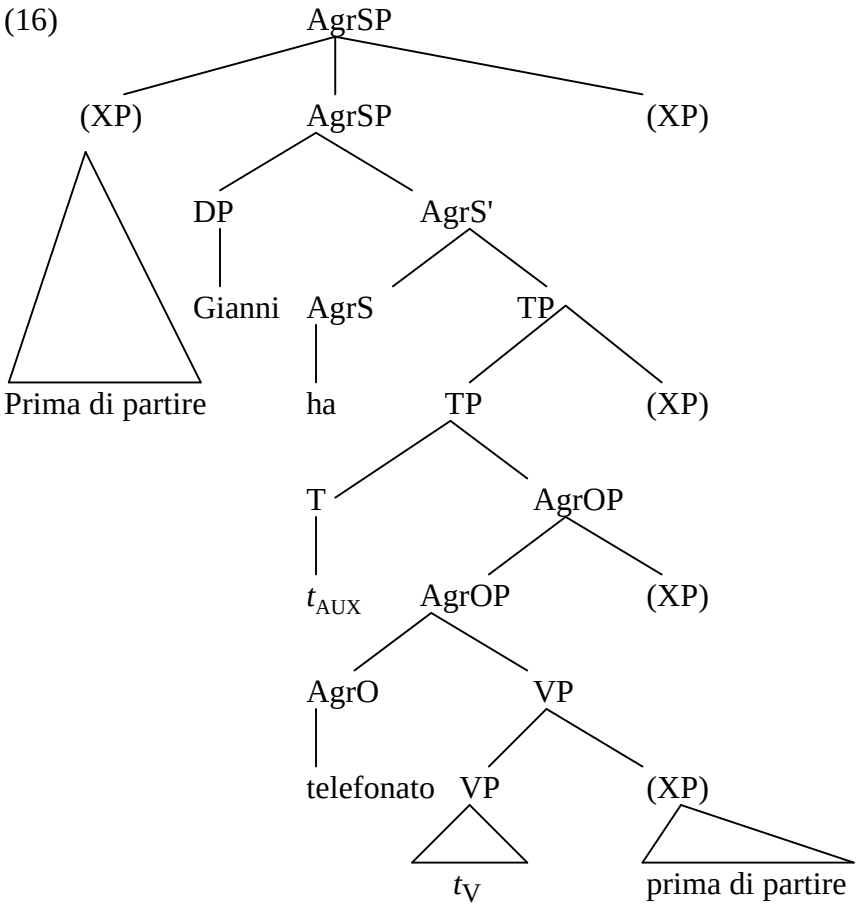
The three positions correspond to a different status of the time clause with respect to the topic-comment and focus-background articulation of the whole sentence; this in turn affects the interpretation of the time clause in quantificational structures (Bonomi 1995) and in aspectually marked contexts (Bianchi *et al.* 1995). With respect to these, the right-dislocation position patterns with the sentence-initial position. For the purposes of this discussion, we can put aside the right-dislocation position and simply bear in mind that time clauses can occur at the left or right periphery of the matrix clause.[1] Let us now review the two analyses that have been proposed in the literature for these peripheral positions.

2. The adjunction analysis

The received analysis of adverbial clauses takes them to be adjoined to some level of the extended projection of the verb in the matrix clause. Thus, the left-peripheral clauses in (1)-(5) will be left-adjoined to the highest inflectional projection; this may be either a base position, or the result of topicalization from a lower position. The right-peripheral clauses are instead right-adjoined to VP or to any higher projection in the inflectional structure:

(16)



[1] This statement requires some qualifications. A sentence-initial time clause can be preceded by topicalized constituents:
(i) Quel dolce, dopo averlo preparato, devi conservarlo in frigo.
A sentence-final time clause can be followed by right-dislocated or heavy shifted constituents:
(iii) Le ho date a Gianni, prima di partire, le chiavi della mia auto
(iv) Ho dato a Gianni, prima di partire, le chiavi della mia auto.

While the initial position is clearly attached to a high node dominating the whole matrix clause, the level of attachment of right-hand adjuncts is not immediately evident: in fact, different attachments give the same linear order, with the adjunct following the terminal symbols dominated by VP.

It is usually assumed that a modifier is adjoined to the category that it semantically modifies, in virtue of an UG interpretive principle (cf. for instance Wiltshcko 1994). Under this assumption, time clauses must be adjoined to a time-denoting or event-denoting category, presumably VP or TP; the left-initial position in (1)-(5) may be conceived of as an instance of topicalization.

This interpretive principle determines *a priori* the level of adjunction of various clause types; however, it is possible to empirically verify its predictions. First, binding evidence can determine which constituents of the matrix clause c-command a right-adjoined clause. If the lowest possible adjunction site is VP, then the time clause is not c-commanded by VP-internal constituents. Second, the principle predicts a fixed relative ordering of various clause types; in fact, if a clause XP^1 is adjoined to a lower projection than another XP^2, then XP^1 will linearly precede XP^2. These types of evidence will be discussed in section 4.

Let us consider this analysis in the light of the antisymmetry theory. This theory has three major consequences for XP-adjunction, diverging from the standard X-bar theory (cf. Kayne 1994: 15-32):

(i) no multiple adjunction to a category is allowed;

(ii) adjunction is always to the left, i.e. the adjoined category precedes its host;

(iii) the specifier position is adjoined, and it c-commands outside the category that it is adjoined to.

As it can be easily seen, the adjunction analysis of time clauses is inconsistent with the antisymmetry theory. Consider first the sentence-initial position in (16). The time clause is adjoined to the highest inflectional projection. But this projection also has another adjunct, the specifier subject position filled by *Gianni*; this is an illicit instance of double adjunction. In this case, it is necessary to assume that the time clause is the specifier of a higher projection whose head is phonetically empty (cf. Kayne 1994: 27-30). For concreteness, let us assume that this is a Topic projection.

But the problem is much worse for the right-adjoined position. Since an adjoined element is linearly ordered to the left of its host, it cannot be sentence-final (unless the host category is completely void of phonological material). In (16), the time clause is adjoined at least as high as VP, and it must linearly precede the VP-internal constituents. Thus, the sentence-final position of time clauses raises a substantial problem for the antisymmetry theory.[2]

3. The complement analysis

Since in (6)-(10) the time clause linearly follows all the internal constituents of the VP, it may be taken to be asymmetrically c-commanded by them. In other terms, the right-hand time clause may be generated in the lowest position within the VP.

An analysis along these lines has been first proposed by Larson (1988; 1990). Larson assumes a binary branching constraint[3] and proposes that the internal structure of the VP consists of recursive VP shells. In a structure with two verbal complements, the higher shell is headed by an empty V head which takes a specifier (the VP-internal subject position) and a VP complement. The lower VP is headed by the lexical verb and hosts the objects in its Spec and in the lowest complement position:

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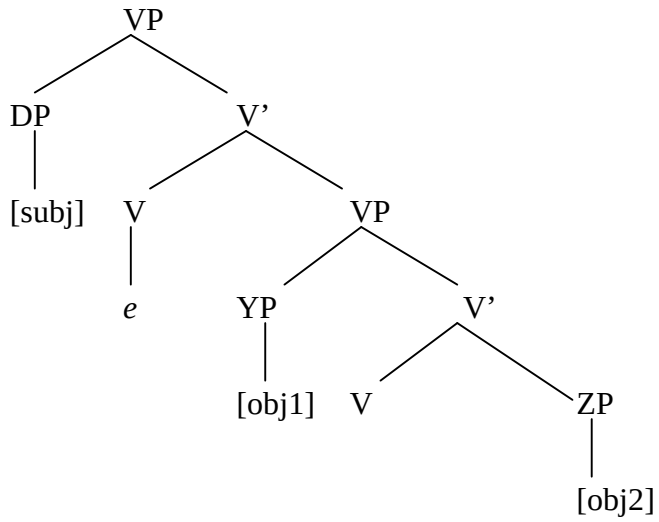
[2] The same holds for Chomsky's (1995) "bare phrase structure theory" if the latter incorporates some version of the LCA (Chomsky 1995: 334-340), and also for Haider's (1993) Branching Constraint.

[3] Namely the Single Complement Hypothesis (Larson 1988: 380-81).

(17)



The base position of the verbal arguments is determined by the Thematic Hierarchy (18) and by the principle of argument projection (19):

(18) Thematic Hierarchy
Agent > Theme > Goal > Obliques (manner, location, time...)

(19) If a verb A determines theta-roles θ_1, θ_2, ...θ_n, then the lowest role on the Thematic Hierarchy is assigned to the lowest argument in constituent structure, the next lower role to the next lowest argument, and so on. (Larson 1988: 382)

Note that the Thematic Hierarchy (18) also includes manner, location and time modifiers: these are not analysed as adjuncts, but rather as the most oblique verbal complements,[4] and by principle (19) they are realised in the lowest argument positions within VP, and hence surface to the right of the less oblique verbal complements.

The surface linear order with the verb preceding all of its complements is obtained by raising the lexical verb from the lower head position to the higher empty V position.

This analysis obviously extends to time clauses: the right-hand time clause in (6)-(10) occurs in the lowest VP-internal position (cf. Larson 1988: 350; 384).[5] The representation of the matrix VP of (9) will be something like (20):

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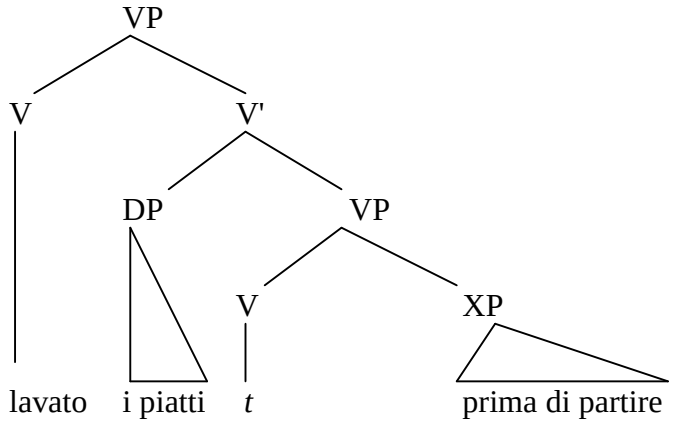
[4] Larson (1990: 623-624) claims that this conception of adjuncts follows from Parson's (1990: 69-76) analysis of theta roles as relations between the event *e* expressed by the verb and a participant in that event. The interpretation of the time clause in (i) will be along the lines of (ii) (disregarding past tense):
(i) Prima di partire, Gianni ha lavato i piatti
(ii) (∃e) washing (e) & agent(e, Gianni) & patient (e, dishes) & time (e, t: before leaving (t))
Note however that manner adverbs such as *slowly* simply predicate a property of an event (Parsons 1990: 44-45, after Davidson), and hence it is not obvious that they can be included in the Thematic Hierarchy.
Empirically, the assimilation of verbal modifiers to oblique complements is supported by Larson's (1988) analysis of "heavy NP shift". Suppose that in the structure (17) YP is a "heavy" direct object DP and ZP is a PP complement:
(i) [$_{VP}$ Spec [$_{V'}$ V [$_{VP}$ DP [$_{V'}$ V PP]]]]
The final position of the heavy DP is obtained by reanalysing the V' of the lower shell as a complex predicate of category V, and raising it to the head position of the highest shell:
(ii) [$_{VP}$ Spec [$_{V'}$ [$_{V}$ V PP] [$_{VP}$ DP t_V]]]
The point is that the PP raised to the left of the DP can be not only a complement, but also a modifier, as in (iii):
(iii) I [saw at the conference] [everyone who believes in UFOs] (Larson 1988: 349)
Hence, PP modifiers too must be analysed as internal to V'.

[5] The sentence-initial position is presumably the result of topicalization.

(20)



It is impossible here to discuss the pros and cons of Larson's proposal (see Jackendoff 1990 and Williams 1994: 178-98 for a criticism). What is important here is to note that, whatever its merits, this solution yields the linear ordering of terminal symbols predicted by the antisymmetry theory, with the most deeply embedded constituent in the rightmost position. In fact, the complement analysis is adopted by Kayne (1994: 69-71) for sentence-final adverbials in general.[6] Note that this proposal differs from the adjunction analysis with respect to some specific empirical predictions: first, as the time clause is c-commanded by the VP internal complement, it should be accessible for binding by the latter; second, the relative ordering of right-hand adverbial clauses should be unambiguously determined by their relative prominence in the Thematic Hierarchy (18).

4. The sentence-final position

This section presents a systematic review of the empirical tests that bear on the choice between the adjunction analysis and the complement analysis for time clauses in sentence-final position. As mentioned above, this is usually taken to be the "base" position. The evidence will turn out to be contradictory and open to alternative interpretations; this will lead us to a critical evaluation of the empirical tests themselves. The following section 5 will then present evidence concerning the sentence-initial position.

4.1. Evidence from binding

As mentioned above, the two analyses of right-hand time clauses make distinct predictions with respect to binding phenomena. In the complement analysis (20), the right-hand time clause is in the lowest position within VP, and hence it is c-commanded by all the preceding constituents, including, crucially, the verbal complements. In the adjunction analysis (16), instead, the right-hand time clause is attached at least as high as VP, and hence it is not c-commanded by the VP-internal complements. If it is adjoined to AgrSP, it is not even c-commanded by the preverbal subject.[7]

Consider first principle C effects. By principle C of the binding theory, an R- expression cannot be A-bound. For our purposes, we may verify whether an R expression embedded

[6] The complement analysis has been independently defended by Stroik (1990) on the basis of binding evidence (cf. section 4.1) and, for time adverbials, by Giorgi & Pianesi (1995: 113-126) (cf. section 4.8) and Bertinetto & Delfitto (1995). It is also adopted for theory-internal reasons by Chomsky (1995: 332).

[7] Of couse, I am here keeping to the standard X-bar theory, in which specifiers do not c-command outside the maximal projection that they are specifiers of.

within a right-hand time clause can corefer with a pronominal argument of the main clause, in particular, a preverbal subject or a complement.

The following English data show a subject/complement asymmetry in this respect. A verbal complement can freely corefer with an R-expression embedded in a time clause (21a); on the contrary, free coreference is impossible for a preverbal subject (21b). This means that the preverbal subject c-commands the time clause, but verbal complements do not:[8]

(21) a. I told her$_i$ [before Mary$_i$ asked]
b. * She$_i$ knew me [before I met Mary$_i$] (Manzini 1995)
c. Mary shot him$_i$ [before John$_i$ could leave] (Williams 1994:180)
d. * They$_i$ visited us [before we admitted those students$_i$]
e. ?? We interviewed them$_i$ [before we admitted those students$_i$]
(Chomsky 1986: 61)

If the right-hand time clause were in a VP-internal complement position, it would have to be c-commanded both by the subject and by the preceding verbal complements, just like the complement clause in (22):[9]

(22) a. * I told her$_i$ [that Mary$_i$ should ask me]
b. * She$_i$ knew [that I met Mary$_i$] (Manzini 1995)

This pattern also holds in Italian:

(23) a. ? Le$_i$ ho detto la verità [prima ancora che Maria$_i$ mi facesse domande]
b. * Lei / *pro*$_i$ mi conosceva [già prima che io incontrassi Maria$_i$ a quella festa]
(24) a. * *pro* le$_i$ hanno detto [che Maria$_i$ era stata licenziata]
b. * Lei / *pro*$_i$ mi ha detto [che Maria$_i$ era incinta]

Thus, the principle C effects reveal an asymmetry between time clauses and complement clauses, which is not expected if they are structurally identical. On the basis of these data, Williams (1994:180) and Manzini (1995) conclude that the complement analysis is untenable; the right-hand time clause must be attached at an intermediate level that is not c-commanded by the verbal complement but is in the c-domain of the preverbal subject.

A possibility suggested by Kayne (1994: 71) is that the time clause raises out of VP in LF to a position that is not c-commanded by the verbal complements. Assuming with May (1991) and Chomsky (1995:190-94) that the binding theory applies at LF, the observed subject/complement asymmetry of (21) and (23) follows. Manzini (1995) objects to this proposal that there is no clear trigger for this LF raising. One would have to assume that time clauses are generated in a low position in virtue of the Thematic Hierarchy (18), but they must

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[8] Brody (1995: 82-94) judges an example parallel to (21a) ungrammatical (cf. also Larson 1990: 622):
(i) * We never saw him$_i$ [before we examined John Smith$_i$]
He assumes that principle C is sensitive to m-command rather than to c-command; the time clause is adjoined to VP, and it is m-commanded by the direct object.
A possible interfering factor is that in (i) and in (21e), contrary to (21a), the R-expression is in focus (clause-final) position, and focus is known to interfere with backward anaphora (see Delfitto 1990 and Williams 1994:237 ff. for discussion).

[9] Cf. also the following contrasts (quoted by Larson 1990: 622):
(i) ? They booed him$_i$ [before the candidate$_i$ could finish his speech]
(ii) * They told him$_i$ [that the candidate$_i$ would not finish his speech]
(iii) Every contestant$_i$ was given a prize [before the idiot$_i$ could protest]
(iv) * Every man$_i$ thinks [that Mary likes the idiot$_i$]

raise in LF to a tense-denoting category in order to be properly connected to the "temporal structure" of the main clause.

Principle A effects are difficult to test, because the time clause itself constitutes the minimal governing category for an anaphor that it embeds.[10] As for PP time adverbials, Jackendoff (1990:453) reports a contrast between a directional PP complement, in which an anaphor can be bound by a preceding direct object, and a time PP adverbial:

(25) a. I sent [John and Bill]$_i$ [$_{PP}$ to each other$_i$'s classrooms]
b. ?* I saw [John and Bill]$_i$ [during each other$_i$'s classes]

On the other hand, quantifier binding is not clause-bound, and it provides a good test for time clauses. Strikingly, this binding phenomenon gives an opposite result with respect to principle C. In fact, a pronoun embedded in a time clause can be bound by a matrix complement: compare the examples in (26) to (21a) and (23a) above:

(26) a. I saw everyone$_i$ [the day before he$_i$ died] (Stroik 1990: 656)
b. I invited nobody$_i$ [before he$_i$ met you]
c. I did not invite anybody$_i$ [before he$_i$ met you] (Manzini 1995)
d. Mary hit each man$_i$ [before the other$_i$ could intervene] (Cinque 1990: 190)
e. We will sell no wine$_i$ [before its$_i$ time] (Higginbotham 1988)

This possibility is confirmed by the Italian paradigms (27)-(28), showing that quantifier binding into a time clause is possible both for the matrix subject, the direct object, and a PP object:

(27) a. Ogni prigioniero$_i$ è fuggito [prima che lo$_i$ condannassero]
b. Ho intervistato ogni prigioniero$_i$ [prima che lo$_i$ condannassero]
c. Ho parlato con ogni paziente$_i$ [dopo averlo$_i$ visitato]
(28) a. Nessun paziente$_i$ si è fatto vivo [dopo che lo$_i$ abbiamo dimesso]
b. ? Non ho più rivisto nessun paziente$_i$ [dopo che lo$_i$ abbiamo dimesso]
c. Non scrivo su nessun argomento$_i$ [prima di averlo$_i$ studiato a fondo]

Thus, we seem to run into a contradiction: principle C effects suggest that a right-hand time clause is not c-commanded by VP-internal material, but quantifier binding facts suggest the opposite conclusion.

As discussed by Manzini (1995), it is possible to eliminate the contradiction by adopting a different conception of quantifier binding. In the approach of Reinhart (1983), quantifier binding is only possible if the S-structure A position of the quantified expression c-commands the variable. However, it is commonly assumed that quantified expressions undergo in LF an operation of Quantifier Raising which moves them to a position having clausal scope (May 1985; Stowell & Beghelli 1994). It is then possible to assume that what counts for quantifier binding is not the surface argument position of the QP, but rather its LF scope position. Thus in (26), (27b-c) and (28b-c) the time clause may not be c-commanded by the VP-internal complement positions, but it is c-commanded by the QP complement in LF after Quantifier Raising:

(29) a. I [$_{VP}$ saw everyone] [the day before he died]
b. LF: [Everyone]$_i$ I [$_{VP}$ saw t_i] [the day before he$_i$ died]

[10] The long-distance anaphor *proprio* in Italian tends to be subject-oriented, and hence it is not suitable for testing subject/object binder asymmetries.

But as is well known, binding from the LF position of the QP must be restricted so as to account for the "weak crossover" effect in (30b):

(30) a. [Those who know her$_i$] adore Zelda$_i$
b. * [Those who know her$_i$] adore every girl$_i$

In (30a), the pronoun does not c-command the R-expression; in turn, the R-expression does not c-command the pronoun, and *a fortiori* does not bind it. Under these conditions, the two constituents can corefer "accidentally". This is possible because they both have a fixed reference (Reinhart 1983: 137 ff.).

On the other hand, in (30b) the pronoun cannot accidentally corefer with the quantified expression *every girl*, which does not have a fixed reference. The impossibility of any anaphoric relation shows that syntactic binding is impossible as well. This is not predicted if the pronoun can be bound in LF from the scope position of the QP. In fact, in LF the direct object QP can raise to a position that has sentential scope and c-commands the pronoun:[11]

(31) LF: [Every girl]$_i$ [those who know her$_i$] respect t$_i$

Therefore, the LF binding configuration (31) must be excluded.[12]

In order to rule out (31), it is possible to assume that quantifier binding is not sensitive to c-command, but rather linear precedence.[13] Recently, Acquaviva (1995), Brody (1994) and Williams (1994) have argued that anaphoric dependencies in general are sensitive to linear precedence,[14] whereas principle C is sensitive to c-command. That the two types of phenomena are subject to different conditions is shown by the grammaticality of examples like (32)-(33), where quantifier binding by the QP *each boy* would require c-command of the

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[11] If the object QP is instead adjoined to VP in LF, it is unable to bind the pronoun embedded within Spec,IP in (31):
(i) [$_{IP}$ [Those who know her$_i$] [$_{VP}$ [every girl]$_i$ [$_{VP}$ respect t_i]]]
On the other hand, the QP will still c-command the time clause in (29) if the latter is right-adjoined to VP. Cf. Delfitto (1990) for a proposal along these lines.

[12] The configuration in (31) is one of Weak Crossover. For analyses of this phenomenon alternative to Reinhart's, see Koopman & Sportiche (1982), Safir (1984) and, more recently, the discussion in Lasnik & Stowell (1991). These analyses too exclude (34b) as a Weak Crossover configuration on a par with (36). Also Williams (1994: 198) observes that the adjunction analysis incorrectly predicts a Weak Crossover violation in the following example, parallel to (34b):
(i) Who$_i$ did you [see t_i] [before he$_i$ died] ?

[13] This requires the assumption that linear precedence is visible at LF (*contra* Chomsky 1995: 334-35), given the possibility of binding under reconstruction:
(i) [Quale dei propri$_i$ quadri]$_k$ pensi che ogni pittore$_i$ voglia vendere t$_k$?
Alternatively, Williams (1994: 246) analyses binding as a relation holding between thematic roles rather than between syntactic constituents, so that the base thematic position of constituents is relevant. See section 4.9 for further discussion.

[14] A similar point can be made with respect to the licensing of Negative Polarity Items. Under standard assumptions, these must be licensed under S-structure c-command by an "affective" operator (cf. for instance Larson 1990: fn. 3). As for licensing of an NPI within a time adverbial, the judgements reported in the literature are somewhat contradictory :
(i) John visited *few* friends *any* day this week. (Larson 1990: 591)
(ii) * Mary hit *noone* [after *anyone* could intervene] (Acquaviva 1995)
In any event, Williams (1994: 190) argues that NPI too are sensitive to linear precedence and not to c-command. In the following example, the negative phrase is embedded in a DP complement to a preposition and does not c-command the NPIs that it licenses:
(i) I gave [to [*noone*' s parents]] [*any* indication that *anything* was amiss].
Reversing the linear order, however, prevents the licensing of the NPI:
(ii) * I gave [*any* indication that something was wrong] [to [*noone*' s parents]].

purpose clause by the verbal complements, but principle C would impose the opposite requirement to allow coreference between the pronoun and the R-expression *Mary:*

(32) I sent each boy$_i$ to her$_k$ [in order to make Mary$_k$ meet him$_i$] (Brody 1994)
(33) ? Le$_i$ presenterò ogni studente$_k$ [solo dopo che Maria$_i$ lo$_k$ avrà esaminato]

The linear precedence condition correctly excludes the quantifier-pronoun dependency in (30b), but not in (29a).

In conclusion, the binding evidence turns out to be contradictory: principle C effects support the adjunction analysis, whereas quantifier binding supports the complement analysis, under the assumption that both are sensitive to c-command relations.

A first solution consistent with the complement analysis is to rely on the quantifier binding data, and to dispose of the principle C effects by assuming LF movement of the time clause to some intermediate position. Note however that this LF raising of the time clause eliminates c-command by a verbal complement for the purposes of principle C but not for the purposes of quantifier binding (cf. (21a,c) vs. (26)). It is then necessary to assume, following Brody (1995), that all the links of a chain are visible in LF; the various c-command or anti-c-command conditions must be satisfied by at least one chain link. This also provides a solution for the contradictory binding requirements in examples (32)-(33).

A second solution is to assume that only principle C is sensitive to c-command, whereas quantifier binding is sensitive to linear precedence. Then the latter phenomenon becomes irrelevant to the determination of the structural position of time clauses; only principle C effects are relevant, and they support the adjunction analysis.

For the moment, let us leave open the choice between the two solutions; the problem will be thoroughly discussed in section 4.9.

4.2. Parasitic gaps

The phenomenon of parasitic gaps can be used as a diagnostic for the level of attachment of right-hand time clauses. In fact, the widely assumed anti-c-command condition requires that the parasitic gap be not c-commanded by the primary gap (cf. Chomsky 1986: 54 ff.). Therefore, a parasitic gap within a time clause can only be linked to a primary gap that does not c-command the time clause itself.

Once again, a subject/object asymmetry emerges:

(34) a. This is the man$_i$ that I knew t_i [even before meeting e_i]
b. * This is the man$_i$ that t_i knew me [before I met e_i] (Manzini 1995)
c. What$_i$ did you file t_i [before you read e_i] ?
d. * Who$_i$ t_i met you [before you recognized e_i] ? (Chomsky 1986: 54)
e. ? Who$_i$ did you hire t_i [after you talked to e_i] ?
f. * Who$_i$ t_i went home [after you talked to e_i] ? (Kayne 1994: 70)

This suggests that the time clause occupies a position c-commanded by the preverbal subject but not by the direct object.

Consider also the corresponding Italian data:

(35) a. Quello è l' uomo$_i$ che conoscevo t_i [ancor prima di incontrare e_i]
b. ?* Quello è l' uomo$_i$ che t_i mi conosceva [prima che io incontrassi e_i]
c. Il libro$_i$ che ho buttato via t_i [ancor prima di finire e_i] ...
d. ?* Il libro$_i$ che è stato premiato t_i [dopo che abbiamo pubblicato e_i]...

e. ? Quale pentito$_i$ pensi che uccideranno t_i [prima che la polizia possa interrogare e_i]?
f. * Quale pentito$_i$ pensi che scomparirà t_i [prima che la polizia possa interrogare e_i]?

These data confirm the subject/object asymmetry and support the adjunction analysis.[15]

The complement analysis instead predicts that all the preceding examples would have to be ungrammatical: if the right-hand time clause occupies the lowest complement position within VP, then the parasitic gap will be c-commanded both by the preverbal subject (34b) and the direct object (34a), (35a,c,e). Once again, the prediction is incorrect.[16]

A slightly different version of the anti-c-command condition is proposed by Brody (1995: 82-94), who discusses the following contrast:

(36) a. ? Who$_i$ did Bill believe [t_i visited you [without you having invited e_i]]?
b. * Which girl$_i$ did you expect [t_i met [everyone who liked e_i]]?

In (36a) the parasitic gap is contained in an adverbial clause, by hypothesis adjoined to the embedded clause VP; in (36b), it is contained in the direct object of the embedded verb. In both cases the parasitic gap seems to be c-commanded by the primary gap in Spec,IP, in violation of the anti-c-command requirement; yet (36a) is grammatical.

Developing a suggestion by Chomsky (1986: 63), Brody argues that what counts for parasitic gap dependencies is not the preverbal subject position, but the thematic subject position within VP. In (36b), the primary gap in this position c-commands the parasitic gap, so that a single representational chain is built in which the parasitic gap is the root, and the primary gap is a non-root theta position. This constitutes a violation of the Main Thematic Condition, according to which only the root of a chain can be theta-related. In (36a), instead, the clause adjoined to VP is not c-commanded by the thematic subject position (Spec,VP), and it is possible to construct a "branching dependency" in which two thematic root positions are related to a single operator. This analysis presupposes a structural asymmetry between adjuncts and complements.

Alternatively, one may reject the assumption that parasitic gaps are subject to an anti-c-command requirement. In fact, Chomsky (1986: 61; 67) and Manzini (1995) point out that in the following examples the primary gap in the indirect object position licitly c-commands the parasitic gap embedded in the complement clause:

(37) a. This is the man$_i$ that [I told t_i [they would arrest e_i]]
b. Which man$_i$ did the police warn t_i [that they were about to arrest e_i] ?
c. Che studente$_i$ hai convinto t_i [che puoi aiutare e_i] ?
d. * Che studente$_i$ è stato convinto t_i [che puoi aiutare e_i] ? [17]

In order to maintain the anti-c-command requirement, one would have to assume that the complement clauses in (37a-c) have been extraposed and right-adjoined to VP, so that they are not c-commanded by the VP-internal primary gap (cf. Chomsky 1986: 67). However, this

[15] Recall that in Italian the subject can be extracted from the inverted position (Rizzi 1982; 1990: ch. 2). The ungrammaticality of (35b,d,f) suggests that this position too c-commands the right-hand time clause; but see the discussion around (36).

[16] As mentioned in section 4.1, the time clause may be moved to a position higher than the direct object in LF by a process akin to scrambling (Kayne 1994: 71).

[17] The judgements on these examples are delicate. Chomsky (1986: fn. 45) points out that in (37b) *warn* also allows an intransitive interpretation, with no primary gap in the main clause. The degraded status of (37d) may be related to the Case mismatch between the two gaps (cf. Kiss 1985).

solution is stipulative,[18] and more importantly, it is unclear why a similar string-vacuous extraposition of the complement clause cannot avoid the principle C violation in (22a) above.

If we reject the anti-c-command requirement, we are left with two alternatives: the 0-subjacency Condition (Chomsky 1986:64 ff.) or the Connectedness Condition (Kayne 1984: chapter 9; Longobardi 1985).

On the 0-subjacency account, the parasitic gap in (34)-(35) is not directly bound by the main operator, but it is bound by a null operator sitting in the highest Spec of the time clause. The latter must be 0-subjacent to the main operator, i.e. it can be separated from it by at most one barrier. If the time clause is adjoined to VP, in Chomsky's (1986) locality theory it will be 0-subjacent both to the direct object and to the subject, since a segment of VP does not qualify as a barrier:

(38) a. the man$_i$ that [$_{VP}$ [$_{VP}$ I knew t_i] [*Op*$_i$ even before meeting e_i]]
b. the man$_i$ that [$_{IP}$ t_i [$_{VP}$ [$_{VP}$ knew me] [*Op*$_i$ before I met e_i]]

Hence, no subject/complement asymmetry is expected.

In the complement analysis, instead, the time clause is dominated by the whole VP, which is an inherent barrier in Chomsky's system. Since the null operator is also dominated by another barrier, i.e. the time clause, it will be 0-subjacent to the direct object, but not to the subject, which is outside VP (Chomsky 1986: 64)

(39) a. the man$_i$ that I [$_{VP}$ knew t_i [*Op*$_i$ before meeting e_i]]
b. the man$_i$ that [$_{IP}$ t_i [$_{VP}$ knew me [*Op*$_i$ before I met e_i]]]

If anything, the 0-subjacency approach seems to favour the complement analysis. However, it must be noted that the assumption of the barrierhood of VP is dubious, and it has been generally abandoned;[19] if it is not assumed, then no subject/object asymmetry is predicted (cf. Kayne 1994: 71).

The Connectedness Condition (Kayne 1984: chapter 9) instead requires that the g-projection path of the parasitic gap be connected to that of the primary gap, which necessarily reaches the operator. In the adjunction structure (38), the g-projection path of the parasitic gap stops at the level of the adjoined clause; this is connected to the path of the direct object, starting in a lower position, but not to that of the subject, which connects to the main branch at the IP level. In the complement analysis (39), the path of the parasitic gap reaching the time clause boundary may be connected to the path of the direct object (assuming that the two are dominated by the same immediate projection), though not to that of the subject. Thus, the Connectedness Condition predicts the subject/object asymmetry, but it does not discriminate the two analyses.

In conclusion, the anti-c-command condition favours the adjunction analysis, but it is potentially challenged by data like (37). On the other hand, the 0-subjacency condition favours the complement analysis only with the dubious assumption that VP counts as a barrier; finally, the Connectedness Condition is completely neutral. It seems to me that no reliable conclusion can be drawn from these data.

[18] It is also incompatible with the antisymmetry theory, since it involves rightward adjunction.
[19] Cf. Cinque (1990:24-44) and Lasnik & Saito (1992).

4.3. Control

A further type of evidence comes from control phenomena. Kayne (1994: 69-70) notes that a non-finite adverbial clause can only be controlled by a subject, but not by an object:

(40) $John_i$ criticized $Bill_k$ after $PRO_{i/*k}$ giving a talk on syntax

If control requires c-command, this asymmetry is predicted by the adjunction analysis (16), but not by the complement analysis (20).

In order to solve this problem, Kayne suggests that PRO of adverbial clauses may be assimilated to a subject-oriented anaphor; the same subject orientation emerges in French infinitival clauses paraphrasable by indicatives (as opposed to those paraphrasable by subjunctives).

Manzini (1995) objects that the indicative-subjunctive asymmetry does not hold in adverbial clauses: e.g., in Italian *before* clauses have the subjunctive, *after* clauses have the indicative, but they both require subject control in the infinitival form.

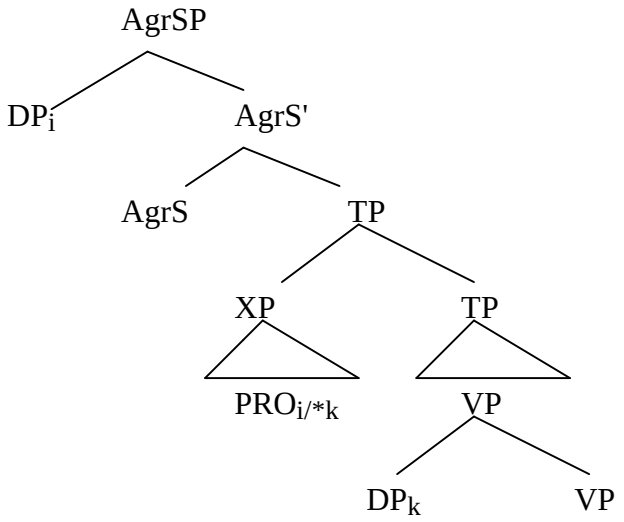
There is also a further contrast related to the surface position of the subject. Guasti (1996: 166-67) attributes to L. Rizzi the observation that a left-hand time clause can be controlled by a preverbal subject, but not by an inverted subject:

(41) a. Prima di PRO_i finire il libro, $Gianni_i$ è morto.
b. * Prima di PRO_i finire il libro, è morto $Gianni_i$.

This too suggests that at LF, where control is determined, the time clause occupies an intermediate position in between Spec,AgrSP and the inverted subject position. In fact, Guasti suggests that the initial time clause is reconstructed in LF to a position adjoined to the Tense Phrase:[20]

[20] Guasti argues that the hypothesis of reconstruction can also account for an example like (i), where a time clause occurring at the beginning of the main clause is controlled by the preverbal subject of the embedded clause:
(i) [Dopo PRO_i aver conosciuto Mario], [mi han detto [che $Maria_i$ l' ha lasciato]]
The idea is that in (i) the time clause has been topicalized at the beginning of the main clause, but it is reconstructed in LF to the TP of the embedded clause, where it is c-commanded by *Maria.* See also Acquaviva (1995) and Longobardi (1985: 180-87) for a similar proposal. The phenomenon of "adverbial preposing" exemplified in (i) is also discussed in section 5.

(42)



Up to now, the data in (40) and (41) suggest an adjunction site for the time clause, at least in LF. A contrast parallel to (41) also holds for a right-hand time clause:

(43) a. Gianni$_i$ è morto prima di PRO$_i$ finire il libro.
b. * E' morto Gianni$_i$ prima di PRO$_i$ finire il libro.

Note however that in (43b) the inverted subject is typically interpreted as part of the "broad focus" of the matrix clause, and the following time clause must be intonationally separated, so that it is probably right-dislocated, rather than in the base position.

This observation brings to light the relevance of focus. If the inverted subject in (43b) is narrowly focussed, control becomes more acceptable. Furthermore, the non-focussed inverted subject of interrogative clauses controls both a left-hand and a right-hand time clause:

(44) a. Dopo PRO$_i$ aver compiuto il delitto, dove è andato l' assassino$_i$?
b. Dove è andato l' assassino$_i$ dopo PRO$_i$ aver compiuto il delitto ?

In order to maintain the c-command condition on control, it is possible to adopt Guasti' s (1996:176-77) proposal that the inverted subject of interrogative clauses is higher than that of declarative clauses.[21,22] This higher adjunction site, corresponding roughly to a right dislocation, may justify the fact that in (44) the inverted subject is out of focus.

Though this solution is in principle viable, a different set of data suggests that the alleged structural asymmetry is in any event irrelevant, and that the crucial factor is indeed focus. The following examples of "logophoric control" into a left-hand time clause suggest that c-command is not a necessary condition on control (cf. Williams 1994:85-88):

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[21] In support of this hypothesis, Guasti mentions the following observation: in a declarative clause like (i), the inverted subject with the determiner *molti* "many" can amalgamate with negation yielding the reading "not+many = few"; this reading is unavailable for the inverted subject of the question (ii):
(i) Non lo hanno letto molti studenti. (Guasti 1996:176)
(ii) Cosa non hanno letto molti studenti ?
By hypothesis, this amalgamation is only possible if the determiner is c-commanded by the sentential negation (cf. Cinque 1990).This is the case in (i), where the inverted subject fills the VP-internal position, but not in (ii), where according to Guasti, it is right-adjoined to AgrSP.

[22] Similarly, narrowly focussed inverted subjects may be higher than those included in broad focus: see Pinto 1997:231-236 for discussion).

(45) a. Prima di PRO_i conoscere Maria, [la vita di Joe_i] era un disastro
b.Prima di PRO_i conoscere Maria, [la mia_i vita] era un disastro
c. ? Prima di PRO_i comprare quelle azioni, [i $suoi_i$ affari] andavano male
d. Al PRO_i vedere Maria, [il viso di Joe_i] s' illuminò di un sorriso

In all of these examples the controller is the "logophoric centre" of the matrix clause, although it does not c-command the controlled time clause. As for right-hand time clauses, logophoric control is perhaps more marginal, but not impossible (*pace* Williams):

(46) a. ? [La sua_i vita] è cambiata solo dopo PRO_i aver conosciuto Maria
b. ? [Il viso di Joe_i] s' illuminò di un sorriso al PRO_i vedere Maria dall' altro lato della strada.

These data call into doubt the structural determination of control. Suppose that obligatory control of complement clauses is not structurally but lexically determined (Pollard & Sag 1994: chapter 4). Since time clauses are not subcategorized for by the matrix verb, their control is not lexically, but logophorically determined.

The hypothesis of logophoric control allows for a different approach to the data in (41), (43) and (44). It is natural to assume that the inverted subject of a purely presentational "broad focus" sentence like *E' morto Gianni* cannot be the logophoric centre of that sentence. As argued in detail by Pinto (1997), in this sentence type there must be an explicit or implicit locative/temporal argument which is deictically related to the speaker (or to an alternative current logophoric centre):

(47) a. E' morto Gianni ' Gianni has *just* died'
b. Maria sperava che arrivasse qualcuno a portarla via dal suo squallido paesino
' Mary hoped that someone would arrive *to her* to take her away from that unpleasant town'

According to Pinto, the logophorically related loco-temporal argument satisfies the Extended Projection Principle in the place of the subject. On the other hand, the inverted subject itself cannot be the logophoric centre since it is part of the broad focus, i.e. of the rhematic component of the sentence, and thus constitutes new information. Hence, it cannot enter in a relation of logophoric control, as in (41b) and (43b).

On the contrary, the inverted subject of interrogative clauses and a narrowly focussed inverted subject are not part of the rhematic component of the sentence: thus, they have sufficient "logophoric prominence" to control a time clause, as in (44).

If this approach is correct, then the control properties of time clauses are simply irrelevant to the determination of their structural position.

4.4. Scope relations

The binding and control phenomena discussed so far detect the position of the time clause at the level of LF, since they are visible only at this level. Let us now turn to other phenomena which are instead sensitive to the position of the time clause in overt syntax.

Manzini (1995), quoting from Donati & Tomaselli (1994), points out that the surface linear order of right-hand adverbial clauses affects their reciprocal scope, in that the innermost adverbial is in the scope of the rightmost one:

(48) a. I left [without dancing] [because I was tired]
b. * I left [because I was tired] [without dancing].

In the right-adjunction analysis, the ungrammaticality of (48b) may follow from the hypothesis that causal adverbials modify a propositional category, IP, whereas manner adverbials modify a lower category, e.g. VP.

In Larson's complement analysis it is possible to stipulate that the manner theta role is higher in the Thematic Hierarchy than the causal theta role, hence the former must be realized in a position structurally superior to the latter (cf. (18)-(19); Larson 1990: 624). But intuitively, in (48a) the causal adverbial has scope over the manner adverbial, in the sense that it modifies the complex expression composed of the main IP and the manner adverbial. Scope relations are usually encoded by c-command; hence one would expect that the causal adverbial be structurally superior, contrary to Larson's claim.

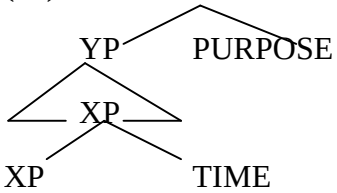
Consider also the following Italian data, featuring a time clause and a purpose clause:

(49) a. Me ne sono andato [prima che arrivasse] [per evitare di incontrarlo].
IP TIME PURPOSE
b. [Per evitare di incontrarlo] [prima che arrivasse] me ne sono andato.
PURPOSE TIME IP
c.?? [Prima che arrivasse] [per evitare di incontrarlo] me ne sono andato.
TIME PURPOSE IP

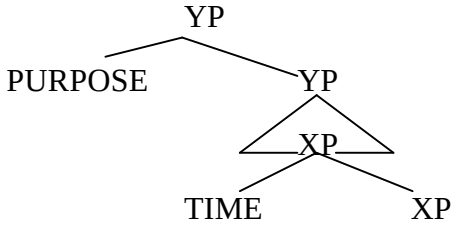
In (49a) the rightmost purpose clause has scope over the leftmost time clause: i.e., the purpose of leaving before his arrival was not to meet him. In the sentence-initial position, however, the same scope relations are obtained with the reverse linear order (49b). In the complement analysis, this symmetric behaviour is unexpected: it appears that in the topicalized initial position, scope relations are determined by c-command, but in the base VP-internal position, scope relations are independent of (or even opposed to) c-command.

In the adjunction analysis, on the contrary, the data are straightforwardly predicted. In fact, (49a) corresponds to the schematic right-adjunction structure (50a),[23] and (49b) corresponds to the symmetric left-adjunction structure (50b); (49c) instead corresponds to the structure (50c), where the time clause is structurally superior to the purpose clause and hence does not fall in its scope:

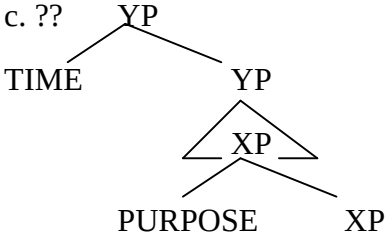
(50) a.



b.



c. ??



[23] In (50), the two adverbial clauses are taken to be adjoined to distinct maximal projections; but outside the antisymmetric framework, they may be adjoined to the same projection. In this case, the definition of c-command must take into account segments, so that the higher adjoined clause c-commands and takes scope over the lower adjoined clause.

Consider also the possibility of mixed orders:

(51) a. [Per evitare di incontrarlo], me ne sono andato [prima che arrivasse]
PURPOSE IP TIME
b.??[Prima che arrivasse] me ne sono andato [per evitare di incontrarlo]
TIME IP PURPOSE

In the adjunction analysis, a possible account can be formulated in terms of relativized minimality. Suppose that (50a) represents the base structure, and the sentence-initial position is the result of topicalization. Then, in the derivation of (51b) the topicalized time clause has to cross the structurally higher purpose clause, which qualifies as a potential antecedent for its trace (cf. Nakajima 1992). In the derivation of (51a), instead, the purpose clause is topicalized from a position higher than that of the time clause, and no relativized minimality effect arises.

The complement analysis incorrectly predicts the opposite pattern, because the base position of the time clause in (49a) is assumed to be higher than that of the purpose clause. Thus, this type of evidence favours the adjunction analysis.

4.5. Stress prominence

The theory of phrasal stress proposed by Cinque (1993) bears on the question of the level of embedding of the right-hand time clause. Roughly, in Cinque's theory the most prominent stress is assigned to the most deeply embedded constituent in the sentence.[24] Thus, the complement analysis of right-hand adverbials predicts that they can bear the main sentence stress, whereas the adjunction analysis predicts that they cannot.

Cinque (1993:263 ff.) notes that different types of right-hand adverbials behave differently in this respect. The manner adverb in (52a) is able to bear the main stress, as predicted by Larson's approach. The sentential adverb in (52b), on the contrary, cannot bear main stress, but it must be pronounced as a separated intonational unit. This is consistent with Belletti's (1990:41-56) proposal that this type of adverb modifies a high inflectional projection:

(52) a. Loro hanno ascoltato la lezione attentaménte.
b. Gianni verrà, probabilmente.

Consider now the behaviour of (non-dislocated) right-hand time clauses. In Italian, these seem able to bear the main sentence stress, even without focalization: [25]

(53) a. Gianni mi ha telefonato prima di partíre.
b. Gianni ha lavato i piatti mentre io dormívo.
c. Si è laureato dopo aver studiato per molti ànni.

Thus, Cinque's theory of phrasal stress supports the complement analysis.

[24] Unless there is a distinct focussed phrase, which then receives the main stress.

[25] But according to Zubizarreta (1994: 7-9), in English the main unmarked stress cannot fall on a right-hand time adverbial. In her analysis, the time adverbial is right-adjoined to VP; in Romance languages, the VP-internal constituents can be scrabled out of VP, so that the adjunct becomes the most deeply embedded constituent and receives main stress. On the contrary, English does not allow the scrambling of complements, and therefore the latter remain in the most embedded VP-internal positions and receive main stress.

4.6. Reordering of complements

An argument pointing to the opposite conclusion is provided by the phenomenon of reordering of postverbal complements. As discussed by Belletti & Shlonsky (1995), Italian is freer than English in that it can place a direct object after a PP complement even when the former is not "heavy". Consider the following examples, featuring a goal PP, a locative PP, and a predicative PP respectively:

(54) a. Ho comunicato [a tutti i candidati] [i risultati della selezione]
b. Ho comunicato [i risultati della selezione] [a tutti i candidati]
(55) a. Ho messo [il tuo libro] [sullo scaffale]
b. Ho messo [sullo scaffale] [il tuo libro]
(56) a. Ho stracciato [la tua lettera] [in mille pezzi]
b. Ho stracciato [in mille pezzi] [la tua lettera]

Furthermore, two PP complements usually allow both the possible orders, as is also the case in English (cf. Jackendoff 1990):

(57) a. Ho parlato [della mia tesi] [con un professore]
b. Ho parlato [con un professore] [della mia tesi]

Even assuming (with Belletti & Shlonsky (1995) and Larson (1990), and *contra* Jackendoff (1990)) that there is a fixed base order for verbal complements, these must allow some reordering process. The exact nature of this process need not concern us here; let us simply note the different predictions that the two analyses of time clauses make in this respect. The complement analysis predicts that time adverbials too freely allow this type of reordering, whereas the adjunction analysis predicts that they must follow all the verbal complements, being external to VP.

It is difficult to test this prediction with time clauses, since these are necessarily "heavy" and thus tend to occur at the end of the sentence.[26] However, the prediction can be tested with "light" PP time adverbials. Though the judgements are rather delicate, it seems that reordering for these is much less natural than for well-behaved complements; when possible, it requires a strong focalization on the time adverbial and a clear dislocation intonation on the following complement, be it a direct object or a PP:[27]

(58) a. Gianni legge [il giornale] [prima di cena]
b. ?* Gianni legge [prima di cena] [il giornale]
(59) a. Gianni è uscito [dal suo ufficio] [alle cinque]
b. ? Gianni è uscito [alle cinque] [dal suo ufficio]
(60) a. Ho parlato [con Gianni] [dopo il concerto]
b. ?? Ho parlato [dopo il concerto] [con Gianni]

---

[26] The same holds for complement clauses, which are generated in a VP-internal argument position:
(i) Ho detto [al portiere] [che stavo uscendo]
(ii) ?? Ho detto [che stavo uscendo] [al portiere]

[27] Similar data for Dutch are reported by Koster (1989): a PP complement and a PP adverbial can either precede or follow the verb, but the former is always closer to the verb than the latter.
(i) Hij heeft [tijdens de pauze] [aan zijn vader] gedacht
he has during the pause of his father thought
(ii) % Hij heeft [aan zijn vader] [tijdens de pauze] gedacht
(iii) Hij heeft gedacht [aan zijn vader] [tijdens de pause]
(iv) % Hij heeft gedacht [tijdens de pauze] [aan zijn vader]

The hypothesis that the complements following a time adverbial are dislocated is also supported by an observation quoted by Frascarelli (1997: 221): these complements cannot be interpreted in the scope of focussing negation, e.g. in (61):

(61) a. Gianni non ha dato ieri quel libro a Maria (... ma giovedì scorso)
(* ... ma un altro libro)
Gianni didn' t give yesterday that book to Mary, (but last Thursday)
* (but another book)

These restrictions on reordering suggest that a time adverbial has a different status than other verbal complements. This lends support to the adjunction analysis over the complement analysis: if the time adverbial is right-adjoined to VP (or higher), a complement may follow it only if it is right-dislocated.

4.7. Topicalization and VP preposing

A similar point can be made with respect to topicalization. In the complement analysis of Larson (1988; 1990), time adverbials are generated inside VP, where they receive an oblique theta role, and the sentence-initial position exemplified in (1)-(5) above must be the result of topicalization. However, Jackendoff (1990: 452) notes that in English sentence-initial adverbials differ from topicalized arguments in that they can be preceded by the subject:

(62) a. John, in the morning, wrote a letter (to Mary).
b. * John, to Mary, wrote a letter (in the morning).

This asymmetry may perhaps be explained by assuming the existence of two distinct Topic positions, a lower one for adverbials, and a higher one for arguments,[28] with the dislocation position for the subject occurring in between:

(63) [$_{\text{Top1}}$ to Mary [$_{\text{Top2}}$ John [$_{\text{Top3}}$ in the morning IP]]]

However, in Larson's analysis, it is unclear why adverbials should occur in a Topic position distinct from that of arguments, since from the thematic viewpoint the two classes of elements are essentially assimilated.

Furthermore, Doherty (1993: fn. 38 p. 62) points out that time clauses can be stranded by VP-ellipsis:

(64) John [$_{\text{VP}}$ got married] [when he was 24] and Mark did [$_{\text{VP}}$ *e*] [when he was 25]

This suggests that they at least can be external to VP even when they appear in a right-hand position.

4.8. Argumenthood of time PP adverbials

Giorgi & Pianesi (1996: 113-127) argue that time DP adverbials share some properties of argumental DPs and hence must be analysed as VP-internal arguments rather than adjuncts. If their conclusion is tenable, it is natural to extend it to time clauses, under the reasonable assumption that time adverbials form a homogeneous class.

First, Giorgi & Pianesi argue that the time adverbials in (65) below pattern with the arguments in (66) and contrast with the manner adverbials in (67) in that they are not sensitive

[28] But Rizzi (1995: fn. 26) proposes the opposite hierarchical order.

to weak islands. In the relativized minimality theory of Rizzi (1990), this means that time adverbials are endowed with an argumental index, which allows them to bind their trace across a potential antecedent:

(65) a. (?) In quale giorno/a che ora/in che mese non sai [se partire]?
b. (?) Quale giorno/a che ora/in quale mese non hai mangiato?
c. (?) In quale giorno/a che ora/in quale mese ti dispiace [che Mario sia partito]?
(66) a. Quale problema non sai [come risolvere]?
b. Quale problema non sei riuscito a risolvere]?
c. Quale studente ti dispiace [che sia partito] ?
(67) a. * Come non sai [se partire]?
b. * Come [non hai mangiato]?
c. * Come ti dispiace [che Mario sia partito]?

However, the data in (65)-(67) are not entirely convincing. The examples in (67a-b) seem pragmatically infelicitous; furthermore, the manner adverb in (67), as opposed to the time adverbials in (64), is a "bare wh-word": this type of element tends to disallow extraction from weak islands irrespective of its +/-argumental status (cf. Cinque 1990: 17-18). If one modifies the examples so as to avoid the interference of these factors, the extraction of a manner adverb from a weak island turns out to have the same marginal status as the extraction of the time adverbials in (64a,c):

(68) ? In che modo ti dispiace [che si siano comportati]?

Note also that in (64b) the time adverbial is outside the scope of negation,[29] and hence it is presumably generated outside the c-command domain of NegP; therefore, no relativized minimality effect is expected. (64c) is quite marginal, and only (64a) seems really acceptable.

A second type of evidence comes from the behaviour of proper names of days. In Standard Italian, proper names are not preceded by an article, unless they are modified by an adjective. The paradigm of the proper day name in (69) is parallel to the paradigm of the personal proper name in (70):

(69) a. Ho incontrato Mario (* il) giovedì
b. Ho incontrato Mario (il) giovedì scorso
c. Ho incontrato Mario *(lo) scorso giovedì
(70) a. E' venuto (* il) Mario
b. E' venuto (il) Mario bello
c. E' venuto *(il) bel Mario

Following Longobardi (1994), Giorgi & Pianesi assume that the definite article is expletive, since the proper name has a unique referent. When the article is absent, as in (69a), the proper name raises to the empty D° position and fills it. When the name follows the adjective, as in (69c), it has not incorporated to D°; in this case the expletive article is obligatory.

This argument suggests that the temporal DP in (69) is argumental. Giorgi & Pianesi conclude that it is theta-marked by the matrix predicate.[30]

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[29] The meaning is: "which day is such that you didn' t eat on that day?"

[30] The parallelism between nominal and temporal arguments is also highlighted by Delfitto & Bertinetto (1995). These authors argue that, like nominal arguments (Diesing 1992), time adverbials receive a "weak" interpretation when they remain in the base VP-internal position, whereas they receive a familiar-presuppositional interpretation when they move overtly out of VP.

But the fact that the DP is argumental does not necessarily imply that it is thematically related to the verb. As argued by McCawley (1988), bare DP adverbs may be selected by a phonetically null preposition (the counterpart of temporal *at*) which Case-licenses them and assignes them the appropriate theta-role. Under this hypothesis, the argumental properties of these DPs would be determined by the selecting null preposition, independent of the syntactic position of the whole PP.

The issue of bare DP adverbs is quite intricate. Wehsler & Lee (1996) discuss the class "situation delimiter" adverbials, which denote an extensive measure function over the state/event described by the clause, as in *I talked to Lucy* [*an entire evening*]. They argue that these DP adverbials are directly Case-marked by the predicate.[31]

On the other hand, they argue that "locating" DP adverbials like that in (69) are not Case-marked by the verb, but they are intrinsically Case-marked.[32] In fact, for these adverbials the omission of the preposition depends on the lexical choice of the noun head: in this respect, they pattern with manner DP adverbials like *that way*, which according to Giorgi & Pianesi' s tests are not argumental (cf. (67)).

If the distinction proposed by Wehsler & Lee is correct, there is no positive evidence for a direct Case-marking relation between the locating DP adverb and the verb in (69).

4.9. Evaluation of the data

The empirical evidence reviewed in the preceding sections turned out to be contradictory and open to different interpretations. The following table summarizes the results:

TEST	ADJUNCTION	COMPLEMENT
Principle C	?	?
Quantifier Binding	?	?
Parasitic gaps	?	?
Relative scope	+	-
Stress prominence	-	+
Reordering	+	-
Topicalization	+	-
N-raising	?	?

The only test that positively supports the complement analysis is Cinque's (1993) stress assignment rule (but see footnote 25). The evidence from relative scope, reordering and topicalization instead suggests some kind of asymmetry between adverbials and complements. This asymmetry may be thought of as thematic rather than structural;[33] but in any event, the data do not provide positive evidence in favour of the complement analysis.

The most suggestive type of evidence is the left-right symmetry for relative scope observed in (48)-(51). This falls out very naturally in the adjunction analysis, under the standard assumption that scope relations are determined by relative c-command. On the other hand, there seems to be no natural account for it in the complement analysis.

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[31] Zamparelli (1996) analyses them as the specifiers of a Measure Phrase selecting VP.

[32] As proposed by Larson (1985) for the whole class of DP adverbs.

[33] The assumption would be that adverbials differ from complements in that they receive a "non-referential" theta role and do not bear a referential index (in the sense of Rizzi 1990): cf. Larson 1985: 605-6, 614-15. This assumption is independently required to account for the islandhood of adverbials as opposed to complements (Chomsky 1995: 332).

Finally, the evidence from binding and parasitic gaps is intrinsically contradictory (whence the question marks in the corresponding cells). The factual observation is that both principle C effects and parasitic gap licensing reveal a contrast between adverbial clauses and complement clauses, and only the quantifier binding data suggest a parallelism between the two. In the face of this contradictory evidence, it is necessary to make a choice, though this will be somewhat arbitrary: one of the two sets of data must be reanalysed so as to eliminate the contradiction.

As mentioned above, the solution that supports the complement analysis considers irrelevant the data from principle C and parasitic gaps, by assuming LF scrambling of the time clause to a position that is not c-commanded by the VP-internal complements but is c-commanded by the preverbal subject. But this assumption raises various problems:

(i) first, the LF scrambling position is never overtly filled by the time clause: it would be a "third" invisible position lying in between the base sentence-final position and the sentence-initial position.

(ii) Second, the trigger of this scrambling is unclear (Manzini 1995). If the time clause is directly connected to the *event*-position of the verb in its base "thematic" position, why must it raise to a different position in LF?

(iii) Third, the LF scrambling is visible for principle C effects and parasitic gap licensing, but invisible for quantifier binding. If all these relations are established at LF, this implies that any position in an LF chain is eligible for the satisfaction of a particular principle; this assumption may be independently justifiable, but it makes the LF module less restrictive.[34]

The opposite solution is to assume the validity of principle C effects and parasitic gaps licensing as a diagnostic for c-command, and to reanalyse the quantifier binding data. In fact, various authors have proposed, for partially independent reasons, that quantifier binding requires the pronoun to be to the left of the variable, rather than c-commanded by the variable. This "leftness condition", originally proposed by Chomsky (1976), has been recently revived by a number of scholars, including Acquaviva (1995), Brody (1994), Jackendoff (1990), Manzini (1995), Williams (1994).

This solution seems more true to the facts, in that it does not require the stipulation of any *ad hoc* LF movement. Therefore, I will adopt here the leftness condition.[35] It follows that the quantifier binding evidence is neutral with respect to the question of the structural position of right-hand time clauses. Thus, this interpretation of the data supports the adjunction analysis over the complement analysis.

5. The sentence-initial position: a reconstruction paradox

As mentioned in section 4.3, the sentence-initial position is commonly considered the result of topicalization from the base sentence-final position. Thus, it is natural to assume that in LF a process of reconstruction places the time clause back in some IP-internal position, where it can be properly interpreted.

The reconstruction hypothesis predicts that at the level of LF the sentence-initial time clause will be in the c-domain of some matrix constituents, depending on the exact position of the reconstruction site. Let us verify the predictions of this hypothesis, taking into account two types of reconstruction: "local" reconstruction of a time clause placed in front of the sentence that it modifies, and "long distance" reconstruction of a time clause modifying an

[34] However, this problem also arises with respect to the LF reconstruction of sentence-initial time clauses: see section 5 below.

[35] This proposal may appear inconsistent with the antisymmetry theory: quantifier binding is a relation between constituents, i.e. nonterminal nodes, but in the antisymmetry theory nonterminal nodes are linearly unordered. However, in Bianchi (1997) it is argued that the antisymmetry theory allows for a reformulation of the leftness condition in purely hierarchical terms.

embedded clause, but fronted at the beginning of the root clause (in the so called "adverbial preposing" structure):[36]

(71) Prima di partire, Gianni ha fatto un' ultima gita.
(72) Prima di partire, Gianni ha deciso [di fare un' ultima gita].

It seems that in the case of adverbial preposing, LF reconstruction into the modified embedded clause is required to obtain the proper interpretation.

Consider first the evidence from quantifier binding. Judgements are not completely clearcut, but local reconstruction seems at least marginally possible for binding by the matrix subject and direct object:[37]

(73) a. Dopo che lo_i abbiamo dimesso, ogni $paziente_i$ è tornato a casa.
b. ? Prima che io lo_i visitassi, nessun $paziente_i$ seguiva una terapia adeguata.
(74) a. ? Dopo $averlo_i$ operato, abbiamo dimesso ogni $paziente_i$ entro pochi giorni.
b.? Dopo $averlo_i$ utilizzato, Gianni non rimette nessun $attrezzo_i$ al posto giusto.

Similarly, long-distance reconstruction seems marginally possible:

(75) ? Dopo che lo_i avremo operato, sono certo che nessun $paziente_i$ avrà bisogno di una terapia riabilitativa.
(76) ? Dopo $averlo_i$ consultato, è obbligatorio riportare ogni $libro_i$ nel settore di appartenenza.

This implies that the leftness condition on quantifier binding holds of the LF representation (cf. footnote 35).

Consider next parasitic gaps licensing. According to Longobardi (1985:178), a parasitic gap embedded in a preposed adverbial clause can be licensed by a lower primary gap under reconstruction:

(77) ? [Prima di aver letto e_i attentamente], non riesco proprio a immaginare [quale $libro_i$ Maria accetterebbe di pubblicare t_i nella sua collana].

Furthermore, we observe reconstruction effects for anaphor binding:

(78) ? Dopo il fallimento della $propria_i$ azienda, $Gianni_i$ si è ritirato dagli affari.
(79) ? Dopo il fallimento della $propria_i$ azienda, sospetto che $Gianni_i$ sia caduto in depressione.[38]

The evidence reviewed so far suggests that the sentence-initial time clause is reconstructed to the sentence-final position in LF, so that it patterns with right-hand time clauses.[39] But this conclusion is challenged by data concerning principle C effects. As shown in (21b), repeated here, a right-hand time clause is in the c-domain of the matrix subject for the purposes of principle C:

(80) * She_i knew me [before I met $Mary_i$]

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[36] For discussion see Cinque (1990:89-94), Hukari & Levine (1995), and Pollard & Sag (1994:ch. 4).
[37] Acquaviva (1995) instead argues that there is a subject / object asymmetry here.
[38] Recall that the long-distance anaphor *proprio* is subject-oriented; this explains the marginality of binding by a matrix object:
(i) ?? Dopo il fallimento della $propria_i$ azienda, ho aiutato $Gianni_i$ con un prestito.
[39] Recall that in section 4.3 it was argued that the control data are irrelevant, contrary to Guasti's (1996) conclusion.

On the contrary, a sentence-initial time clause shows no principle C effects under either local or long distance reconstruction:

(81) Dopo che Gianni$_i$ avrà finito la tesi, *pro*$_i$ si prenderà una vacanza.
(82) Dopo che Gianni$_i$ avrà finito la tesi, è probabile che [*pro*$_i$ si prenderà una vacanza].
(83) Dopo che Gianni$_i$ avrà finito la tesi, *pro*$_i$ ha deciso che [*pro*$_i$ si prenderà una vacanza].

A solution to this paradox immediately comes to mind: the data in (71)-(79) show that reconstruction of the time clause is possible; but this does not necessarily imply that it is obligatory. Suppose that it is in fact optional: then, the data can be correctly derived by applying reconstruction in (71)-(79), but not in (81)-(83).

This solution raises two objections. The first one is conceptual: if we take reconstruction to be optional, we have to admit that the time clause can be interpreted in different positions in LF, and hence that reconstruction is not guided by interpretive needs, *contra* Chomsky (1995: 202 ff.). This decreases the restrictiveness of the reconstruction mechanism.

The second objection is empirical: it is possible to test principle C effects and quantifier binding in one and the same example, yielding contradictory requirements for reconstruction, as proposed by M. Brody (M. R. Manzini, p.c.; cf. the discussion around (32)-(33) above):

(84) ? Non appena Gianni$_i$ lo$_k$ ha visitato, *pro*$_i$ ha consigliato ad ogni paziente$_k$ una nuova terapia.
(85) ? Dopo che Gianni$_i$ gli$_k$ avrà parlato, sono certo [che *pro*$_i$ consiglierà ad ogni studente$_k$ di iscriversi a medicina].

Once again, these data are not clearcut, but they seem substantially better than the principle C violation in (80).

We thus incur in an apparent paradox. LF reconstruction is necessary for interpretive needs, and a reconstructed position seems to be visible for quantifier binding and anaphor binding; but the same reconstructed position is invisible for principle C. This suggests that reconstruction is not a unitary phenomenon as it is usually assumed to be. In other terms, it is not the case that all the principles applying at LF make reference to a single "interpretable" position in an LF chain.

On the other hand, it is not even the case that any principle can make reference to any position of an LF chain. As discussed in detail by Heycock (1995) and Rizzi (1997), in A' chains of nonspecific operators the restrictive term is visible in the base reconstructed position also for the purposes of principle C:

(86) * [How many stories about Diana$_i$]$_k$ is she$_i$ likely to invent t_k?
(Heycock 1995: 558)

Therefore, the visibility of the links of LF chains must be somehow restricted on principled grounds.[40] For the moment, this remains an open problem.

[40] In the LF chains of *wh*-operators, a relevant factor is specificity (Heycock 1995, Rizzi 1995). Contrary to nonspecific operators like the one in (86), specific operators show reconstruction effects for binding but not for principle C:
(i) [Which picture of himself$_i$]$_k$ does Bill$_i$ like t_k best?
(ii) [Which stories about Diana$_i$]$_k$ did she$_i$ most object to t_k? (Heycock 1995: 558)
In this respect, the LF chains of preposed time clauses pattern with specific A' chains; but the reason is unclear.

6. Conclusions

The preceding discussion has revealed a contradictory behaviour of time clauses with respect to various tests for c-command.

As for sentence-final time clauses, a contradiction arises between quantifier binding, which suggests that the clause is in the c-domain of the matrix object, and various other tests, which instead suggest a VP-external position. The interpretation proposed in section 4.9 calls into doubt the relevance of the quantifier binding data and supports the adjunction analysis over the complement analysis.

As for the sentence-initial position, a contradiction again emerges between quantifier binding and principle C: the former shows reconstruction effects, the latter does not. In the light of the data in (84)-(85), we cannot simply assume that reconstruction is optional; rather, it is necessary to allow different principles to make reference to different positions in an LF chain. This option must be restricted on principled grounds; the problem is closely related to the question of what LF configuration(s) allows the time clause to be properly interpreted.

In conclusion, the complement analysis, though it is compatible with the antisymmetry theory, cannot adequately account for the data discussed in sections 4.1, 4.2, 4.4 and 4.6. If we want to maintain the restrictiveness of the antisymmetry theory, it is necessary to devise a new analysis of complex adverbials that retains some of the basic properties of the adjunction analysis.[41] Hopefully, this paper will provide a useful starting point for future research in this direction.

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[41] A similar conclusion is reached in Manzini (1995).

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