Consequences of Antisymmetry

Studies in Generative Grammar 46

Editors

Henk van Riemsdijk
Jan Koster
Harry van der Hulst

Consequences of Antisymmetry

Headed Relative Clauses

by

Valentina Bianchi

Mouton de Gruyter
Berlin · New York 1999

Mouton de Gruyter (formerly Mouton, The Hague)
is a Division of Walter de Gruyter GmbH & Co. KG, Berlin.

The series Studies in Generative Grammar was formerly published by
Foris Publications Holland.

∞ Printed on acid-free paper which falls within the guidelines
of the ANSI to ensure permanence and durability.

Library of Congress Cataloging-in-Publication Data

Bianchi, Valentina, 1969–
Consequences of antisymmetry : headed relative clauses / by Valentina Bianchi.
p. cm. – (Studies in generative grammar ; 46)
Based on author's doctoral dissertation.
Includes bibliographical references (p.) and index.
ISBN 3-11-016250-4
1. Generative grammar. 2. Asymmetry (Linguistics) 3. Grammar, Comparative and general – Relative clauses. I. Title. II. Series.
P158.B5 1999
415–dc21 99-34346
CIP

Die Deutsche Bibliothek – Cataloging-in-Publication Data

Consequences of antisymmetry : headed relative clauses / by Valentina Bianchi. – Berlin ; New York : Mouton de Gruyter, 1999
(Studies in generative grammar ; 46)
ISBN 3-11-016250-4

Printing: Werner Hildebrand, Berlin.
Binding: Lüderitz & Bauer GmbH, Berlin.
Printed in Germany.

Preface

In recent years, the status of X-bar theory as a set of primitive principles has been questioned. Chomsky (1995: 241-271) derives X-bar principles from basic properties of the computational operations Merge and Move. Kayne (1994) proposes a radically alternative view: X-bar principles are determined by an independent property of natural language - namely, the fact that words must be linearly ordered in a temporal sequence. Kayne proposes an invariant mapping between the hierarchical relations of nonterminal symbols and the linear ordering of terminal symbols in a tree. In virtue of this mapping, X-bar structures inherit one basic property of linear ordering, namely, antisymmetry.

With respect to standard X-bar theory, the Antisymmetry theory considerably restriots the class of possible X-bar structures. It is thus necessary to rethink the structural analysis of many syntactic constructions: in various cases, the standard analysis is incompatible with the Antisymmetry theory and it is necessary to devise a completely new approach. The theory is thus tested on empirical grounds. The minimal requirement is that it must allow for a structural analysis consistent with the data. A more ambitious goal is to show that the new analysis is even superior to previous ones in its empirical consequences.

The aim of this book is precisely to discuss the consequences of Antisymmetry in one specific empirical domain, that of postnominal headed relative clauses. Since rightward adjunction is excluded on principled grounds, the standard adjunction analysis has to be given up. Kayne (1994: 85-115) proposes an alternative "raising" analysis which combines two independent hypotheses: the DP hypothesis, according to which the determiner is a functional head that carries the referential or quantificational force of the noun phrase; and the raising hypothesis, dating back to the early Seventies, according to which the "head" of the relative clauses is generated in the gap position and raises to a pre-complementizer position.

This book critically examines the evidence in support of the raising analysis and develops it by working out various aspects that are left implicit or unexplored in Kayne's discussion. Besides these general goals, it also aims at proving that the raising analysis is empirically superior to the adjunction analysis on several grounds. First, it is argued that the raising analysis allows for a unified approach to various relativization strategies that remained unrelated in the previous approach: this has

interesting consequences both on the typological and on the diachronic side. Second, the properties that distinguish appositive from restrictive relatives are reduced to different LF configurations on the basis of Chomsky's (1995: 202-210) theory of reconstruction. Third, the analysis provides a solution to some notorious problems in the morpho-syntax of relative pronouns, like "Case attraction" and the PF deletion phenomena that usually go under the rubric of "doubly filled Comp" effects.

These results justify the claim that the raising analysis is empirically superior to the adjunction analysis; this in turn implies, on the theoretical side, that the restrictiveness of the Antisymmetry theory is supported over the standard X-bar theory.

This book is based on my doctoral dissertation. Various parts have been revised and extended (in particular sections III.2-4, VI.8-9, VII.1-2, and chapter VIII). However, for editorial reasons it has been necessary to leave out an entire chapter on "heavy pied piping". The interested reader may find the relevant discussion in the sixth chapter of my dissertation (Bianchi 1995).

There are a number of people whom I wish to thank for their teaching as well as for their support during my doctoral studies. Pier Marco Bertinetto taught me a lot of things, and above all, the importance of always being willing to critically rethink and even call into question one's own theoretical premises. I owe to Richard Kayne the original inspiration of this work; he supported its progression with many insightful comments and criticisms. I greatly benefitted from his rigorous way of pushing a line of reasoning to its furthest consequences. Adriana Belletti and Luigi Rizzi constantly helped me with many important suggestions since the very beginning of my studies in generative syntax: with them I learned to appreciate the value of open and collaborative exchange of ideas. Finally, I learned a lot from Rita Manzini, and in particular from her readiness in pointing out the consequences of theoretical issues on the empirical side, and vice versa.

I also wish to thank Jan Koster and Jean-Yves Pollock for carefully reading my thesis and for their stimulating comments on it.

During my doctoral studies and the subsequent period, I greatly benefitted from the interaction with students and colleagues at the Scuola Normale Superiore in Pisa, in the universities of Campinas, Florence, Florianopolis, Geneva, Milan, Padua, Siena and Venice, and in the ZAS in Berlin. Let me attempt a (surely incomplete) list: Birgit Alber, Artemis Alexiadou, Anna Cardinaletti, Carlo Cecchetto, Guglielmo

Cinque, Gloria Cocchi, Denis Delfitto, Luca Dini, Caterina Donati, Verner Egerland, Charlotte Galves, Barbara Gili, Giuliana Giusti, Alex Grosu, Maria Teresa Guasti, Liliane Haegeman, Mary Kato, Bob Learmonth, Alessandro Lenci, Giuseppe Longobardi, Michele Loporcaro, Carlos Mioto, Andrea Moro, Jairo Nunes, Yuya Perez Vazquez, Carol Peters, Cecilia Poletto, Ur Shlonsky, Mario Squartini, Vittorio di Tomaso, Giuseppina Turano, Chris Wilder, Roberto Zamparelli.

Generative syntax also gave me the occasion to meet two of my best friends: Paolo Acquaviva and Cristina Figueiredo, whom I thank heartily for their invaluable help.

A special thank to Jan Koster, who suggested that I might submit my thesis for publication in the series "Studies in Generative Grammar", to Anke Beck and Katja Huder of Mouton de Gruyter, and to Maddalena Agonigi for her crucial help in editing the manuscript.

On the personal side, acknowledgements would take the next three hundred pages. Besides all of the above mentioned people, I also wish to thank the following ones: my beloved Stevie and Isabella; my parents, Tiziano and Cioni; my sister Alessandra and Saverio; my sister Silvia and Angelo; my "acquired" family, Renata, Domenico and Alberto; Sandra Gosso; Luigi, Rosalba, Marco and Lucia Santarini; Monica, Francesco, Gilberto, Pietro, Domenico and Manuela, Giovanna, Kerstin, Grazia, Elena.

Finally, I dedicate this book to my parents, Tiziano and Cioni, with the deepest love and gratefulness.

Contents

Chapter I. The theoretical background: Kayne's (1994) "Antisymmetry of Syntax"

0. Introduction 1
1. X-bar theory in the Principles and Parameters framework 1
    1.1. Dominance versus linear order: the directionality parameters 2
    1.2. "Invisible" nodes 4
    1.3. Binary branching 4
2. Some empirical evidence 6
    2.1. Against adjunction 7
    2.2. Against multiple sister complements 14
    2.3. Against rightward adjunction 19
3. Kayne's (1994) Antisymmetry 21
    3.1. The Linear Correspondence Axiom 22
    3.2. Consequences for phrase structure 23
    3.3. Consequences for linear order 26
4. Other theoretical assumptions 29
5. Summary 31

Chapter II. Restrictive relative clauses

0. Introduction 33
1. The adjunct analysis 33
2. Kayne's (1994) raising analysis 35
    2.1. The DP hypothesis 35
    2.2. The hypothesis of the external determiner 39
    2.3. The raising of the relative "head" 41
3. Evidence for the external determiner 41
    3.1. Licensing of a definite D° 42
    3.2. Indefiniteness of the relative trace 43
    3.3. Idiom chunks 43
    3.4. Scope assignment under reconstruction 45
    3.5. Floating quantifiers 46
    3.6. An alternative analysis 48

4. Evidence for raising 49
4.1. Idiomatic expressions 50
4.2. Predicate nominals 52
4.3. Reconstruction for binding 53
4.4. The problem of the trigger 54
5. A locality problem 54
5.1. Barriers 56
5.2. Head-to-head dependencies 58
5.3. Concluding remarks 61
6. Cross-linguistic evidence in favour of the raising analysis 61
6.1. Internally headed relative clauses 61
6.2. Superlatives and "degree" relative clauses 65
7. Summary and open questions 69

Chapter III. The syntax of relative determiners

0. Introduction 71
1. A mixed analysis: Åfarli (1994) 71
2. Relative pronouns as determiners 74
2.1. The trigger of raising 75
2.2. Movement of DP/PP 76
2.3. The raising of the NP "head" 77
2.4. Omission of the relative determiner 79
2.5. A morphosyntactic problem 80
3. The non-definiteness of the relative DP 80
3.1. Empirical evidence 82
4. Some issues in the syntax of relative determiners 86
4.1. Correlative clauses 86
4.2. From correlatives to externally headed relatives 91
4.3. Inverse attraction 92
4.4. Case attraction 94
4.5. Postposition of the relative determiner 96
4.6. Concluding remarks 97
5. The typology of relative determiners in the Indo-European languages 97
5.1. The correlative origin of relative pronouns 98
5.2. Relative pronouns as articles 100
5.3. The cycle of the definite article 101
5.4. Three types of relative determiner 103
6. Summary and open questions 104

Chapter IV. A reconstruction asymmetry

0. Introduction 107
1. Reconstruction as a test for the raising of the "head" 107
2. Principle C effects 109
   2.1. The exceptional behaviour of tonic pronouns 112
3. Principle A effects 115
4. Reconstruction for scope assignment 122
5. Quantifier binding 123
6. Idiomatic expressions 125
7. Reconstruction of the pied piped material in appositive clauses 126
8. Argument-adjunct asymmetries in reconstruction 127
9. Summary 129

Chapter V. Appositive relative clauses

0. Introduction 131
1. Previous approaches 131
   1.1. The coordinate analysis 132
   1.2. The discontinuous constituent structure analysis 133
   1.3. The LF' analysis 133
   1.4. Asymmetry in the level of adjunction 136
2. Properties of appositive relatives 136
   2.1. Definiteness of the relative trace 137
   2.2. Floating quantifiers 137
   2.3. *Relatif de liaison* 138
   2.4. Non-nominal antecedents 139
   2.5. Islandhood for binding 139
3. A non-raising analysis 139
   3.1. X° as a "predicative" head 140
   3.2. X° as a "specifying" coordination 140
   3.3. Problems with the conjunction analysis 144
   3.4. Summary 146
4. Kayne's LF movement approach 146
   4.1. Lack of reconstruction of the "head" 147
   4.2. The definiteness of the relative trace 148
   4.3. Floating quantifiers 150
   4.4. *Relatif de liaison* and non-nominal antecedents 151
   4.5. Islandhood for binding 152
   4.6. Independent evidence for movement of IP 153
5. Summary 154

Chapter VI. Doubly filled Comp effects

0. Introduction 155
1. Approaches to the problem in the adjunct analysis 156
1.1. The standard analysis 156
1.2. Pesetsky's (1994) optimality approach 159
1.3. Rizzi's (1990) feature compatibility approach 163
1.4. Consequences for the raising analysis 166
2. The omission of the relative D° 167
2.1. Base generation of NP 167
2.2. A null relative determiner 169
2.3. PF deletion as incorporation 170
3. Two types of null complementizer 175
3.1. Subject relativization 175
3.2. Embedded topicalization and negative preposing 177
4. A characterization of the complementizer system 178
4.1. Relative ordering of preposed constituents 178
4.2. Multiple complementizers 182
4.3. Omission of the functional heads 183
5. Optional *that* deletion 185
5.1. Zero complement clauses 186
5.2. Zero relatives 187
6. The *wh*-relative 188
6.1. A two steps relativization 188
6.2. Kayne's (1994) analysis 190
6.3. An alternative proposal 191
6.4. Evidence for the two steps derivation 192
7. Pied piping relatives 195
8. Economy and PF deletion 196
8.1. An alternative: the extraction of the "head" 198
9. Appositive relatives 201
10. Summary 202

Chapter VII. The complementizer system of headed relative clauses

0. Introduction 205
1. The Topic parameter 206
1.1. Finiteness 206
1.2. Licensing Topic° 208
1.3. Verb second 212
2. The complementizer system in Old and Middle English 213

3. Violations of the doubly filled Comp filter 219
3.1. Quebec French 219
3.2. Occitan and Gascon 222
3.3. West Flemish 223
3.4. Bavarian *daß* 224
3.5. Summary 225
4. English infinitival relatives 225
5. The head government requirement 226
6. Embedded topicalization and negative preposing 228
7. Subject relativization 231
8. Relativization in ancient Tuscan 237
9. Some remarks on resumptive relative clauses 240
9.1. Irish resumptive PPs 241
9.2. Hebrew free relatives 242
9.3. Resumptive clitics in some Romance dialects 244
9.4. German relative determiners 250
9.5. Concluding remarks 255
10. Summary 256

Chapter VIII. Stacking, coordination, and extraposition

0. Introduction 259
1. Stacking 259
2. Coordination 262
3. Extraposition 264
4. Summary 270

IX. Concluding remarks 271

Notes 273

References 333

Index 355

Chapter I
The theoretical background: Kayne's (1994) "Antisymmetry of Syntax"

0. Introduction

Several recent studies in the Principles and Parameters framework have converged on the conclusion that the standard X-bar theory, as formulated for instance in Chomsky (1986b: 2–6),[1] is too little restrictive. Accordingly, various principles restricting the format of X-bar structures have been proposed. However, these principles are conceptually unrelated to each other and they can only be stipulated as independent axioms of X-bar theory.

Kayne's (1994) Antisymmetry theory instead attains the necessary restrictiveness on principled grounds. All of the empirically justified restrictions on the X-bar structures are derived from a single axiomatic principle, the Linear Correpondence Axiom. This principle constitutes a hypothesis on the relation between the hierarchical organization of the nonterminal symbols and the linear ordering of the terminal symbols in a tree. This is the most innovative aspect of Kayne's proposal.

However, the restrictiveness of the Antisymmetry theory has a considerable impact on the analysis of many empirical domains. One case in point is the syntax of headed relative clauses. The standard approach to them is incompatible with the antisymmetric X-bar theory; thus, an alternative must be sought for.

Kayne (1994) proposes a "raising analysis" for relative clauses. The aim of this book is to defend this proposal, elaborate it and further explore its consequences. The following chapters focus on various aspects of the syntax of headed relative clauses, showing that the raising analysis leads to a more satisfying approach to many well known problems and also reveals new interesting problems.

This introductory chapter examines the relevant literature on X-bar theory and provides a brief summary of the Antisymmetry theory, in order to lay down the theoretical background of the following discussion.

1. X-bar theory in the Principles and Parameters framework

In the Principles and Parameters framework, X-bar theory is conceived of as a component of the computational system that projects a tree

structure from elements chosen from the lexicon (Chomsky—Lasnik 1991: § 3.2). The standard version of X-bar theory is given by Chomsky (1986b: 2–4) in the format of the following recursive context-free rules, where the variable X ranges over preterminal symbols, either lexical or functional:[2]

(1) $X' \rightarrow X \quad X''^*$
(2) $X'' \rightarrow X''^* \; X'$

The general format of the rules in (1)–(2) implies that all the preterminal symbols project in a uniform way. The rules express universal hierarchical relations: the two bar level projection constitutes the maximal projection of X (XP) and dominates the specifiers of X (themselves maximal projections) and the intermediate projection X′ (rule (2)). The intermediate projection X′ dominates the projecting preterminal X, called the head, and one or more maximal projections, the complements of X (rule (1)).

The rules in (1) and (2) do not exhaust the possible hierarchical relations. Besides specifiers, heads and complements, a fourth type of position has been structurally characterized by May (1985) and adopted by Chomsky (1986b: 7): the adjunct position. In the adjunction configuration, the adjoined element β is immediately dominated by a node with label α and has a sister node with the same label α. The two nodes labelled α are called the segments of the category α. The adjunct is dominated by only one segment of α, but not by the whole category α: this distinguishes it from the specifier position. Adjunction is introduced by rule (3), where α, β are both heads or both maximal projections:

(3) $\alpha \rightarrow \beta \; \alpha$

The recursiveness of the rule allows multiple adjunction to a category.

1.1. Dominance versus linear order: the directionality parameters

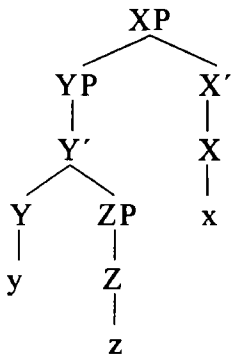
The context free rules in (1) and (2) are meant to encode only the dominance relations between the various categories. The symbols to the right of the arrows do not constitute a linearly ordered string, but rather an unordered set;[3] the linear order of the corresponding sister categories in the tree is fixed in every language by the value of the directionality parameters. The Head-Complement parameter fixes the order of the head with respect to all of its complements: if the head precedes them, the value is head-initial; if it follows them, the value is head-final. Simi-

larly, the Specifier-Head parameter fixes the order of the categories introduced in the right-hand side of rule (2): the specifiers may either precede or follow the sister projection X′ (and *a fortiori* the head X, which is dominated by X′).

It is the separation of the dominance relations from linear order that makes it possible to isolate the universal aspects of phrase structure from the language-specific ones. In fact, this separation is also assumed in other syntactic frameworks like GPSG (Gazdar et al. 1985: 44–50).[4, 5]

The directionality parameters are defined with respects to sister nodes. If the left value is fixed for both parameters, rules (1)–(2) generate the tree structure in (4).

(4)



In this tree, the relative order of the sister nodes is determined by the value of the parameters: the specifier of XP, YP, is to the left of the head X, and the complement of the head Y, ZP, is to the right of Y. However, the tree does not determine the linear order of the terminal symbols *x, y, z*. The implicit assumption underlying the terms "head-initial" and "head-final" is that the string of terminal symbols is obtained by reading the leaves from left to right, rather than from right to left. This gives the string *yzx*. In graph-theoretic terms, the string is obtained by a depth-first left-to-right visit of the tree.[6] Thus, two assumptions are necessary to yield a linear order of the terminal symbols from the setting of the directionality parameters: the left-to-right orientation, and the depth-first procedure. If the tree is instead visited in a breadth-first fashion (keeping the left-to-right orientation), the output string is *xyz*, since the less embedded terminal symbol *x* is reached before *y* and *z*, and *y* is reached before *z*. These assumptions are often left implicit, which gives the misleading impression that the directionality parameters directly yield an ordered string of terminal symbols by fixing the order of sister nodes in the tree.

1.2. "Invisible" nodes

A problem with the standard X-bar theory, explicitly noted by Chomsky (1986b: 4; 1995: 242–243), is that some nodes in the tree structure are not available for syntactic manipulation. In particular, there is strong empirical motivation for restricting the application of the rule Move α to maximal projections and heads, excluding the intermediate projections;[7] but the invisibility of X′ must be stipulated.

It is also usually assumed that the lower segment(s) in an adjunction configuration cannot move (whereas the adjoined element can).[8]

Another problem with intermediate projections is their number. Jackendoff (1977) originally proposed a three level X-bar theory; rules (1)–(2) instead define the two bar level as the maximal projection. It is clear that the upper limit of projection levels must be postulated in the rules themselves;[9] it may be empirically justified, but it is not determined by any principle.

Recently, Hoekstra (1991) has proposed a one-level X-bar theory in which specifiers are structurally indistinguishable from adjuncts, but are characterized by an agreement relation with a head. Agreement relations, and licensing relations in general, are assumed to be biunique (the Uniqueness of Licensing Principle): a head can agree with only one constituent with respect to a given set of features. However, a head may be specified for more than one set of features, and thus it can enter multiple agreement relations and license multiple specifiers. It follows that the number of possible specifiers of a head is determined by the number of distinct agreement relations that the head can enter; X-bar theory does not *a priori* impose any upper bound.

1.3. Binary branching

The Kleene star in rules (1) and (2) allows an undetermined number of specifiers and complements. The sister nodes under XP and X′ are symmetric to one another with respect to the fundamental relation of c-command:

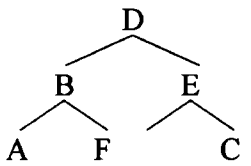
(5) α c-commands β iff neither α dominates β nor vice versa, and the first (branching)[10] node that dominates α dominates β as well.

The c-command relation enters into the definition of two significant syntactic relations, binding and government.

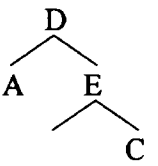
Kayne (1984: 129–132) proposes an original conception of the c-command requirement: its essential content is that a branching node in-

tervening between two elements α and β blocks a syntactic relation between them. Thus in the abstract structure (6) the branching node B, which dominates A but not C, prevents A from c-commanding C; in (7), instead, no branching node intervenes and A c-commands C:

(6)



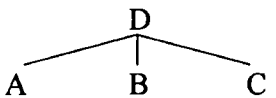
(7)



The blocking effect of branching nodes can be reformulated as a condition on the path connecting C to A (where a path is defined as a sequence of distinct and adjacent nodes in the tree). When the path reaches a branching node, two possibilities arise. If the branching node dominates exactly one node not yet included in the path, there is no choice: the path can only be extended by including the new node. This is the case in (7), where the path C, E, D reaches a branching node D, but the latter dominates only one node not yet included in the path, namely A. Kayne defines such a path from C to A unambiguous. If, on the contrary, the branching node dominates more than one node not yet included in the path, the path becomes ambiguous, for it can continue in more than one direction. This is the case in (6) when the path from C reaches the node B. B is dominated by D, which is already included in the path, but it dominates two nodes not yet included in the path, A and F: therefore, the path from C to A is ambiguous. The requirement that A c-command C can then be replaced by the requirement that there exist an unambiguous path from C to A.[11]

The unambiguous path requirement is equivalent to c-command with respect to (6) and (7), but with respect to other structures it is more restrictive. In a multiple branching structure like (8), the nodes A, B, C c-command each other, but there exists no unambiguous path linking any one of them to either of the other two.

(8)

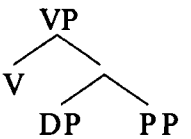


Thus, whenever a node has more than two branches, the nodes immediately dominated by it will not be reached by any unambiguous path, and consequently they will be unable to be bound or governed by any other node. This gives a strong constraint on the phrase structures of na-

tural language. For instance, replacing the abstract symbols D, A, B, C by VP, V, DP and PP in (8), a VP structure is obtained where the verb cannot govern either one of its complements, contrary to usual assumptions (9). In order for government to hold, it is necessary to group the two complements in a category which is itself the complement of V, as in (10).

(9)

(10)



Thus the unambiguous path requirement forces binary branching.

Note that binary branching is not a general property of tree structures; it is not determined by a principle of X-bar theory, but by the need of government and binding relations, which belong to other modules of the grammar.[12] In recent studies it has become common to assume a generalized binary branching constraint: this can be easily incorporated in the standard X-bar theory by eliminating the Kleene star in (1) and (2); but this constitutes a stipulation.[13]

2. Some empirical evidence

The preceding section discussed some postulates of standard X-bar theory. The format of the context-free rules (1)–(3) imposes the separation of dominance relations from linear order and requires the assumption of independent directionality parameters; but these parameters yield a linear order of the terminal symbols of a tree only through a specific visiting procedure. Furthermore, the rule format does not determine an upper bound for the number of intermediate projections and of admissible branches, nor does it determine the visibility of the various nodes for the rule Move α. All these aspects of phrase structure must be independently postulated.

This section provides a synthesis of some empirical evidence suggesting that the standard X-bar theory is too little restrictive. Recent studies on the functional structure of sentences and noun phrases suggest the elimination of XP adjunction and the uniqueness of the specifier for any maximal projection.[14] This rules out, on the one hand, more-than-binary branching under XP and, on the other hand, recursive generation of more than one intermediate projection (§ 2.1).[15]

Furthermore, the controversy on multiple complements of a lexical head (§ 2.2) brings out two interesting problems. The empirical evidence

suggests that the complements stand in asymmetric relations to each other. This can be interpreted in two opposite ways: the complements stand in asymmetric c-command relations, determined by the binary branching requirement; or else, the property which determines these asymmetries is not a structural one, but it is linear precedence. Interestingly, this controversy points out a close connection between linear precedence and asymmetric c-command.

Finally, the existence of rightward movement to an adjunct position has been recently called into question (§ 2.3). But standard X-bar theory does not exclude this possibility; then, once again, an independent postulate is required to obtain the necessary restrictiveness.

2.1. Against adjunction

Let us consider prototypical modifiers, such as adjectives and adverbs. These elements are usually taken to be adjoined to the category they modify: adverbs are adjoined to a verbal or inflectional projection, and modifying adjectives are adjoined to some nominal projection. The adjunct analysis is supported by the apparently free iteration of the modifiers.

This view of modifiers has been recently challenged by Cinque (1993; 1995), who argues that this apparently free iteration is actually an instance of asyndetic coordination; apart from coordination, the number of possible modifiers for every category is limited and subject to rigid ordering constraints.

As for nominal modifiers, Cinque (1993) notes that modifying adjectives cannot be all adjoined to one and the same projection within the noun phrase. Different types of adjective occupy distinct positions: in the Italian examples in (11), for instance, the thematic adjective *italiano* is obligatorily postnominal, whereas the adjective *mero* is obligatorily prenominal:

(11) a. *l'invasione italiana dell'Albania*
the invasion Italian of-the Albania
'the Italian invasion of Albania'

b. * *l'italiana invasione dell'Albania*
the Italian invasion of-the Albania

c. *Gianni ha fatto una mera proposta.*
Gianni has made a mere proposal
'Gianni made a mere proposal.'

d. * *Gianni ha fatto una proposta mera.*
Gianni has made a proposal mere.

The data in (11) cannot be accounted for by the assumption that the two adjectives are adjoined to different projections of the noun either. In fact, the thematic adjective in (11a–b) is assigned the external theta role by the noun, and hence it must be generated in Spec, NP. But since in Italian the specifier is to the left of the head, this should give the linear order of (11b), which is actually excluded. Moreover, in (11a) the thematic adjective appears between the noun and its PP complement, which are generated as sisters. The only possibility to derive this order while ruling out (11b) is to assume the obligatory leftward movement of the head N° past the adjective.[16] This instance of head-to-head movement forces the postulation of at least one functional head between the determiner and the noun:

(12) $[_{DP}$ D $[_{FP}$ N°+F° $[_{NP}$ thematic adjective $[_{N'}$ t_N PP]]]].

As for the contrast between (11a) and (11d), it is still possible to analyse the adjective *mero* as left-adjoined to FP, hence structurally higher than the incorporated noun. However, the existence of at least one functional head between D° and N° opens a new perspective on the syntax of adjectives: they can be taken to occupy each the specifier of a distinct functional head (Crisma 1993: 74–92). In this way, the morphological agreement between the adjective and the noun can be reduced to an instance of Spec/head agreement (assuming that the functional heads associated to the noun share its phi-features).

This analysis is supported by the observation that, abstracting from asyndetic coordination (exemplified in (13)), the number of modifying adjectives is limited and the various types of adjective must be realized in a fixed order. (14) shows the relative order of adjectives modifying an object-denoting noun:

(13) *Una lunga, piacevole festa*
'a long, agreeable party'

(14) a. evaluating > size > color
b. *a beautiful big red ball*
c. *una simpatica grande palla rossa*[17]
'a nice big red ball'

The limit on the number of non-coordinated attributive adjectives cannot be easily accounted for in the adjunct analysis, since adjunction, like coordination, allows free iteration by definition (cf. the recursiveness of rule (3)). Moreover, the adjunct analysis does not explain the fixed order of the adjectives in (14), since adjunction is usually taken to be free. As Crisma (1993: 78) observes, in order to explain the serializa-

tion of adjectives, the adjunct analysis requires two stipulations: that adjectives are always adjoined to the left, and that there is some semantic or selectional relation between an adjunct and the maximal projection it is adjoined to. The limited number and the serialization of non-coordinated adjectives instead follow straightforwardly if each adjective is taken to occur in the specifier of a nominal functional head. In fact, assuming the uniqueness of the specifier position, it follows that two adjectives of the same type cannot cooccur unless they are coordinated; moreover, functional heads occur in a fixed order determined by c-selection, and consequently their specifiers are ordered with respect to each other as well.

A similar argument holds for adverbial modifiers. In a study of the position of the past participle in Romance, Cinque (1995) shows that adverbs of various classes and floating or leftward moved quantifiers occur in a fixed order in the Romance family. Italian and French are two representative examples:

(15) a. *I bambini non hanno mica più tutti detto tutto bene alla maestra.*
the children not have at all any longer all said everything well to the teacher.
'The children haven't said everything well to the teacher any longer.'

b. *Les enfants n'ont plus tous tout bien repondu à la maîtresse.*
the children not have any longer all everything well said to the teacher.
'The children haven't said everything well to the teacher any longer.'

Note that although the order of the adverbs and quantifiers is identical in the two examples, the position of the past participle is different. Cinque proposes, following Pollock (1989) and Belletti (1990), that this is determined by the different scope of verb movement in the two languages: in Italian, the past participle can move to a higher position than in French. Since verb movement is an instance of head-to-head incorporation, it provides evidence for the existence of a head position both to the left and to the right of every one of the adverbs and quantifiers exemplified in (15). In fact, inspecting different Romance varieties, Cinque shows that the participle may intervene between any two adjacent elements of the sequence, as shown in (16):

(16) a. *I bambini non hanno detto mica più tutti tutto bene alla maestra.* (Italian)

(16) b. *I bambini non hanno mica detto più tutti tutto bene alla maestra.*
c. *I bambini non hanno mica più detto tutti tutto bene alla maestra.*
d. *I bambini non hanno mica più tutti detto tutto bene alla maestra*
the children not have (said) at all (said) any longer (said) all (said) everything (said) to the teacher.
'The children haven't said everything well to the teacher any longer.'
e. *Apo mandigadu bene.* (Logodurese Sardinian)
(I) have eaten well
'I ate well.'
f. * *Apo bene mandigadu.*
(I) have well eaten
g. *Apo mandigadu tottu.*
(I) have eaten everything
'I ate everything.'
h. *Apo tottu mandigadu.*[18]
I have everything eaten
'I ate everything.'
i. *Il a bien compris la question.* (French)
he has well understood the question
'He fully understood the question.'
l. * *Il a compris bien la question.*
he has understood well the question

The data in (16) show that the inflectional structure of the participle involves a rich array of functional heads. Since exactly one adverbial element of a specific type can occur to the left of every head position, Cinque concludes that adverbs (and quantifiers) occur in the specifier of the various functional heads.[19]

The line of the argument can be summarized as follows: each modifier is realized in a unique and specific position; since these properties are characteristic of specifiers, there is no positive evidence to the effect that modifiers are generated in positions of a different type. In particular, the properties usually attributed to the adjunct position, namely free iteration and free ordering, turn out to be empirically incorrect once the interference of asyndetic coordination is recognized. This approach to modifiers rests on the current theory of functional heads.

Two other phenomena that are often analysed as cases of adjunction are English topicalization (cf. Baltin 1982; Lasnik–Saito 1992) and

scrambling (cf. Müller–Sternefeld 1993, 1994; Saito 1989).[20] In this domain too, the adjunction analysis has been recently questioned.

As for English topicalization, Authier (1992) and Rizzi (1995) argue for a CP-recursion analysis: topicalized phrases occupy the specifier of a complementizer-like functional head which occurs below the declarative C°.

Authier (1992) starts from the analysis of negative preposing, exemplified in (17). In this structure, a negative phrases is fronted and triggers auxiliary-subject inversion. Inversion is usually analysed as incorporation of I° to the immediately c-commanding head: since in (17) the preposed auxiliary follows the declarative complementizer, there must be a head position between the declarative C° and I° which hosts the auxiliary, while its Spec is the landing site of the negative phrase.

(17) *I believe* $[_{CP}$ *that* $[_{XP}$ *under no circumstances*$_i$ $[_{X'}$ *would* $[_{IP}$ *he* t_{AUX} *do that* $t_i]]]]$.

Authier analyses XP as the lower layer of a CP-recursion structure.

He then argues that English topicalization is excluded in the same contexts that exclude negative preposing, like noun complement clauses (18a–b), sentential subjects (18c–d), and factive complement clauses (18e–f). In all these contexts, the CP is an island.

(18) a. * *The fact that never has he had to borrow money makes him very proud.*
b. * *The fact that Bill, Mary likes makes John very jealous.*
c. * *That never in his life has he had to borrow money is true.*
d. * *That this book, Mary read thoroughly is true.*
e. * *John regretted that never had he seen Gone with the Wind.*
f. * *John regretted that Gone with the Wind, we went to see.*

Therefore, Authier proposes that topicalization too is an instance of CP-recursion where the topicalized phrase raises to the Spec of the lower CP level; the lower C° head, however, remains phonetically empty, since topicalization does not trigger the incorporation of the auxiliary. If topicalization were instead adjunction to IP, it would be unclear how to exclude it in (18b, d, f), since adjunction to IP is not expected to be sensitive to the properties of the CP level.

A similar approach is developed by Rizzi (1995), who actually abandons CP-recursion in favour of a "split Comp" hypothesis: the IP is introduced by several distinct functional heads, whose specifiers host specific elements. Consider for instance the Italian data in (19). The clausal

particles *che* and *se* are usually taken to both occur in C°. However, they differ in relative order with respect to left-dislocated phrases: the latter obligatorily follow *che*, but they may either precede or follow *se*:

(19) a. * *Penso questo libro che lo darò a Gianni.*
(I) think this book that (I) will give it to Gianni
b. *Penso che questo libro, lo darò a Gianni.*
(I) think that this book, (I) will give it to Gianni
'I think that I will give this book to Gianni.'
c. *Non so questo libro se dovrei darlo a Gianni.*
(I) don't know this book if (I) should give it to Gianni
d. *Non so se questo libro dovrei darlo a Gianni.*
(I) don't know if this book (I) should give it to Gianni
'I don't know whether I should give this book to Gianni.'

If left-dislocated phrases are adjuncts, a contradiction arises: adjunction to CP must be impossible in (19a) but possible in (19c). Note that in both cases the CP is an argument of the matrix verb, so that Chomsky's (1986b: 6) constraint against adjunction to an argument is irrelevant. The data instead follow if *che* and *se* are analysed as two distinct functional heads, labelled C° and Focus°; the positions for left-dislocated phrases are between C° and Focus°, and between Focus° and IP:

(20) $[_{CP}$ *che* [(XP) $[_{FocusP}$ *se* [(XP) $[_{IP}$ ...]]].

This structure can also account for the different position of relative and interrogative phrases. Rizzi proposes that interrogative phrases land in the specifier of the head Focus°, which carries the feature [+wh]; this predicts that they may precede or follow left-dislocated elements. The prediction is confirmed by the data in (21). On the other hand, contrary to interrogative phrases, relative pronouns obligatorily precede any dislocated phrase: this follows if they target a higher position, namely Spec, CP, which in the standard analysis of relative clauses is adjacent to the relative pronoun's antecedent (22).

(21) a. *Mi domando, il premio Nobel, a chi lo potrebbero dare.*
(I) wonder the Nobel prize to whom (they) could award it
b. *? Mi domando a chi, il premio Nobel, lo potrebbero dare.*
(I) wonder to whom, the Nobel prize, (they) could award it
'I wonder to whom the Nobel prize could be awarded.'
(22) a. *un uomo a cui, il premio Nobel, lo daranno senz'altro.*
a man to whom, the Nobel prize, (they) will surely award it
'a man to whom the Nobel prize will be surely awarded'

(22) b. * *un uomo, il premio Nobel, a cui lo daranno senz'altro.*
a man, the Nobel prize, to whom (they) will surely award it

In (20), left-dislocated phrases could be taken to adjoin to FocusP and IP: in fact, left dislocation exhibits the properties of iteration and free order that are usually attributed to adjunction:

(23) a. *A Gianni, questo libro, credo che nessuno glielo darebbe volentieri.*
to G., this book, (I) believe that nobody would give to-him it willingly
b. *Questo libro, a Gianni, credo che nessuno glielo darebbe volentieri.*
this book, to G., (I) believe that nobody would give to-him it willingly
'As for this book, to Gianni, I think that nobody would willingly give it.'

Nevertheless, Rizzi proposes that left-dislocated elements too are in the specifier of a recursive functional head, Topic°, which happens to be phonetically empty. Evidence for this null functional head comes from French, where a left-dislocated phrase cannot intervene between a trace in subject position and its antecedent:

(24) a. *Je ne sais pas* [$_{CP}$ *qui*$_i$ [$_{C'}$ C°$_i$ [$_{IP}$ t$_i$ *pourrait l'acheter*]]]
I not know who could it buy.
'I don't know who could buy it.'
b. *? *Je ne sais pas* [$_{CP}$ *qui*$_i$ [C°$_i$ [$_{TopP}$ *ton livre* [Top° [$_{IP}$ t$_i$ *pourrait l'acheter*]]]]].
I not know who, your book, could it buy.
'Your book, I don't know who could buy it.'

In earlier work Rizzi (1990: 51–60) proposed that the subject trace in (24) needs to be governed by a head C° endowed with agreement features in order to satisfy the Empty Category Principle. Thus, the ungrammaticality of (24b) follows from the assumption that left dislocation introduces a head position between C° and IP. This head prevents C° from governing Spec, IP, by relativized minimality.[21]

The split Comp hypothesis will be further discussed in chapters VI-VII.

Scrambling is a very complex and controversial phenomenon, but it must be mentioned that at least some authors have analysed it as involving specifier positions rather than adjunction. For instance, Sportiche (1992: 64–67) analyses Dutch scrambling as overt movement of an ar-

gument phrase to the Spec of an IP-medial functional head, the Clitic Voice.[22]

In sum, the recently developed theory of functional heads has called into question the existence of base-generated adjuncts (modifiers) and the adjunction analysis of certain instances of A' movement, such as topicalization and scrambling.[23] Many purported instances of adjunction actually involve a specifier position, which must be assumed to be unique. If empirically justified, the elimination of adjunction and of multiple specifiers constitutes a strong restriction on the phrase structure of natural language.

2.2. Against multiple sister complements

The syntax of multiple complements has been the subject of an interesting debate. Kayne (1984: 129–163) gave some empirical evidence in favour of his theoretical notion of unambiguous path, which excludes multiple sister complements (cf. § 1.3). Barss–Lasnik (1986) brought to light an asymmetry in double object constructions, where the leftmost goal argument appears to asymmetrically c-command the theme argument. Larson (1988) and Jackendoff (1990) argue that this asymmetry is shared by all double complement constructions. Since the standard formulation of X-bar theory does not provide a structural representation that may justify this asymmetry, the authors draw two opposite conclusions: Larson proposes a revision of X-bar theory, incorporating a binary branching constraint for complement positions (the Single Complement Hypothesis); Jackendoff criticizes this proposal and suggests that the relevant asymmetry concerns linear order rather than hierarchical relations. This double theoretical possibility brings to light a correlation between the two ordering principles of natural language, the hierarchical and the linear one.

Kayne (1984: 136–159) observes that nouns are unable to govern into a clausal complement. This is shown by the ungrammaticality of raising and ECM infinitival complements to a noun:

(25) a. * *Mary$_i$'s appearance* [t$_i$ *to have left*]
b. *Mary$_i$ appears* [t$_i$ *to have left*].
c. * *Its$_i$ likelihood* [t$_i$ *not to be there*]
d. *It$_i$ is likely* [t$_i$ *not to be there*].

(26) a. *John believes* [*Mary to have left*].
b. * *John's belief of* [*Mary to have left*].[24]
c. * *Mary$_i$'s belief* [t$_i$ *to have left*] *by John*

This defective behaviour of nouns also emerges in small clauses configurations, supporting Stowell's (1983) approach:

(27) a. *John believes* [*Mary a genius*].
b. * *John's belief of* [*Mary a genius*].

This provides an empirical argument in favour of the binary branching constraint (§ 1.3). In fact, the data in (28) below show that derived nominals are unable to take more than one complement in the way that verbs do. This verb/noun asymmetry can be assimilated to those in (25)–(27) by assuming that double complements cannot be sisters to the selecting head, but they must be grouped together in a clauselike constituent. This constituent is a barrier for government by a noun head: therefore, the noun complements cannot be Case-marked by the noun itself, and moreover, an ECP violation arises if one of the complements is moved, as in (28d).

(28) a. *John robbed* [*Mary of her money*].
b. * *John's robbery of* [*Mary of her money*]
c. *Mary*$_i$ *was robbed* [t$_i$ *of her money*] *by John.*
d. * *Mary*$_i$*'s robbery* [t$_i$ *of her money*] *by John*

An independent argument against multiple sister complements stems from Barss—Lasnik's (1986) study of double object constructions. A number of syntactic tests show that the two objects stand in an asymmetric relation: these include anaphor binding, quantifier binding, the reciprocal construction *each...the other*, and the licensing of negative polarity items. In all these phenomena, one constituent must be properly related to another one: if this relation requires c-command, it must be concluded that the leftmost goal argument c-commands the theme argument, but the reverse does not hold.

(29) a. *I showed Mary herself.*
b. * *I showed herself Mary.*
(30) a. *I gave every worker*$_i$ *his*$_i$ *paycheck.*
b. * *I gave its*$_i$ *owner every paycheck*$_i$..
(31) a. *I showed each man the other's socks.*
b. * *I showed the other's friend each man.*
(32) a. *I showed no one anything.*
b. * *I showed anyone nothing.*

This asymmetry is not predicted by a multiple complements structure like (9), where the two objects c-command each other.

Larson (1988: 338) observes the same asymmetry in the dative construction where the goal argument is realized within a dative PP:

(33) a. *I showed Mary to herself.*
b. * *I showed herself to Mary.*
(34) a. *I sent every check$_i$ to its$_i$ owner.*
b. ?? *I sent his$_i$ paycheck to every worker$_i$..*
(35) a. *I sent each boy to the other's parents.*
b. * *I sent the other's check to each boy.*
(36) a. *I sent no presents to any of the children.*
b. * *I sent any of the packages to none of the children.*

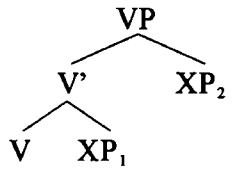
In this case, it is possible to assume a multiple branching structure and argue that it is the PP node that prevents the second object from c-commanding the first one. This assumption, however, cannot account for the data in (37)–(40), reported by Jackendoff (1990), where two PP objects show the same left-to-right asymmetry. Clearly, here the presence of the PP node does not prevent the first complement from binding the second one:

(37) a. *I heard from John and Bill about themselves.*
b. * *I heard from themselves about John and Bill.*
(38) a. *I heard from every mother$_i$ about her$_i$ child.*
b. * *I heard from her$_i$ mother about every girl$_i$..*
(39) a. *I talked about each boy to the other.*
b. * *I talked about the other to each boy.*
(40) a. *I talked about none of the boys to any of the girls.*
b. * *I talked about any of the boys to none of the girls.*

Jackendoff also shows that the order of the two PPs can be inverted, and the result is the same: the leftmost PP asymmetrically binds into the rightmost one.

The two authors propose two opposite solutions to the problem of double complement structures. Larson assumes a structural approach to binding and polarity items licensing, and concludes that the asymmetric relation between two complements is an argument against multiple branching. However, in the traditional analysis of the VP even a binary branching representation does not give the right structural asymmetry. In fact, the leftmost complement, which is closer to the verb, must be its sister under V'; but then it cannot be structurally higher than the rightmost complement, which must be the daughter of a higher verbal projection, as in (41):

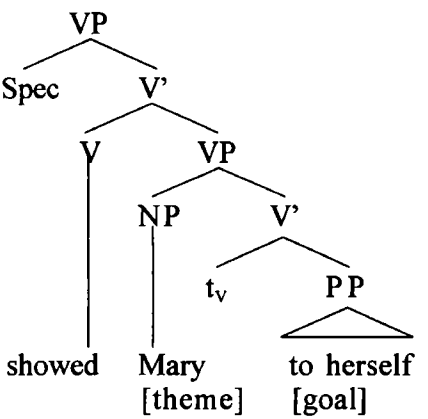
(41)



This yields an asymmetric relation which is the reverse of what we expected: here it is the rightmost argument XP_2 that asymmetrically c-commands the leftmost one.

Therefore, Larson proposes a different base structure for double complement constructions, featuring a so-called "VP shell". In the dative PP construction (e.g. (33a)), the rightmost goal argument is generated as a sister to the lexical verb, and the theme argument is instead generated in the specifier of VP. The surface order is derived by moving the verb from its base position to a higher head position, which is empty in the base: this is the head of a VP projection superposed to the VP projected by the lexical verb. In its derived position, the verb governs and Case-marks the direct object in Spec, VP. The derivation of (33a) is represented in (42).

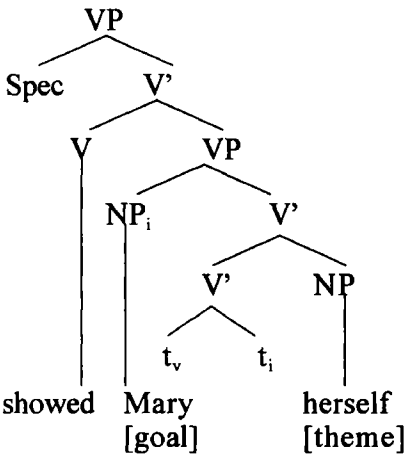
(42)



In this structure, the linear order of the complements corresponds to the desired c-command relations: the theme argument asymmetrically c-commands the PP argument. As for the double object construction, exemplified in (29a), Larson suggests that it can be derived by an operation akin to passivization. In fact, the structural relation between the two complements in the lower VP of (42) is akin to a subject/object asymmetry. The double object construction can be derived by a process of argument demotion which assigns the theme theta role to a right-hand adjunct position; the goal argument is raised to the nonthematic

Spec of the lower VP, where it receives the structural Accusative case. (43) is the derivation of (29a):

(43)



Independently of the analysis of the double complement construction, the VP shell representation of multiple complements is now widely assumed.[25] Larson (1988: 380–381) excludes the possibility of multiple branching under X' by eliminating the Kleene star in the X-bar rule expanding X' (the Single Complement Hypothesis). Thus the binary branching constraint is directly incorporated into X-bar theory.[26]

Jackendoff (1990) criticizes Larson's approach in one fundamental respect, namely the assumption that the asymmetric relation between the complements must be explained in terms of hierarchical relations. An alternative analysis, which cannot be *a priori* excluded, is that binding domains be defined in terms of linear order. In fact, linear order affects the possibility of coreference in conjoined constructions like (44), where neither of the coreferent arguments c-commands the other:

(44) a. *Fred mentioned that I saw George$_i$ yesterday and that he$_i$ looked good.*
b. * *Fred mentioned that I saw him$_i$ yesterday and that George$_i$ looked good.*

This argument is not compelling if one adopts Reinhart's (1983) proposal that the accidental coreference exemplified in (44a) is distinct from syntactic binding.

However, the generalization that in English the leftmost complement takes asymmetrically scope over the rightmost one raises an interesting theoretical problem: there is a redundancy between the two ordering re-

lations of natural language, the linear one and the hierarchical one. Yet both of these ordering principles are necessary: on the one hand, natural languages universally have a constituent structure, and on the other hand, natural language expressions are necessarily realized as a (temporal) sequence of discrete elements. Therefore, the only way to eliminate this redundancy is to establish a principled correlation between the two types of order.

2.3. Against rightward adjunction

The possibility of rightward adjunction is exploited in the standard analysis of many "stylistic" rules, like heavy NP shift and extraposition. In a specifier-head language like English or German, rightward movement can only be an instance of adjunction.[27]

Haider (1993) gives several arguments against such an analysis of extraposition. First, he observes that extraposition does not obey the same constraints as other clear instances of movement, for instance the subject island constraint:

(45) a. $[_{DP}$ *A man* $t_i]$ *came into the room* [*with red hair*]$_i$.
b. * [*With blond hair*]$_i$, $[_{DP}$ *a man* t] *came into the room.*

Second, some constituents that can be extraposed (e.g. the PP in (46a)) cannot be extracted by leftward scrambling:

(46) a. *Ich habe gestern* $[_{DP}$ *einen Mann*] *gesehen* $[_{PP}$ *mit blauen Haaren*].
I have yesterday a man seen with blue hair
'Yesterday I saw a man with blue hair.'
b. * *Ich habe* $[_{PP}$ *mit blauen Haaren*] *gestern* $[_{DP}$ *einen Mann* t] *gesehen.*
I have with blue hair yesterday a man seen.

Thus, the class of constituents that can be extraposed does not coincide with the class of elements that can be moved. In German, for instance, DPs can move leftward but they cannot be extraposed. These asymmetries suggests that extraposition is not an instance of (rightward) A' movement.

Furthermore, there is evidence to the effect that extraposed constituents are very low in the structure. Binding phenomena show that a relative clause extraposed from the direct object is c-commanded by VP-internal complements:

(47) *I would not tell everyone*$_i$ *all the details at once* [*that he*$_i$ *might be interested in*].

This evidence is inconsistent with the view that extraposition is (even base-generated) rightward adjunction to VP[28] (or *a fortiori*, to IP).[29] This point is strenghtened by the observation that in German a constituent extraposed from the VP cannot be left behind in the left dislocation of the VP:

(48) a. [*Das Haus gezeigt, in dem ich wohne*] *das hat der Mann keinem freiwillig.*
the house shown in which I live, that has the man to-noone voluntarily
'The man hasn't voluntarily shown to anyone the house in which I live.'

b. * [*Das Haus gezeigt*] *das hat der Mann keinem freiwillig, in dem ich wohne.*
the house shown that has the man to-noone voluntarily in which I live

(49) a. [*Fremden gesagt, wo sie wohnt*] *das hat sie ja nie.*
strangers told where she lives, that has she never
'She has never told strangers where she lives.'

b. * [*Fremden gesagt*] *das hat sie ja nie, wo sie wohnt.*
strangers told, that has she never where she lives

In the light of these data, Haider argues that extraposed constituents are base-generated in a VP-internal base-generated position: the later they appear in the sentence, the deeper they are in the constituent structure.[30] Since standard X-bar theory does not exclude the possibility of rightward adjunction, Haider concludes that it is too little restrictive.

Accordingly, Haider proposes that the linear order of the symbols in the right-hand side of rules (1)–(3) must be universally fixed to the effect that the recursive node on the projection line is to the right of the non-recursive node. Thus in (2) X' must be to the right of the specifier, and in (3) the adjoined phrase β must be to the left of the lower segment of its host α. This gives a universal order specifier-head and adjunct-host.[31] This general constraint on X-bar structures is formulated as follows:

(50) Branching Constraint: the projection line is branching progressively. (Haider 1993: 9)

Haider gives an interesting cognitive motivation for this constraint in terms of optimality of parsing. In a regressively branching structure like (51) below, when the parser finds the first element V° it cannot know how deeply embedded it is, namely, how many brackets must be postulated above it, since in this structure an element "closing" a higher projection linearly follows an element closing a lower projection:

(51) $[_3[_2[_1$ V° DP] DP] PP]

Therefore, the parser cannot build the structure until the final element of the string is reached. In a progressively branching structure, instead, the first constituent of the string introduces the highest node of the projection line, the second constituent introduces an immediately lower projection, and so on: this is because a leftmost element necessarily c-commands a rightmost one, and the node that dominates the first element necessarily dominates the second element as well. Since the elements are necessarily presented in a linear, temporal order, this guarantees an optimal monotonic and incremental parsing of the string.

The essential insight of Haider's proposal is that X-bar theory must be restricted by limiting the possible linear ordering of nonterminal symbols in the tree.[32] This is also essential to Kayne's proposal, to be discussed in the following section.

3. Kayne's (1994) Antisymmetry

In the light of the empirical evidence reviewed in the preceding section, there has developed an increasing consensus on the necessity of constraining the standard X-bar theory of the Principles and Parameters framework: the works by Fukui–Speas (1986), Larson (1988), Hoekstra (1991) and Haider (1993) are representative of this tendency. However, the proposed constraints often belong to modules of the grammar independent of X-bar theory (cf. Kayne's (1984) unambiguous path requirement or Hoekstra's (1991) uniqueness of licensing principle) or, if they belong to X-bar theory, they are introduced as independent postulates (cf. Larson's (1988) single complement hypothesis and Haider's (1993) branching constraint).

An important step towards the goal of restricting the set of possible phrase structures is Kayne's (1994) Antisymmetry theory. In this theory, some of the fundamental properties of phrase structure encoded in rules (1)–(3) are derived from, while others are excluded by, one axiom and a revised definition of c-command. The following summary will be

unable to do justice to the intrinsic compactness and elegance of Kayne's theory; it is only introduced for the sake of self-containment of this study.

3.1. The Linear Correspondence Axiom

As a first step, Kayne abandons the standard assumption that hierarchical structure and linear order are independent of one another. As discussed in § 1.1, in standard X-bar theory linear order is defined between sister categories introduced by the X-bar rules, and this determines the linear order of the terminal symbols that they dominate. But from a conceptual viewpoint, while linear order is an irreducible property of the string of terminal symbols, it is not quite clear why it should hold between nonterminal symbols.[33]

Kayne proposes instead to derive the linear order of terminal symbols from the hierarchical relations between the nonterminal symbols dominating them. In order to do so, it is necessary to define a hierarchical relation on the tree structure with the properties of a linear order, namely transitivity, totality and antisymmetry. The relation of asymmetric c-command has the first and the third property; however, it is not total, since it is not defined for any pair of distinct nodes in the tree. This difficulty can be obviated by defining on the tree the set A of all the ordered pairs of nonterminals $<X_i,Y_i>$ such the first element asymmetrically c-commands the second one. Assuming a relation d that maps every nonterminal X to the set $d(X)$ of terminals that it dominates, the image under d of every ordered pair $<X_i,Y_i>$ can be defined as the Cartesian product of $d(X_i)$ and $d(Y_i)$, namely the set of all the ordered pairs of terminals $<x,y>$ such that $x \in d(X_i)$ and $y \in d(Y_i)$, and $d(A)$ is defined as the union of the images under d of all the ordered pairs $<X_i, Y_i>$. Taking T to be the set of terminals of the tree, the following axiom holds:

(52) *Linear Correspondence Axiom.*
$d(A)$ is a linear ordering of T.

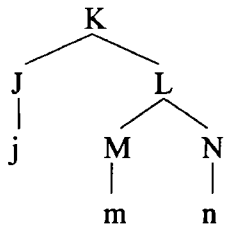
Informally, the axiom implies that, although the relation of asymmetric c-command does not totally order the tree, it must hold for a number of pairs of nonterminals such that the union of the images under d of these pairs[34] yields a linear order of the terminals.

3.2. Consequences for phrase structure

The Linear Correspondence Axiom has two distinct sets of consequences with respect to the standard X-bar theory: some properties are derived from it, thus reducing the number of independent postulates of the theory; other properties are excluded by it, yielding a more restrictive X-bar scheme.

These consequences can be deduced by examining some elementary tree structures. For the time being, the relevant definition of c-command is the one that does not make reference to branching nodes (Kayne 1994: 7).[35]

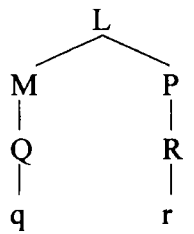
(53)



In tree (53), K dominates a preterminal J and a nonterminal L; although c-command between J and L is symmetric, J asymmetrically c-commands the daughters of L, M and N; this gives the ordered pairs <J,M> and <J,N>. On the other hand, L dominates two preterminals M and N, which c-command each other; therefore, there is no ordered pair including the nodes M and N, and the terminals dominated by them cannot be ordered with respect to each other. Therefore, the structure violates the LCA. In X-bar theoretic terms, preterminals are heads: thus the LCA derives the uniqueness of the head (which is stipulated in rule (1), by the lack of a Kleene star associated to the symbol X) and the non-head status of complements.

Another type of symmetric relation that the LCA excludes is (54):

(54)

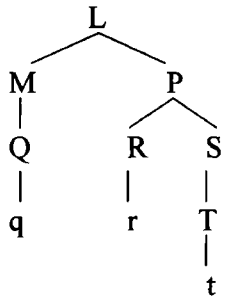


Neither of the sister nodes M and P is a preterminal. It follows that each one asymmetrically c-commands the other's daughter, giving the

pairs <M,R> and <P,Q>, whose images under *d* are respectively <q,r> and <r,q>. Hence the configuration with two sister nonterminals violates the antisymmetry requirement imposed by the LCA. In X-bar theoretic terms, this has two consequences. On the one hand, there cannot be headless projections, e.g. [$_S$ NP VP], where neither NP nor VP is a preterminal.[36] On the other hand, a head cannot have more than one structural complement, since multiple complements necessarily introduce the illformed structure (54).

The impossibility of two non-preterminal sister nodes also excludes the abstract structure (55), which corresponds to the structure introduced by the X-bar rule (2):

(55)



In fact, asymmetric c-command holds between M and R, but also between P and Q, which gives a violation of antisymmetry for the terminal symbols *q, r*. In order to allow a specifier position, Kayne (1994: 15–16) adopts the segment/category distinction proposed by May (1985) and gives a new definition of c-command:

(56) X c-commands Y iff X and Y are categories and X excludes[37] Y and every category that dominates X dominates Y.

Let us now consider a structure where a non-preterminal M is adjoined to another non-preterminal P:

(57)