THE SYMMETRY OF SYNTACTIC RELATIONS

by

Wei-wen Liao

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ABSTRACT

In generative syntax, the theory of asymmetry in syntax has gained much attention due to the influential work of Kayne (1994), who adopts the null hypothesis that syntax is inherently asymmetric. However, such a direction does not seem fully compatible with the general assumptions in Galilean style scientific theories, all of which aspire to uncover hidden symmetry (in theoretical models) from observed asymmetries (see also Brody 2003, Stewart & Golubitsky 1992, Stewart 1998). In view of this tension, it will be argued in this dissertation that the base syntactic representation should be symmetric, while surface phrase structures are actually derived from symmetric representations by the symmetry-breaking mapping rules that are induced by the asymmetric natures of the interfaces (Prinzhorn & Vergnaud 2004 et seq.). The hidden invariance/symmetry of syntax can be revealed by studying recursive parallel patterns, which can be identified in three types of primitive syntactic coupling relations. The three types of fundamental relations are the N-V relation, the substantive-functional (S-F) relation, and the k-k’ (generalized connectives) relation. Following Prinzhorn & Vergnaud (2004 et seq.), it is hypothesized that the basic unit characterizing syntactic merger (a base structure in the sense of Chomsky 1964) can be viewed as a Cartesian product that simultaneously encodes primitive syntactic relations (i.e., a base structure = \{N,V\} \times \{S,F\} \times \{k,k’\}), which can be represented in a graph-theoretical way as a three dimensional cube, and each node of the cube is a certain combination of syntactic relations that defines the syntactic role played by the lexical item inserted in that node (e.g. a noun (N,S,k) = a
nominal substantive root coupled with a classifier (N,S,k’)). Each instance of merge, then, is a reflection of a syntactic relation (Collins 2002). The symmetry of syntax, eventually, arises from the recursive parallelisms generated by the primitive syntactic relations. Considering the asymmetry of phrase structures (in the sense of Kayne 1994), it is argued that the asymmetry is imposed by the asymmetric nature of the interfaces. Thus, the translation from a highly symmetric syntactic representation (i.e. a Cartesian product of primitive syntactic relations) to asymmetric phrase structures is identified as a symmetry-breaking process in syntax. Generalizing Moro (2000), labeling can be taken as an asymmetric direction-marking mechanism of symmetric Merge. Following Prinzhorn & Vergnaud (2004), it is argued that different orderings among the primitive syntactic relations may be responsible for the macroparameters found in the cross-linguistic phrase structures. With the primitive syntactic relations remaining invariant, each possible type of phrase structures can therefore be viewed as a member of the symmetry group of the underlying symmetric syntax. Evidence from classifier constructions and indefinite expressions (with special reference to the Chinese languages) will be discussed in favor of the symmetric syntax.
CHAPTER 1 AIMS AND SCOPE

This dissertation pursues an alternative version of Minimalist syntax that is instead guided by the general principle of symmetry. The main thesis in this dissertation is that the fundamental structure of syntax is inherently symmetric, and the surface asymmetries of phrase structures (generally adopted in the standard analysis) are only apparent, and are derived from an underlying abstract symmetric structure. More specifically, the apparent asymmetries of phrase structures are actually induced from the asymmetric nature of the LF and PF interfaces. By adopting an abstract symmetric structure, the main claims (e.g. Bare Phrase Structure and Inclusiveness Condition) in the Minimalist Program can be straightforwardly derived, and many syntactic problems that have arisen from the assumption of standard phrase structural rules can be solved. The novel claim that phrase structures are derived products originates from an unpublished manuscript by Prinzhorn & Vergnaud (2004). In this dissertation, I shall adopt their perspective, and elaborate on their account.

The research questions that I will ask here include the following:

(1) 
   a. Symmetry being an underlying principle in most scientific fields, is symmetry also a guiding principle of syntax?
   b. If there is inherent symmetry in linguistic theory, where can we find it? How do we represent it in structures?
   c. Is there linguistic evidence suggesting an inherent symmetry that can be reconstructed from surface (linguistic) representations?
As a road map to this project, the questions in (1), in the order given, will guide the discussions in the following chapters. Reflecting on the question (a), the first chapter serves as a general methodological introduction to the principle of symmetry and its theoretical status in general. Chapter 1 will discuss the reason why the principle of symmetry should also be observed in theoretical linguistics. Chapter 2 discusses the first part of question (b), where it is argued that Merge and Agree (the basic operations in narrow syntax, as assumed in the Minimalist Program) are both symmetric relations from a universal point of view. The latter part of question (b) is considered in Chapter 3, where the sources of symmetric structures are identified as three primitive syntactic relations, and a structural description of syntax can be generated by combinations of the syntactic relations. It is also demonstrated that phrase structures are in fact derived from asymmetric orderings among the fundamental relations. Chapter 4 and 5 discuss in detail two types of parallel constructions that can shed light on the (hidden) symmetric properties of syntax: classifier constructions, and the syntax-semantics of indefinite expressions.

1.1 The Inherent Symmetry: Where and How?

Since Kayne (1994), it has often been assumed in generative syntax that the entire grammatical system, including syntactic structures, phonological forms, and logical forms, is inherently asymmetric. Therefore, syntax constructs asymmetric phrase structures that are mapped in isomorphism to the asymmetric hierarchical logical forms and linear phonological forms: Each interface is a realization of the inherent asymmetries.
The assumption of symmetry in syntax therefore seems redundant and unnecessary.

However, this assumption is not fully compatible with other models of general scientific inquiry, which aspire to discover underlying symmetry in scientific models. Consider the quote below from the Nobel Prize in physics laureate, Leon M. Lederman:

(2) Symmetry pervades the inner world of the structure of matter, the outer world of the cosmos, and the abstract world of mathematics itself. The basic laws of physics, the most fundamental statements we can make about nature, are founded upon symmetry. (Lederman & Hill 2004: 13)

We can witness this symmetry in Isaac Newton’s laws of motion, and the time-space symmetry in Albert Einstein’s theory of relativity. In biology, symmetry is also prevailing; e.g., D’Arcy Thompson’s work *On Growth and Form* suggests that (bio-)mathematical principles of symmetry govern beyond the theory of evolution in the biological worlds, and the current model on the structure of DNA is also subject to the same principle of symmetry in its architecture (See Stewart 1998 for an introduction).

One natural question to ask is whether the same principle of symmetry governs mental cognitive domains, such as those of linguistics and psychology. Here, I shall adopt standard methodological considerations in generative linguistics. It has been a recurring theme in Chomsky’s work that the fundamental question of generative linguistics is to ask ‘to what extent and in what ways can inquiry in something like the “Galilean-style” yield insights and understanding of the roots of human nature in the cognitive domain? (Chomsky 1980: 9)’ Here, the ‘Galilean-style’ (a term attributed to Husserl) refers to the
hypothesis that nature can be understood (by humans) through simple mathematic models (Chomsky 1980). As Freidin & Vergnaud (2001) put it, ‘more generally, one can define Galilean science as the search for mathematical patterns in nature (p.647),’ and ‘a significant feature of the Generative Revolution in linguistics has been the development of a Galilean style in that field (p.647).’ Indeed, generative linguistics, as the name suggests, represents one of the most striking breakthroughs in the understanding of language (and other human cognitive faculty) in showing that grammatical patterns can be described (and furthermore explained) in a simple mathematical model (see especially Chomsky 1964). In this sense, it is not unnatural to assume that the same general considerations and principles of mathematical models of the ‘Galilean-style science’ (in which symmetry plays a central notion) should also be maintained in the study of grammar (cf. also in Jenkins 2000). Chomsky (1995) describes the guidelines of linguistic research as follows:

(3) What are the general conditions that the human language faculty should be expected to satisfy... (A) its place within the array of cognitive systems of the mind/brain and (B) general considerations of conceptual naturalness that have some independent plausibility, namely, simplicity, economy, symmetry, nonredundancy, and the like (p.1).

Now, if the expectation of inherent asymmetry is correct, why is grammar of language so peculiar in resisting the pervasive principle of symmetry? This question leads to the doubt that perhaps we are not looking for symmetry in the right place. Perhaps an inherent symmetry can also be discovered in grammar, if we know how and where to look for it.
Interestingly, current scientific studies on symmetry lead to the conclusion that symmetry may often be hidden from view. It is, nevertheless, present in physical and mathematic laws. As remarked by the French physicist Pierre Currie, it is the departure from a symmetric state that may yield an observable phenomenon: “Asymmetry is what creates a phenomenon” (Curie 1894). The account might seem paradoxical at first sight. However, suppose we are standing in a quiet country field, and nothing is happening. We are actually in a most symmetric state (since everything remains invariant). Suddenly, an apple falls from the sky. It is quite easy to observe the asymmetric movement of the apple, but we do not observe, or perceive, the symmetric laws of motion and gravity behind such physical phenomena. Consider also the rotation of a perfect sphere (another state of symmetry), it is difficult to notice whether a sphere is rotating or not. The sphere will always look the same unless marked with some reference point(s) that creates some asymmetry (or lower the symmetry) of the rotation:

(4) a. Rotation (90 degree clockwise) of a sphere
b. When an asymmetry (the X mark) is created (a lowered symmetry)

Modern developments in theoretical physics further suggest that asymmetric patterns can be regarded as broken symmetry (a departure from inherent symmetry), explaining observed asymmetric phenomena out of an inherent symmetry. However, it is only in theorizing that we can reconstruct the underlying symmetry. Take an example given by Lederman & Hill (2004: 191). Think of a pencil standing on its lead tip, a highly symmetric, yet highly unstable state. The pencil will eventually fall into one direction, and each observed falling event of the pencil is asymmetric (since it only falls into one direction each time). Even in this case, however, the symmetry is not lost. It is only hidden. If we take into consideration all ‘possible’ directions that the pencil might have fallen into (it will be a symmetric circle around the tip), the broken symmetry is reconstructed into a rotational symmetry.

The apparent asymmetry is often deceptive, and it should not count as evidence against the inherent symmetry. As remarked by Stewart & Golubitsky (1992):
History is littered with examples where scientists and philosophers... seeking large-scale asymmetries in causes, to account for large-scale asymmetries – such as patterns – in effects. (p.17)

The deceptive nature of asymmetry may have also misled theoretical linguists to assume inherent principles of asymmetry that argue against symmetry in linguistic theory. On the other hand, I will argue for a thesis that an inherent symmetry underlies the abstract structure of syntax (where the core fundamental grammatical relations are encoded, if the general assumptions in Chomsky 1981, 1995 are adopted), and that surface phrase structures are actually the products of symmetry-breaking. In this sense, the dissertation will be generalizing an assumption first argued by Moro (2000), who suggests that asymmetric phrase structure can be created from a symmetric product of Merge. The proposed account, however, goes beyond Moro’s original proposal in assuming that all fundamental grammatical relations encoded in phrase structures are ‘simultaneously’ encoded in an abstract level of syntax, which possesses a structural/relational symmetry. It is in the departure from this underlying symmetry that surface phrase structures are derived.

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1 To be precise, Moro (2000) discusses three points of phrase structural symmetry: (i) small clauses, (ii) multiple specifiers, and (iii) clitic-complementation. The current work will attempt to generalize structural symmetry to every instance of local Merge (see Chapter 3).
1.2 Synopsis

What underlies the core concept of symmetry is **invariance** under transformations. One source of structural symmetries, therefore, can be discovered from the recursive applications of some constant relations found in syntax. Let us refer to these constants as primitive syntactic relations, which are the driving forces of syntactic structures.

Following Prinzhorn & Vergnaud (2004), Vergnaud (2009), and Liao & Vergnaud (2010), it will be argued that the primitive syntactic relations consist of three types of (local) relations: the N-V relation, the Substantive (Sb)-Functional (Fn) relation, and the K-K’ relation (K for some structural connectives). These are the relations that recursively hold in each level of syntactic domain, despite possible transformations, and the ‘narrowest’ syntax is a combination of these primitive relations. Specifically, the main proposal can be summarized in (6):

(6) **The Prinzhorn-Vergnaud Conjectures**
   a. Narrow Syntax (NS) is a Cartesian product of the primitive syntactic coupled domains (CD<sub>n</sub>), and Merge applies to any two adjacent nodes in NS: 
   $$\text{NS} = \text{CD}_1 \otimes \text{CD}_2 \otimes \text{CD}_3$$
   
   b. Given (a), Merge applies only to lexical items (**formatives** in the sense of Chomsky 1965), which is realized as a node in NS.

   c. Phrase-markers are constructed from the abstract NS.

Given (6a), syntax is a simultaneous satisfaction of the three primitive relations. Syntax can therefore be formulated as a Cartesian product of the primitive relations, which can be represented by a cubic lattice in its structural description:
a. Base syntactic structure = \{N, V\} \otimes \{Sb, Fn\} \otimes \{k, k'\}

b. 

Each node in the structure can be realized by a lexical item (call this Lexical Insertion; Chomsky 1964), and each pair of adjacent nodes represents an instance of structural merger. The theory therefore derives the desirable consequence that Merge is a relation that holds between lexical heads, and does not involve (artificial) projections or labels of the lexical items (such as X’, X”’ or X^max). In this sense, the proposed theory embraces a label-free (narrow) syntax proposed in Collins (2002) and a radical version of Bare Phrase Structure and the Inclusiveness Condition, both of which are adopted as core assumptions in the Minimalist Program (Chomsky 1994, 1995).

The proposal that these primitive relations are satisfied in a simultaneous fashion is simply another instance governed by the principle of symmetry. In the standard phrase structural analyses, though, they are assumed to be asymmetrically ordered. For example, it is usually assumed in the standard Minimalist framework that a noun is first merged with an element of its extended projection, a determiner, and is only subsequently merged with a verb (to satisfy the theta relation), which further extends to a light verb phrase:
In the configuration (8a), the four syntactic relations are asymmetrically ordered, as in (8b). As noted by Prinzhorn & Vergnaud (2004 et seq.), however, assuming asymmetric representations as the underlying syntactic forms fails to capture the strict locality of theta role assignment, which is a relation between the substantive verb and substantive noun. The asymmetric assumption also fails to generate the functional (Accusative Case checking) relation between D and v, and has to resort to a derived mechanism such as movement for spec-head checking in order to eliminate the redundant merge between V and D, and to satisfy the locality requirement between v and D. In this sense, the failure to capture strict locality of certain syntactic relations in the underlying representation is due to the assumption that some syntactic relations need to be satisfied earlier than others (i.e. an asymmetric ordering among primitive syntactic relations). An alternative, which is guided by the principle of symmetry, is to assume that in the ‘narrowest’ syntactic
representations, all of the primitive relations hold simultaneously, hence creating a multidimensional structure that satisfies the primitive syntactic relations all at once, and the asymmetry of phrase structures are always a derived product (by imposing ordering on the primitive relations in order to satisfy the ordering requirements of the interfaces; see Chapter 3).

The symmetric syntactic structure in (7) is a graph that represents the symmetric ‘base structure’, or the Merge-markers. Depending on types of lexical insertion, the base structure in (7) then instantiates different domains in syntax (corresponding to the derivational ‘phases’ in Chomsky 2001). Nevertheless, what remains invariant is that each domain is constructed by the same type of primitive syntactic relations. The recursion of the base structures thus directly follows from the translational symmetry:

(9)  The C-T domain

(10) The v-V domain (see Chapter 5)
As the graphs show, one important aspect of the proposed theory is the structural parallelisms, and they turn out to be good indications that syntax indeed has an inherent symmetric cause. It has often been argued that the nominal and the verbal projections exhibit a structural parallelism (Borer 2005a,b, Megerdoomian 2002, Grimshaw 2000, Hiraiwa 2005, Vergnaud & Zubizarreta 2001). In the proposed theory, this parallelism is directly built into the structures of Merge that reflect one of the primitive syntactic relations (i.e., the N-V relation). Therefore, the parallelism of the nominal and verbal projection in fact reveals one of the symmetric forms in the base syntactic structures.

Another recurring parallelism that is not quite transparent in all languages is depicted by the substantive-functional relation. Generalizing from the theory of root in Distributed Morphology (Borer 2003, 2005a, b, Halle & Marantz 1993, Marantz 1997), it will be argued that each functional item is paired with a substantive item, and the former defines for the latter its syntactic category and LF function (in this respect, the proposed theory departs from the standard assumption that a substantive item may fall into a series of functional projections). An illuminating example can be given from Chinese classifiers. A classifier comes from a substantive noun (with reduced morphological/phonological
surface forms), and its grammatical function is a classifier only if paired with a numeral (a functional item). In the same fashion, we shall argue that a substantive noun is also paired with a functional item (called [unit], related to the mass/count distinction; see Chapter 4). Other grammaticalizations in Chinese also provide examples for such a proposal (see §3.2.2). Yet another parallel pattern in syntax is realized in the local relations between two categorically similar items (e.g. C-T, Mod-Asp, v-V, CL-N, etc.). Pursuing the analysis in Liao & Vergnaud (2010), it is argued that this type of local relation is a reflection of an underlying connective pair (k-k’; k = connective), combining and extending the theory of transformational T-markers in Chomsky (1964, 1965), the theory of connectives in Kayne (2005), and the Relator-Linker theory in den Dikken (2006). It is assumed that these binary connective pairs will give rise to structural extensions, and may generate different phrase structural relations when mapped to the phrase structural terms (as the T-markers). Eventually, the parallel effects in syntax can be directly accounted for in the symmetric syntax.

The dissertation is organized as follows: Chapter 2 is a theoretical discussion of the minimalist thesis that narrow syntax consists of two operations, Merge and Agree. It is argued that both Merge and Agree are in fact symmetric operations, in contrast with standard assumptions. It is shown that the source of asymmetry of Merge, the labeling mechanism, is not intrinsic to Merge, and Merge simply applies to lexical items per se. The other core syntactic operation, Agree, is also a symmetric operation from a universal point of view. The properties of Chinese w/h-question suggest that Agree does not
presuppose a hierarchical asymmetry between Probe and Goal (i.e. Probe must be a structural extension of Goal in the derivations). On the other hand, it is argued that Agree can applied in either direction, and is simply governed by a domain of relativized locality (or Generalized Phases), which is in turn defined on Full Interpretation (represented in a refined feature system). Pursuing more fundamental questions, Chapter 3 then looks into sources of symmetry in syntax. Following Prinzhorn and Vergnaud (2004) and Vergnaud (2009), it is shown that parallelisms in syntax suggest that the ‘narrowest’ base structures in syntax are representations of the combinations of three core syntactic relations – which form a symmetric cubical lattice structure, and the generally assumed phrase structures are always derived from abstract symmetric structures. Chapter 4 and 5 explores some technical aspects of the proposed framework by studying nominal expressions and nominal-verbal interactions of the indefinite NPs in Chinese.
In pursuing a minimization of syntactic theory, Chomsky (1995) has initiated the hypothesis that syntactic operations are limited to **Merge** and **Agree**. Merge is a combinatorial rule which applies to lexical items, while Agree regulates the features that carried by the lexical items. The structures built by the two operations are then sent to Interface Levels, the sensory-motor interface (PF) and the conceptual-intentional interface (LF), where interpretations are given to the features of the lexical items with respect to sounds (or phonological gestures) at PF and meanings at LF:

(12) The Inversed T-Model of Syntactic Derivations

A fundamental question immediately raised by such a model is whether there is any criterion that can distinguish Merge and Agree from other grammatical relations or mechanisms. That is, is there a ‘natural class’ to which Merge and Agree belong? In what sense do Merge and Agree suffice as the minimal operations in syntax? In this dissertation it is argued that the notion of symmetry plays a crucial role. Here, symmetry is defined over the relations involved in Merge and Agree. I argue that Merge and Agree are the only two operations that do not presuppose an ordered relation (either hierarchical
or linear), and the applications of these relations yields symmetric outputs. The symmetry of the two operations hence distinguishes them from the interface operations (e.g. Scope interaction, Linearization, Binding Theory, etc), along with operations in other possible representational levels, all of which involve mapping to/from ordered relations. The study of syntax, therefore, is a study of the transformations from a (core) symmetric structure, which is immune to an ordering constraint, to an asymmetric one that satisfies the requirement of interfaces. The fact that interfaces are asymmetric is revealed by their algebraic properties. Prinzhorn & Vergnaud (2004:18), followed by Leung (2007:39), define their complementarities as follows:  

(13) a. The elements concatenated by PF operations are non-commutative (but are associative).

b. The elements concatenated by LF operations are non-associative (but are commutative)

Therefore, at PF, in a simple English sentence *A dog bit a man*, the ordered temporal phonological sequence *a dog > bit > a man* is not equivalent to *a man > bit > a dog*. The temporal ordering is non-commutative: any operations that tamper with its sequential orderings will eventually change its output. On the other hand, at LF, where only hierarchical relation is crucial (but not the temporal sequence), the structural dominations (or c-command relations) remain unaltered when the linear orderings are shifted: *(Every

---

2 The definitions of commutativity and associativity can be given as follows:

(i) A binary relation R is *commutative* if \( xRy = yRx \).
(ii) A binary relation R is *associative* if \( (((xRy)Rz) = (xR(yRz)) \)

A relation is *symmetric* if it is commutative and/or associative.
\[ \text{pug (bit (its owner)))} = (((\text{its owner} \text{ bit}) \text{ every pug}) = ((\text{bit (its owner)}) \text{ every pug}). \]

However, since the temporal sequencing of an utterance does not concern the LF interface, its commutativity appears to be trivial. Nevertheless, it is crucially non-associative since \((\text{Every pug (bit (its owner)))} \neq (((\text{Every pug}) \text{ bit}) \text{ its owner})\). In the former, \text{every pug} structurally contains \text{its owner}, but not the latter. At this point, two possible conjectures of narrow syntax can be assumed:

\begin{enumerate}
\item Syntax is both associative and commutative (and therefore highly symmetric), but some part of the symmetric properties is discarded at PF and at LF (due to the asymmetric nature of the interfaces).
\item Syntax is both non-associative and non-commutative (and therefore asymmetric), and one of the asymmetries is sent to PF and LF, respectively.
\end{enumerate}

In this dissertation, I pursue the first option (14a). The conceptual reason for adopting this view is that linear orderings (e.g. precedence) and hierarchical orderings (e.g. c-command) are external to narrow syntax, the two operations of which (Merge and Agree) are symmetric, as will be argued in this chapter. A reasonable view of interface asymmetries is that they result from factors outside Merge and Agree. Asymmetry in PF results from temporal linear ordering (the fact that time is unidirectional in the observable world),\(^3\) while asymmetry in LF comes from our mental cognitive constraints that we cannot process ambiguities simultaneously (we cannot understand \textit{someone loves everyone} in a parallel fashion. It \textbf{either} means, at a time, (a) a very ‘loving’ person, \textbf{or} (b) the fateful

\footnote{3 In a large scale, time can be, and should be, symmetric, but it is beyond our perceptual capability. See, for example, Tom Siegfried’s (2007) ‘Law and Order’ in Science News 117(13): p.26.}
soul-mates, but not (a) and (b) at the same time). Suppose scope readings reflect structural hierarchy, then the asymmetry is related to the fact that we can only process one hierarchical order at one time (EITHER some > every OR every > some), and not both at the same time (some > every AND every > some).4

The current minimalist syntactic theory, however, redundantly assumes that syntax is inherently non-associative and commutative, a bias towards LF. Therefore, we arrive at the familiar story that the derivation of syntax reflects the hierarchical structure that is linearized at PF at some point, and then this hierarchical structure may need to be adjusted by (inaudible) LF rules that in theory behave exactly like syntactic rules (but may override syntactic locality constraints). This assumption hence provokes the consequence that syntax is not elegant enough due to the unwanted redundancy between syntax and LF (e.g. the redundancy between syntactic movements and LF chain formations; see Brody 1995 and many of the following works, reviewed in our Section 2.2.2). This redundancy is eliminated if, instead, we look at narrow syntax and LF as quite different objects. The former is a symmetric structure, while the latter interpret the symmetric structure by mapping (parts of) the structure to asymmetric representations (i.e. a system that is non-associative), which is imposed on the symmetric inputs by external factors (e.g. our mental/cognitive constraints). Developing the an alternative minimalist idea, this dissertation argues that narrow syntax is only subject to minimal computation,

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4 The same asymmetric constraint is observed in the optical illusion of Necker Cube in the visual cognitive domain.
in the sense that only the local relations, such as \( \theta \)-selection, pairing of functional-substantial items, and head selections, etc., are encoded (See Chapter 3, developing original ideas in Prinzhorn & Vergnaud 2004, Vergnaud 2009, and Vergnaud & Zubizarreta 2001), but it is not constrained by linear or hierarchical conditions. In fact, linear and hierarchical structures are constructed and interpreted from the symmetric structures (by breaking its symmetry and mapping a subpart to certain asymmetric structures). I will focus on the thesis that Merge and Agree are symmetric in this chapter, leaving the symmetric structure of syntax to the next chapter.\(^5\)

An immediate challenge that embraces the second option (14b) is the theory of asymmetry of syntax in Kayne (1994), who argues that any operation that creates a symmetric relation should be prohibited by structural reasons, and that only hierarchical relations established in syntax can be isomorphically mapped to the linear relation at PF (i.e. Linear Correspondence Axiom; LCA). In addition, languages observe a universal underlying ordering SVO, with other surface orderings being derived through the

---

\(^5\) In this sense, Pierre Curie’s principle of symmetry is well observed in the grammatical theory (See also Jenkins 2000 for a discussion of the symmetry principle in biolinguistics):

(i) **Curie’s Principle of (Dis-)symmetry** (Curie 1894, Stewart & Golubitsky 1992)

a. If certain causes produce certain effects, then the symmetries of the causes reappear in the effects produced.

b. If certain effects reveal a certain dissymmetry (lack of symmetry), then this lack of symmetry will be reflected in the causes that give rise to them.

I attribute the observed asymmetric effects to external factors of the interfaces, which retain only a broken symmetry from the narrow syntax (hence the observed asymmetry at PF and LF). Notice that if we only adopt (ib), as in Kayne (1994), and claim that syntax is inherently asymmetric, we fail to predict certain symmetry that is retained in the representations (which is no longer trivial if we observe them globally). As we shall see in Section 2.3, a symmetry (commutative symmetry) is found in adjunction structures by comparing English and Chinese adjuncts.
occurrence of movement. Kayne supports his proposal by observing that there are no perfect symmetric patterns among languages (from wh-movement, binding condition C, and word orders, etc.). Here, objections to such a position are raised from both theoretical and empirical point of views. It will be argued that an asymmetric output in the interface level does not necessarily presuppose an asymmetric syntactic structure. In fact, hidden symmetry can be recovered when we consider it globally. That is, the asymmetries we observe are globally related to one another in a symmetric fashion (Stewart & Golubitsky 1992). I also argue that it is conceptually superior to assume that the narrow syntax is inherently symmetric and the asymmetries come from extraneous factors at interfaces. This is not only true for grammatical theory, but also true for an elementary computational system like arithmetic. In this sense, it is concluded that Kayne’s asymmetry actually hinges upon asymmetry external to the narrow syntax proper (see also Chomsky 1995, Moro 2000).

This chapter is devoted to establishing the point that operations of narrow syntax are highly symmetric. In Section 2.1, the basic concepts of the Minimalist Program are introduced. I argue that the core syntactic components (Merge and Agree) are symmetric in nature in Section 2.2. In Section 2.3, Kayne’s theory of antisymmetry is reconsidered.

2.1 A Sketch of the Minimalist Program

The Minimalist Program in Chomsky (1995) is an endeavor to reduce the computational load of syntax by downsizing syntactic theory to its minimal conceptual necessity (i.e. to
define the minimal components of narrow syntax). The result shows that many
descriptive tools and derivational levels that were once imposed on syntax during the
Government-Binding (GB) era can either be dispensed with, or they can be reformulated
as interface conditions if they bear no direct significance in the generative process of
narrow syntactic computation. For example, X-bar theory (Chomsky 1981, Jackendoff
1977), once thought to be a core syntactic component, is reduced to a by-product of
syntactic projection (Chomsky 1994). The theta-criterion and the binding theory
(Chomsky 1981), on the other hand, have been demonstrated to hold only at the logical
form (LF), and hence are interface conditions (Chomsky 1995: Ch3).

In more recent minimalist works (Chomsky 2001, 2004, 2008), it has been argued that
the minimal (narrow) syntactic components are inclusive of two operations: Merge and
Agree. Merge is a recursive operation that combines syntactic objects, while Agree is an
operation that regulates the combinations:

(15) The operation **Merge**

a. Suppose $\alpha$ and $\beta$ are syntactic objects:

$$\text{Merge}(\alpha, \beta) = K, K = \{\gamma, \{\alpha, \beta\}\},$$

where $\gamma$ is the label of $K$, and $\gamma =$ either $\alpha$ or $\beta$

b. \[
\begin{array}{c}
\alpha/\beta \\
\alpha \\
\beta
\end{array}
\]
The operation **Agree**

a. Suppose $\alpha$ is a probe bearing an uninterpretable feature $[uF]$, and $\beta$ is a goal bearing a matching interpretable feature $[iF]$:

$\text{Agree}(\alpha, \beta) \rightarrow \text{Value}(\beta, \alpha) (= [uF] \rightarrow [iF])$

b.

```
<table>
<thead>
<tr>
<th>probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>α[uF]</td>
</tr>
<tr>
<td>_</td>
</tr>
</tbody>
</table>
| β[iF]          |  \_  \\
| value          |
```

The operation Agree aims at the features of the lexical items (the minimal syntactic objects), eliminating the features that are uninterpretable to the interfaces. The syntactic combinations converge at the interfaces (i.e. the Phonetic Form, which is the Sensory-Motor interface, and Logical Form, the Conceptual-Intentional interface) if all uninterpretable features are eliminated; otherwise, the combinations crash. An uninterpretable feature is eliminated when it is valued by a matching interpretable feature (through the operation Agree, as in (16)). The valued feature, then, is transferred to the interface that can assign it an interpretation (e.g. the Case feature is transferred to PF, yielding Case morphology, but not to LF).\(^6\) The feature agreement is also subject to some structural constraints. Structurally, a Probe, which has an uninterpretable feature, must c-command a Goal, with an interpretable feature that can value the Probe.

\(^6\) This formulation of uninterpretable features is from Chomsky (2008: 145), attributed to Jean-Roger Vergnaud’s original Case theory. For languages that do not present Case morphology (e.g. Chinese), evidence shows that Case features are still at work, but in a covert way (see Li 1990, 2003, and subsequent works).
To illustrate how Merge and Agree work. Let us consider the $\phi$-features agreement in a simple English sentence like *A man arrives*. The operation Merge yields the structure in (17b) from the lexical items in (17a):

(17)  

a. {T, arrives, a, man}  

b. 

\[ \begin{array}{c}
  \text{T} \\
  \text{[u$\phi$]} \\
  \text{[i$\phi$]} \\
  \text{V} \\
  \text{arrive} \\
  \text{D} \\
  \text{a} \\
  \text{N} \\
  \text{man}
\end{array} \]

When T is introduced in the derivation, the uninterpretable $\phi$-features [u$\phi$] on T require agreement.\(^7\) The Probe T searches (in its domain) for a matching Goal, which is the interpretable $\phi$-features of D. Agreement holds between D and T, preventing the sentence from crashing at the LF interface. There are other features, however, that are involved in this derivation. One such feature is the [EPP] feature (EPP = Extended Projection Principle), which requires a head to extend its projection.\(^8\) Consider (17) again. The sentence has two variants: *A man arrives* and *there arrives a man*, with the subject position either filled by *a man* or by *there*. The displacement of *a man*, or the expletive

\(^7\) T is unvalued with respect to its $\phi$-features since it is totally dependent on the $\phi$-features of the subject DP, and it is uninterpretable to the LF interface due to its dependent/redundant nature. However, at the PF interface, the relevant $\phi$-features need to be specified with a morpheme –s in English if valued with [3rd Person Singular]. See Chomsky (2008:154)

merge of *there*, is triggered by the [EPP] feature on T, generating one of the following structures:

\[(18) \quad \begin{align*}
&\text{a. There arrives a man} \quad \text{[executing ①]} \\
&\text{b. A man arrives.} \quad \text{[executing ②]} \\
&\text{c.}
\end{align*}\]

Due to the favored hypothesis of minimal computation, Agree and Merge are further subject to a locality condition, which Chomsky (2001) refers to as the Phase Impenetrability Condition (PIC):

\[(19) \quad \text{The domain of H is not accessible to operations outside HP [HP a strong phase]’ only H and its edge are accessible to such operations.}\]

The main idea of the PIC is that once the derivation reaches a structural position (the phase categories), it must be spelled out to the interface, and therefore will no longer be accessible to any later operations. Chomsky assumes that such categories are CP and vP (and possibly DP). To visualize this mechanism, let us consider the following diagram (See also Epstein & Seely 2002):
Once the syntactic derivation reaches vP/CP, the complement of v/C will be spelt out to PF and only the v/C head and [Spec, vP/CP] (i.e., edges of phase) remain visible to the later derivation. A derivation thus proceeds phase by phase in the following fashion (each circle represents a phase, while the intersection being the ‘glue’ between phases):

This being said, the hypothesis that CP and vP (and possibly, DP) are unique phase categories remains a conjecture, and has been under debate (Epstein & Seely 2002, Franks & Boskovic 2001, Uriagereka 1998, among others), as shown by the following quote in Chomsky (2004): “Call the relevant units ‘phases.’ It remains to determine what
the phases are, and exactly how the operations work.” A response will be provided to this question in Section 2.2.3.

2.2 In Quest of Symmetries in Syntax

Chomsky’s own definitions suggest that Merge and Agree are both strictly asymmetric relations (at least in the early minimalist thesis, as in (15) and (16), repeated below):

(15) The operation Merge
        a. Suppose $\alpha$ and $\beta$ are syntactic objects:
           $\text{Merge}(\alpha, \beta) = K$, $K = \{\gamma, \{\alpha, \beta\}\}$, where $\gamma$ is the label of $K$, and $\gamma = (\alpha \vee \beta)$
        b. $\begin{array}{cc}
             \alpha/\beta \\
             \alpha & \beta
          \end{array}$

(16) The operation Agree
        a. Suppose $\alpha$ is a probe bearing an uninterpretable feature $[uF]$, and $\beta$ is a goal bearing a matching interpretable feature $[iF]$:
           $\text{Agree} (\alpha, \beta) \rightarrow \text{Value} (\beta, \alpha) (= [uF] \rightarrow [iF])$
        b. $\begin{array}{c}
             \text{Probe} \\
             \alpha_{[uF]} \ldots \beta_{[iF]} \\
             \text{value}
          \end{array}$

However, close scrutiny of Merge and Agree indicates that the asymmetry may not be intrinsic to the two operations. Consider Merge in (15). The asymmetry of Merge is that when the new syntactic object is created by merging $\alpha$ and $\beta$, the label of the object can only be identified as $\alpha$ or $\beta$, but this characterization reveals that it is the labeling that is
not symmetric. If we remove labeling from the core definition of Merge, as first suggested by Collins (2002) (see also Chomsky 2008), we remove the asymmetric aspect of Merge. The question is whether labels are core properties of narrow syntax. In Section 2.2.1, Collins’ work is reviewed on eliminating labels from syntax. We shall also review and refine the theory of label reprojection (Hornstein & Uriagereka 2002). The outcome indicates that labeling should be exempt from the core operation of Merge.

Let us turn to Agree. The asymmetry of Agree shows up with respect to the Probe-Goal relation: (i) a structural Probe-Goal asymmetry (in the sense that Probe is in the c-commanding position), and (ii) a [uF]-[iF] asymmetry (in the sense that agreement is always triggered by a [uF]). The first asymmetry is in fact an illusion that arises from the terminology. As argued in Hiraiwa (2005), if we consider multiple agreements, the hidden symmetry emerges (which neutralizes the strict Probe-Goal asymmetry). As for the second type of asymmetry, it has been suggested in Brody (1995, 2003, 2005) that feature agreement is driven by Full Interpretation, and not solely by an uninterpretable Probe. This allows us to eliminate the assumption that agreement is defined on an asymmetric structural ordering. The two types of agreement asymmetries will be reviewed in Section 2.2.2. In Section 2.2.3, we review two theories that assume that agreement is asymmetric (either triggered by Probe or by Goal). By looking at wh-questions in Chinese, we argue that neither of these can fully account for the nature of Agree. A radical examination of

---

9 The debate about the triggers of agreement (or movement), either by target or by goal, also recalls the notion of Greed in the early Minimalist framework.
the Agree mechanism then indicates that the internal organizations of features need to be considered. Then, a refined feature theory is proposed that can account for cross-linguistic parameterization in \(wh\)-questions.

### 2.2.1 The Symmetric Nature of Merge: On the Status of Labeling

The apparent asymmetry of Merge comes from the labeling mechanism, which holds that Merge(\(\alpha, \beta\)) creates a new object, and its label is either \(\alpha\) or \(\beta\). Let us examine, however, the necessity of labels in a Merge operation. If we go back to the beginning of MP in Chomsky (1995), the minimal operation of Merge yields the set \(\{\alpha, \beta\}\). However, this is not in itself sufficient. Labels are created to satisfy the output condition:

\begin{equation}
\text{(22) Applied to two objects } \alpha \text{ and } \beta, \text{ Merge forms the new object } K \ldots \text{ The simplest object constructed from } \alpha \text{ and } \beta \text{ is the set } \{\alpha, \beta\}, \text{ so we take } K \text{ to involve at least this set} \ldots \text{ Does that Suffice? Output conditions dictate otherwise, thus, verbal and nominal elements are interpreted differently at LF and behave differently in the phonological component. (p. 243)}
\end{equation}

Accordingly, labels are used to identify a complete functional unit in the semantic or phonological outputs. This suggests that labeling might be an independent operation from Merge. The question which follows then is whether Label is an operation that applies in narrow syntax? I suggest that the answer is negative. In fact, Collins (2002) proposes that labeling can be completely eliminated as a grammatical component, and all relations referring to XP or X’ can be replaced by other mechanisms. His position might be too strong, however, since it seems that PF and LF still make reference to certain labels. Hornstein & Uriagereka (2002) suggest that re-projection of labels should be an option in
the LF component. Considering the two proposals, a unifying analysis is to claim that the
operation Label applies either at Spell-out, or at the interfaces. This is reminiscent of the
idea in Moro (2000) that the labeling requirement drives symmetry-breaking in syntax,
which is also echoed by the main thesis developed here: Syntax is symmetrical and the
interfaces are asymmetrical. Labeling, then, can be understood as an ordering mechanism
that feeds the design of the interfaces.

2.2.1.1 On Eliminating Labels: Collins (2002)

Collins (2002) reconsiders the definition of Merge in Chomsky (1995), and proposes that
a minimal and ‘barer’ phrase structure building mechanism that involves no labeling
should be entertained. Collin’s main objection against labels is that the functions of labels
are redundant (in the same sense that X-bar theory is redundant). Instead, Collin proposes
that syntactic relations that have the form of Probe-Goal relations are enough to derive
the effects of labels. These relations include the following:\(^{10}\)

\[
\begin{align*}
(23) & \quad \text{a. Theta (X,Y) \quad X assigns a theta-role to Y} \\
& \quad \text{b. EPP (X,Y) \quad X satisfies the EPP requirement of Y} \\
& \quad \text{c. Agree (X,Y) \quad X matches Y, and Y values X} \\
& \quad \text{d. Subcat (X,Y) \quad X subcategorizes for Y}
\end{align*}
\]

\(^{10}\) It is possible to reduce the relations proposed by Collins to a selection between heads (Subcat and Agree)
and a coupling between N and V domain (EPP and Theta). We shall return to these relations in Chapter 3.
Collins also assumes that the traditional sense of local relations under X-bar theory can be replaced by the Probe-Goal relation. To see this, let us consider the following situation, which involves the relation Subcat *(tell, on)*:

(24)  

a. John told on Bill.  
b. tell: [ __ PP<sub>on</sub>]  
c. tell: [ __ on]

X-bar schema requires that selection be local (strict sisterhood); therefore, a label is required. Observe the differences between the tree representations in (25a) and (25b):

(25)  

a.       b.  
        VP                              tell       on  Bill
            V  PP                           tell               
                P NP               on      Bill
                   on
                   Bill

Collins suggests that the local relation can be replaced by minimality, which we define as follows:

(26)  **Minimality**

For a binary Relation R in a configuration, [X…Z…Y], where X c-commands Z, and Z c-commands Y:

R(X,Y) → ¬R(X,Z)
(26) holds if (i) Z does not exist, or (ii) Z does not bear the relevant feature that satisfies R(X,Z). Under minimality, the strict local relation (sisterhood) can therefore be replaced by minimal Search (Chomsky 2001, 2008).

While Collins’ proposal represents a further simplification of the system by reducing labeling to Probe-Goal relations, his position, however, might be too strong. Consider the Theta (X,Y) relation. In an example like *Bill [hits Mary’s brother]*, the syntactic configuration is as follows:

\[(27) \quad [hit [Mary’s [brother]]]\]

Since Mary is a potential theta role recipient, Theta(hit, Mary) should block Theta(hit, brother). With labeling, however, it seems that the problem can be solved if we assume that *brother* projects as the label. But even with labels, the following example is difficult to deal with (modified from van Riemsdijk 1998):

\[(28) \quad \begin{align*}
\text{a. John } & \text{drank } [\text{water three bottles of water}] \quad \text{(theme = water)} \\
\text{b. John } & \text{broke } [\text{bottle three bottles of water}] \quad \text{(theme = bottle)}
\end{align*}\]

This example will be reviewed in Chapter 4. However, one may conclude, at this point, that the label shifts with the interpretation (this possibility will also be discussed in the
next subsection). This means that labels, if needed, do not have to be a derivational
necessity, and in fact, they cannot. In (28), changing the labels according to the verb in
use is a countercyclic operation, and predicting the verb in use causes the look-ahead
problem. Neither should apply in narrow syntax.

2.2.1.2 Reprojection of Labels: Hornstein & Uriagereka (2002)

Hornstein & Uriagereka (2002) argue that reprojection of labels is possible at the LF
interface. The mechanism is shown as follows (from H&U p.109):

\[
\begin{align*}
(29) & \quad \text{a. IP} \\
& \quad \text{QP} \quad \text{I} \quad \text{VP} \\
& \quad \text{most people} \quad \text{I} \quad \text{VP} \\
& \quad \text{tQP … love children} \\
& \quad \text{b. QP} \\
& \quad \text{Q} \quad \text{IP} \\
& \quad \text{most people} \quad \text{I} \quad \text{VP} \\
& \quad \text{tQP … love children}
\end{align*}
\]

Hornstein and Uriagereka proposes that a strong quantifier \textit{most} is a binary quantifier
(Larson & Segal 1995), in the sense that the strong quantifier requires an NP as a
restriction and an VP as a matrix scope. In this way, from the perspectives of LF, a
quantifier behaves like a transitive verb taking two ordered arguments. The analogy can
be represented as follows:

\[
\begin{align*}
(30) & \quad \text{a. [VP [putV [NP a book ]] [PP on the shelf]]} \\
& \quad \text{b. [QP [mostQ [NP people]] [IP likes children]]}
\end{align*}
\]
Syntactically, however, with Infl being the head of the sentence, a standard structure (that follows from the X-bar theory) like (29a) fails to generate the representation in (30b). To come up with a uniform syntax, Hornstein & Uriagereka propose that at LF, it is possible for the quantifier to reproject its label, yielding the structure in (29b), where most is the transitive head and its two arguments are \[np \text{people}\] and \[vp \text{love children}\].

The reprojection mechanism, however, may look deviant from a standard syntactic point of view. Hornstein & Uriagereka note that reprojection changes the c-command relation, and Chain formation at LF, which are not desired consequences. To avoid these problems, Hornstein & Uriagereka have to stipulate a rule ordering: c-command and Chain relations must have applied earlier than reprojection. Since c-command and Chain are core syntactic components, the stipulation finds its natural explanation if reprojection is subject to LF rules. Let us dwell upon this point. The reprojection rule is a type of projection rule (and it is a projection rule that operates on the same syntactic object).\(^{11}\) Therefore, if projection applies before c-command and Chain, why cannot reprojection also apply before c-command and Chain (namely, in narrow syntax)? If reprojection is a LF-unique operation, then simply assuming LF movement seems to be a simpler solution (since c-command and Chain relations will not be an issue). The same question can be asked with respect to the PF interface. Is there PF reprojection? More fundamentally, the

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\(^{11}\) The phonological rule, re-syllabification, can be thought as a reprojection rule. However, re-syllabification always involves adding or deleting some phonological unit (see Kenstowicz 1994 and the references listed there). However, the reprojection rule proposed in Hornstein & Uriagereka is applied to the same syntactic object throughout.
notion of reprojection already presupposes that projection of labels is necessary during the derivation of narrow syntax; that is, Merge always creates the forms subject to the definition in (15). But there is no guarantee that this is so. Instead, let us assume a weaker version of Collins (2002), that narrow syntax is label-free. Labeling being the source of asymmetry, this will go along with our idea that narrow syntax is a symmetric system, while asymmetry is intrinsic to the interfaces. As long as we break the rigid asymmetric frame of Merge in (15), we arrive at a conclusion that labels are constructed from the syntactic input for the needs of the interfaces. Therefore, LF labels can be different from PF labels since labels are created in order to satisfy the needs of the interfaces.

2.2.1.3 Labeling Asymmetry and Interfaces

There is an alternative to the direction taken in the last subsection. Revising the labeling mechanisms in Chomsky (1995), Chomsky (2008:145) assumes that labels may ‘co-exist’ at narrow syntax, yielding different possible interpretations, and the interfaces then filter out the structures that are not mapped to admissible interpretations. Chomsky (2008:145) proposes two labeling algorithms in (31):

(31) a. In \{H, α\}, H an lexical item, H is the label.

     b. If α is internally merged to β, forming \{α, β\}, then the label of β is the label of \{α, β\}.

---

12 As mentioned in the last subsection, labels are totally eliminated in Collins (2002), including at the interface levels.
(31a) rules out the possibilities that when T is merged to VP, or when D is merged to NP, the latter projects:

\[
(32) \quad \begin{array}{ll}
\text{a.} & \text{TP/*VP} \\
& \text{T} \quad \text{VP}
\end{array}
\quad \begin{array}{ll}
\text{b.} & \text{DP/*NP} \\
& \text{D} \quad \text{NP}
\end{array}
\]

(31b) ensures that movements always target specifier positions. One scenario is when \(\alpha=[\text{DP which book}]\) and \(\beta=C_{[+\text{wh}]}\), as in (33):

\[
(33) \quad \text{CP/*DP} \\
\text{[which book]} \quad \text{C} \\
\quad \cdots \text{[which book]}
\]

In typical cases, the algorithms in (31) generate structures conforming to the X-bar convention, but sometimes it does not. For example, reconsider (32b) in a bare phrase structural point of view:

\[
(34) \quad \text{?} \\
\text{the} \quad \text{city}
\]
Both *the* and *city* being bare lexical items, which one should project the label, according to the first algorithm? One answer, suggested by Chomsky (2008:145) is that both project (the labels co-exist) in the structure, shown as follows:

\[(35) \quad \text{the city} \]

\[
\text{the} \quad \text{city}
\]

It is possible that the first and the second algorithms may conflict. Chomsky (2008) illustrates this with the following example, adopting the analysis on free relatives in Iatridou, Anagnostopoulou & Izvorski (2001):

\[(36) \quad \text{a. I read } [\text{DP what you read}].
\]
\[
\text{b. I wonder } [\text{CP what you read}].
\]
\[
\text{c. } \frac{\text{what}_D + C}{\text{what}_D} \quad \frac{C}{\text{you read what}_D}
\]

Chomsky hence concludes that “the labeling algorithms apply freely, sometimes producing deviant expressions. The outcome will satisfy the empirical conditions on I-language if these are the interpretations actually assigned.” I interpret this idea as follows: the labeling algorithms freely generate outputs to the interfaces, and each of the interfaces will assign an interpretation in accords with the label(s) generated. Essentially,
the mechanism behaves on a par with re-projection, but instead of re-project, the interfaces ‘de-project’ the labels. The interfaces ultimately decide/filter out unwanted structures (with wrong labels). However, I think the theory can be further simplified. If labels eventually will be the products of the interfaces, why do they need to (redundantly) show up at narrow syntax in the first place? It is exactly this kind of redundancy between syntax and LF (like movements and Chains) that creates problems.

2.2.1.4 Conclusion on Labeling

Let us conclude the section by reviewing (15):

\[(15)\text{ The operation Merge}\]
\[a. \text{Suppose } \alpha \text{ and } \beta \text{ are syntactic objects:}\]
\[\text{Merge}(\alpha, \beta) = K, K = \{\gamma, \{\alpha, \beta\}\}, \text{where } \gamma \text{ is the label of } K, \text{and } \gamma = (\alpha \lor \beta)\]

\[b. \begin{array}{c}
\alpha \lor \beta \\
\alpha \quad \beta
\end{array}\]

We have seen that at narrow syntax, it is possible to eliminate labels, which is the source of asymmetry in syntax. The elimination of labels in narrow syntax gets rid of a redundancy that resides in a grammatical system that assumes the rigid definition of Merge in (15). However, we might keep the notions of labels at the interfaces, since they are needed to ensure correct interpretations at PF and LF (as argued in Chomsky 1995; 13 That is to say, QP and IP may both project in (29), and LF eventually chooses the QP label for interpretation.)
quoted in (22)). It is thus concluded that labels are not intrinsic to Merge, the definition of
which is revised as follows:

(37) Merge (revised)
    a. Suppose $\alpha$ and $\beta$ are syntactic objects:
       \[ \text{Merge}(\alpha, \beta) = K, K = \{\alpha, \beta\} \]
    b. \[
           \begin{array}{c}
                \alpha \\
           \end{array} \begin{array}{c}
                \beta
           \end{array}
    \]

There are remaining questions in adopting this view. First, how and where are labels
constructed if they are not intrinsic to Merge? Second, if Merge is restricted by relations
between two lexical items, (38a) and (38b) will both hold from a narrow syntactic point
of view:

(38) Suppose Select ($\alpha, \gamma$) and Theta ($\alpha, \beta$), and $\sim$Select ($\gamma, \beta$) and $\sim$Theta($\gamma, \beta$):
    a. \{ {$\alpha, \gamma$}, $\beta$ \}
    b. \{ {$\alpha, \beta$}, $\gamma$ \}

The question is how we decide between the structures. In fact, one possibility, suggested
by Prinzhorn and Vergnaud (2009) and adopted here, is that they are simultaneously
satisfied. We shall leave these issues to the next chapter.
2.2.2 The Symmetric Nature of Agree: On the Design of Feature Checking

2.2.2.1 The Hidden Symmetry in Multiple Agreements: Hiraiwa (2005)

The first type of asymmetry in agreement is the structural asymmetry between Probe and Goal. Namely, a Probe is always in a c-commanding position, and probing applies prior to valuation. Hiraiwa (2005), however, argues that agreement should be regarded as a symmetric operation (in the sense that probing and valuation happen at the same time) as long as we depart from the usual one-to-one agreement, and look into the case involving multiple agreements. Consider the following situation:

\[(39)\quad a.\]

\[
\text{Probe} \quad \downarrow \quad \text{Goal}_1 \quad \downarrow \quad \text{Goal}_2
\]

If the Probe-Goal relation is asymmetric, we expect that the either the first Goal or the second Goal will return a value for the Probe (most likely to be the Goal$_1$, due to minimality). However, what Hiraiwa found is that in a configuration of multiple agreement, the Probe-Goal relation is in fact returned in symmetric fashion, so that a Probe becomes a Goal and a Goal becomes a Probe. Therefore, we do not expect to find minimality (where Probe-Goal$_1$ intervenes Probe-Goal$_2$). On the other hand, since Goal$_2$ is ‘probing’ the Probe at the same time. Goal$_1$ and Goal$_2$ can both return a value to the Probe. According to Hiraiwa, Agree is revised as follows:
(40) Agree instantiates the two relations at the same time:

Value(P,G) and Value(G,P)

Hiraiwa proposes that two types of symmetric patterns are found in multiple agreements:
One is called Centro-symmetry, where a one-to-many Value relation is invariantly returned by another one-to-many Value relation, as shown in (41a). The other type of symmetry is Mirror-symmetry, where a one-to-many Value relation is mirrored by a many-to-one relation, shown in (41b):

(41) a. Centrosymmetry

b. Mirrorsymmetry

Hiraiwa illustrates the two types of agreement symmetries by the Plural agreement in Icelandic. It has been observed by Holmberg & Hróarsdóttir (2003) that Icelandic displays quirky agreement patterns in the transitive expletive constructions (TEC), as shown in the following sentences:
The crucial patterns here are the verbal agreement with the arguments. Hiraiwa observes that the seemingly arbitrary agreement patterns can be explained under multiple agreement with the assumption that Singular agreement can be regarded as the default agreement. His idea is that the verb shows plural agreement only if both the dative and nominative arguments carry a [Pl.] feature; otherwise, a default singular agreement is obtained when the two features conflict (those of the dative and nominative arguments). This shows that the Probe (Agreement feature on the verb) can target both arguments (Goals) at the same time, or vice versa. These agreement patterns follow from Centrosymmetry (Hiraiwa 2005: 53):
In (43a) and (c), T probes both DPs at the same time (a one-to-many relation), which return also a one-to-many relation, in which the two ‘Goals’ (T and DP\textsubscript{Dat}) have conflicting Number features. This conflicting agreement triggers an intervention of valuation between the two Goals, which thus gives rise to a default marking (i.e. Singular) on T. When there is no conflicting value, as in (43b), no intervention is detected between Goals, and thus T is marked as [Pl.]. However, T in (43b) may also be marked as [singular] (or default Number). Hiraiwa attributes this possibility to another symmetric pattern, namely, Mirrorsymmetry:
(44) The Mirrorsymmetry in (42b)

In Icelandic, a Dative argument always triggers default Tense agreement, regardless of its own number feature specification. The fact that T is marked by default singular Number in (42b) suggests that the Dative argument, as well as the Nominative argument, are both ‘Probes’, and T is marked as default since a conflicting value is returned.

Zeijlstra (2004) and Penka (2007) make use of Hiraiwa’s model to account for the negative concord found in many languages (Giannakidou 2000, Haegeman 1995, 1997, Haegeman & Lohndal 2010, Herburger 2001, Penka 2007, Watanabe 2004, Zeijlstra 2004, among others). These authors argue that the negative words (n-words) found in these languages behave like negative polarity items (such as any in English) in that they need to be licensed by a negative operator:

(45) a. John didn’t call anybody.

b. Gianni neg ha telefonato a nessuno. \textit{Italian}
   Gianni Neg has called to n-body
   ‘Gianni didn’t call anybody.’

c. T ee niemand niets gezeid \textit{Dutch}
   it has n-body n-thing said
   ‘Nobody said anything.’
Zeijlstra (2004), following the analysis of polarity contexts in Giannakidou (1998), proposes that the n-words carry an unvalued negative feature, which must be valued by an abstract sentential negative operator ($Op^-$) that carries a valued negative feature:$^{14}$

\begin{align*}
 \text{(46)} & \quad Op^-[\text{Neg}] \ldots \text{n-word}_1[\text{uNeg}] \ldots \text{n-word}_2[\text{uNeg}] \ldots
\end{align*}

In the schematic representation in (46), the Probe-Goal relation is in a reversed order from what is assumed in the standard Derivation-by-Phase (DbP) model. A similar situation can be observed with indefinite NPs in Chinese. We shall leave this issue to Chapter 5.

If these approaches are on the right track, then they indicate that there is no presupposition of an ordering asymmetry in the operation Agree between the structural positions of probes and goals. In fact, feature agreement (or feature checking) can be thought of as an operation that eliminates uninterpretable features in a certain domain (Brody 1995). In standard minimalist theory, the domains are identified as phases, which are often assumed to be CP and vP:

---

$^{14}$ Revising Zeijlstra (2004), Haegemann & Lohndal (2010) suggests that negative concords involve a more complicated feature matrix, including not only the [uNeg], but also the [uQ] (quantificational feature). Their proposal also tries to eliminate strict multiple agreement by tailoring multiple agreement into local agreement pairs. Despite the technical differences, all of the analyses adopt the idea of a Probe that operates in a reversed direction.
(47) Agree (revised)

For some feature F, in a given domain D, \([uF] \rightarrow [iF]\) iff there is another instance of the matching features in D.

Notice that the definition in (47) does not exclude the possibility of multiple agreement. In fact, multiple agreement will be allowed if the matching conditions and the locality condition are met. However, the definition in (47) does leave room for discussion on the definition of ‘domain.’ We shall conclude that the domains of agreement are not strictly vP and CP, but are relativized with respect to different operations (reminiscent of the relativized minimality of Rizzi 1990). The domains are referred to as Generalized Phases (borrowing the notion of ‘Generalized Phase Conjecture’ in Freidin & Vergnaud 2001; see also Simpson 2000). For example, while a \(wh\)-question is potentially unbounded (giving rise to cyclic movements of \(wh\)-phrases), the negative operator is clause-bound in negative concord languages (Zeijlstra 2004), and so is the finite tense operator in English (which blocks the subject raising from a finite clause). To see how this conclusion is arrived, it is helpful to review the proposal in Brody (1995, 2000, 2003, 2005).


In a series of works, Brody examines the notions of Chain and Movement (or the operation Move \(\alpha\), as assumed in the Government-Binding framework). He concludes that a theory that employs both Chain and Movement contains a conceptual redundancy (e.g., the standard derivational model). Brody advocates a radical view that replaces Movement by Chain (which entails that syntax and LF are the same representational level,
i.e., Lexical-Logical Form in Brody 1995). This includes substituting Chain-formations for the standard treatment of feature checking/agreement by movement (Chomsky 1995). His main idea is that as long as feature agreement is reformulated in terms of LF-chains, the asymmetries between Probe and Goal and between uninterpretable and interpretable features can be eliminated. This is referred to as the Bare Checking Theory (Brody 2003:167, 2005):

(48)  
a. A multiple instances of a syntactic feature corresponding to a single semantic value must be linked to each other at the LF interface (via Spec-Head and/or Chain relations).

b. All syntactic features are semantically interpretable, more precisely, that at least one instance of a set of linked instances must be in a position where it is interpreted.

Let us illustrate this with a concrete example -- subject raising in English (from Brody 2005):

(49)  
a. *John_i seems [ t_i likes Mary]

b. John_i seems [ t_i to like Mary]

(49a) involves an instance of illicit subject raising out of a tensed-clause, while raising out of a non-tensed infinitive clause creates no problems in (49b). Brody argues that the ungrammaticality in (49a) is due to an unwanted chain relation between two independent occurrences of Tense, which is forced by the subject raising:
In (50), (the trace of ) John first checks/agrees its tense feature (reflected through Nominative Case) against Tense₂, and then subsequently raises to [Spec, Tns₁] to check its tense feature against Tense₁. The raising of John thus indirectly creates a Chain between Tense₁ and Tense₂, by (48a). This means that the tense feature in Tense₁ and Tense₂ are the same LF object, contrary to the fact. On the other hand, raising out of an infinitive clause does not result in the tense conflict: The infinitive tense is Chain-linked to the finite tense by virtue of subject raising.

Concerning the last point, Brody’s theory can be further supported by the empirical fact that some languages do permit subject raising out of finite clauses when the Tense of the finite clause is specified as subjunctive. These languages include Nguni, a Bantu language (Zeller 2006), and Greek (Alexiadou & Anagnostopoulou 2002). Consider the following patterns (from Zeller 2006), the number represents the Noun Class (NC) agreement:

(51) a. Ku-fanele ukuthi [abantwana ba-fund-e]
    Expl-ought that child2 NC2-study-Subjunct
    ‘It is necessary that the children study.’

    b. Abantwana₁ ba-fanele [ukuthi t₁ ba-fund-e]
       child2 NC2-ought that NC2-study-Subjunct
       ‘The children must study.’
The raising of the subject moves out of the subordinate clause that shows subject agreement (in terms of Noun Class). The patterns find their natural explanations if we suppose that the subjunctive tense is interpreted through linking to the tense of the main predicate (which is unmarked Present in (53)). Therefore, the chain created by the Tense agreement between two tenses indirectly ‘feeds’ the subject-raising chain. Similarly in Greek, a finite subjunctive subordinate clause does not block subject raising, although the subject does agree with subordinate T in terms of its ϕ-features (from Alexiadou & Anagnostopoulou 2002):15

(52) O-Janis1 theli [na figi avrio].
    John-Nom wants Subjunct leave-3Sing tomorrow
    ‘John wants to leave tomorrow.’

As for A-bar movements (e.g., wh-movement in English), Brody’s theory also provides an account in terms of chain-formation:

(53) a. [Who C1 did Mary say [twho C2 Bill saw twho]]

    b. [I wonder [who C3 Bill saw twho]]

The wh-movement in (53a) reflects the chain-formation between C1 and C2. Specifically, by (48a), the interrogative feature [+WH] of C2 and C1 is viewed as a single LF object;

15 These languages also pose apparent problems for the recent popular treatment of associating Case-agreement with ϕ-feature agreement (e.g. Chomsky 2001). In view of the languages allowing subject raising from finite clauses, the association between Case and ϕ-feature must be parameterized. I leave this for future research.
therefore, the whole sentence contains only one wh-question, namely, a direct
wh-question. This is possible because say is not an interrogative verb that selects a [+WH]
complementizer (Grimshaw 1979, Huang 1982). The wh-chain (who, t\_who, t\_who), on the
other hand, is subject to (48b), where the first instance of who occupies the position
where it is interpreted. Likewise, (53b) shows that the wh-chain (who, t\_who) is interpreted
in a position that the interrogative feature of C\_3 is checked.

One may observe that unlike the standard theory, in which an uninterpretable Probe
always probes for an interpretable Goal, Brody’s theory of Chain makes no reference to
the interpretability of features. Agreement by Chain therefore dispenses with the
Probe-Goal asymmetry and also the uninterpretable-interpretable asymmetry. As long as
two elements share a common LF feature in some domain, they form a chain. This
conforms to our revised definition of Agree in (47). The only difference is a minor
technical one: The process of an unvalued feature becoming a valued feature (and
therefore share the same interpretation at LF) in our definition corresponds to a
Chain-formation relation in Brody’s theory. We thus free ourselves from the (asymmetric)
assumption that an unvalued/uninterpretable feature is the one that always occupies the
c-commanding position (as will be reviewed in the next subsection). In this sense,
agreement can be viewed as an operation towards eliminating uninterpretable features in
a certain domain. Concerning the notion of domain, we would expect that Brody’s theory
predicts that the domain of agreement is subject to Chain formation: two objects that do
not contribute to the same semantic value cannot form a Chain; therefore, any other
potential chain relations making reference to such an unlinked chain would also be blocked. For example, a tensed T would block any further subject raising in English, as in (49). Here, in our terms, a tensed T constitutes the ‘agreement phase’ of subject-T agreement.

Consequently, let us define ‘phase’ as a domain in which agreement must take place to ensure Full Interpretation (hence the ‘propositional’ properties in Chomsky 2001), and it is inaccessible to any further operations outside the domain, as suggested by the Phase Impenetrability Condition (PIC) in Chomsky (2001, 2004, 2008); that is, an interpretation is invariant in a given phase. In order not to be confused with Chomsky’s notion of Phase (CP and vP), let us refer to the domain of agreement as a Generalized Phase (GP), following the suggestion by Freidin & Vergnaud (2001) (see also Simpson 2000 for a similar conclusion). The revised definition of Agree in (47) can thus be supplemented with the following locality condition:

\[
\text{(54) Agree (revised and expanded)}
\]

a. For a feature F, in a given domain D, \([uF] \rightarrow [iF]\) iff there is a matching \([iF]\) in D.

b. A domain is a generalized phase, in which the condition of Full Interpretation must be met with respect to all instances of F.

In other words, GPs are relativized notions dependent on some feature, a notion reminiscent of Relativized Minimality (Rizzi 1990).
2.2.3 Only [u] and [i] are not Enough: On ‘Generalized Phases’

In this subsection, we review some proposals regarding the definitions of phases and expansions of phases (i.e. successive cyclicity). The validity of these proposals is challenged by data from *wh*-phrases in Chinese (Aoun & Li 1993a, Li 1992). The conclusion shows that the notion of Generalized Phases is conceptually superior.

2.2.3.1 Top-down vs. Bottom-up Phases

Pesetsky & Torrego (2007) (P&T) criticize the biconditional relation between feature valuation and interpretability in Chomsky (2001), and suggest that feature valuation should be distinguished from feature interpretability, and it is the valuation of a feature that is crucial for the operation Agree. In their approach, four types of features are distinguished (see also Collins 1997):

(55)  

<table>
<thead>
<tr>
<th>Type</th>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>uF [ ]</td>
<td>(uninterpretable; unvalued)</td>
</tr>
<tr>
<td>b.</td>
<td>uF [val]</td>
<td>(uninterpretable; valued)</td>
</tr>
<tr>
<td>c.</td>
<td>iF [ ]</td>
<td>(interpretable; unvalued)</td>
</tr>
<tr>
<td>d.</td>
<td>iF [Val]</td>
<td>(interpretable; valued)</td>
</tr>
</tbody>
</table>

An unvalued feature (whether interpretable or not) always probes for a valued feature (the asymmetry of agreement is kept in their proposal). They argue that the four-way distinction (55) has a greater explanatory potential. Consider the *wh*-questions in English:
(56) a. What C did John buy t_{what}?

b. C ... what
   \[ \text{iWH[ } \quad \text{uWH[+wh]} \]
   \[
   \text{Agree}
   \]

P&T propose that a \(wh\)-phrase is valued with an interrogative [+wh] value on the
WH-feature, but it is uninterpretable in its original NP position at LF (therefore, it must
move to an interpretable position). On the other hand, an interrogative C is unvalued for
the WH-feature, but this interrogative feature is interpretable. The result of this
complementary distribution is a perfect match for the interrogative C (interpretable but
unvalued) and a \(wh\)-phrase (uninterpretable but valued). The unvalued feature attracts the
valued feature, forming a legitimate LF chain. Next, let us consider successive
\(wh\)-movement:

(57) a. [Who C_{1} did Bill say [t_{wh} C_{2} that John bought t_{wh}]]?

b. C_{1} ... C_{2} ... what
   \[ \text{iWH[ } \quad \text{uWH[ ] } \quad \text{uWH[+wh]} \]
   \[
   \text{Agree} \quad \text{Agree}
   \]

The intermediate C_{2} carries an uninterpretable and unvalued WH-feature, which agrees
with (and attracts) the uWH[+wh]-feature on what. However, this is not enough, since the
WH feature is still uninterpretable at LF. Therefore, a subsequent instance of agreement is
further established between C_{1} and what, giving rise to successive cyclic movement of
what on the surface. Following Chomsky, Pesetsky & Torrego assume that each of the
intermediate phases (CP and vP) may also bear an unvalued feature, hence triggering cyclic movement. This assumption, however, has the risk of overgenerating unnecessary movement. It might be natural to assume that intermediate C nodes carry unvalued uninterpretable WH-feature, but it is not clear why a light verb should bear the same feature. Unlike C nodes, there is no light verb that may ever carry an interpretable WH-feature.

Suppose we assume that phases are not strictly CP and vP, but they are defined over the grammatical operations that relate to a certain feature (such as wh-movements to a WH-feature). Under this revision, then, if an unvalued interpretable feature is valued, the phrase that carries it would establish a phase for agreement (for the same feature), while an intermediate unvalued feature would introduce the ‘bounding node’ that connects and expands the phases of agreement. However, this analysis cannot fully stand, either, as we shall see from data in Chinese.

The story becomes more complicated when we look at multiple-wh questions. Boskovic (2007) argues that a multiple-wh question like (58) creates a serious problem for the standard phase model:
(58)  a. \([CP \text{ that}=C^P \text{ Mary bought } t_{\text{what}}]\)

b. \([CP \text{ What does Bill think } C^P t_{\text{what}} \text{ that}=C^P \text{ Mary bought } t_{\text{what}}]\)

c. \([CP \text{ Who thinks } C^P \text{ that}=C^P \text{ Mary bought } \text{what}]\)

d. \(*[CP \text{ Who thinks } C^P \text{ what that}=C^P \text{ Mary bought } t_{\text{what}}]\)

As a long-standing puzzle, it has been referred to as the ‘triggering problem’ (Lasnik & Saito 1984). The problem is that the (non-)movement of what hinges upon the other \textit{wh}-phrase outside its phase (Boskovic also assumes CP and vP are phases). When the derivation proceeds to (58a), what has to move due to agreement with the WH-feature of \(C^P\), (58b) shows that a successive cyclic movement would eventually satisfy the WH-feature on matrix C, as seen in P&T’s analysis. The problem comes from (58c, d). If there is another matrix \textit{wh}-phrase (who) that satisfies the matrix WH-feature, what will not move to the intermediate position. However, at the derivational point in (58a), one cannot tell whether who is introduced into the derivation or not. Therefore, the \textit{wh}-phrase what should move to the intermediate position, and terminate its movement there since the standard cyclic phase model prohibit looking-back into earlier cycles, namely the grayed parts in (58c, d) (subject to the Phase Impenetrability Condition; PIC;

\footnote{Stroik (2009) proposes the principle of SURVIVE, which in its spirit is very much like the activation condition in Boskovic (2007). In his system, what in (58) needs to undergo LF movement. The movement is driven by the fact that what ‘survives’ the cyclic spell-out of phases due to its referential [REF-WH] feature, which allows it to be construed along with the higher \textit{wh}-phrase (as a kind of absorption). The problem with this proposal, however, is that the [REF-WH] feature is not inherently specified for just any what phrase, its presence is due to a structurally higher \textit{wh}-phrase. In this sense, the proposal of such a feature not only violates the core assumption of minimalism, the inclusiveness condition (since the feature [REF-WH] does not come from the lexical item itself, but rather from the structure), but also invokes the same looking-ahead problem.}
Boskovic concludes that adopting the standard derivational cyclic phase model would necessarily run into the triggering problem. His solution is to separate the conditions that govern Move and Agree: Movements are subject to PIC, but feature agreement is not. To restrict agreement, he suggests that agreement is only subject to the Minimal Link Condition (Chomsky 1995, Rizzi 1990). An element with uninterpretable feature will stay active during the derivation (regardless of phases), and needs to search for the closest matching interpretable feature in order to deactivate the uninterpretable feature. Once an uninterpretable feature is deactivated, it is no longer visible to any other interpretable features. Under this analysis, we expect the following intervention effect to hold strictly in every case. That is, $P_2$ will induce a domain of agreement for the feature $F$ (we shall revise and sharpen this observation when we examine the Chinese wh-questions later):

$$(59) \quad a. \ P_1[F] \ldots P_2[F] \ldots G_1[uF] \ldots G_2[uF]$$

Boskovic’s conclusion that Move and Agree are subject to different conditions, however, can be understood in an alternative (and more unified) way. As we have argued in (54), if ‘phase’ is relatively understood as a domain where Full Interpretation must be met, then both Move and Agree (equally driven by interpretation) are subject to the PIC. The
upshot is that these domains, or ‘phases,’ do not have to refer to certain fixed categories (such as vP and CP, although vP and CP might still represent some type of local domain for certain local syntactic relations; see Chapter 3), and phases in general are relativized with respect to different grammatical interpretations.

To summarize, let us compare and contrast the notions of ‘phases’ in the P&T model and the Boskovic model. Regarding the causes and locality of agreement (or ‘phases’ in our term), the P&T model assumes the following:

(60) a. Agreement is driven by feature valuation on the Probe, whose unvalued feature calls for valuation from the Goal(s).

   b. A valued and interpretable feature will induce a domain for agreement, while an uninterpretable and unvalued feature gives rise to expansion of domains.

In contrast, the Boskovic model assumes the following:

(61) a. Agreement is driven by uninterpretable feature on the Goal(s), whose uninterpretable feature calls for an interpretable feature on the Probe (i.e. the activation condition).

   b. Once valued with interpretation, Goals are no longer active: an interpretable feature induces the domain of agreement.

The (b) properties are similar, but not the (a) properties. With respect to the activation condition on agreement, P&T focus on the Probe (top-down), while Boskovic focus on the Goal (bottom-up). Next, we shall see that both approaches are only partially correct. Confirming the thesis of symmetry again, it will be argued that there are no top-down or
bottom-up asymmetries in agreement. Globally speaking, the grammar of agreement is symmetric and occurs in both top-down and bottom-up directions.

### 2.2.3.2 The Challenge from Chinese Questions

What has been studied in Li (1992) may reveal the true nature of agreement (see also Aoun & Li 1993a, Cheng 1991, Huang 1982, Tsai 1999). Carefully examining the distributions and interpretations of *wh*-phrases in Chinese, Li (1992) notes that *wh*-phrases in Chinese can be interpreted either as existential indefinites (such as *someone* or *something*) or as interrogative *wh*-items, depending on the quantificational contexts. Example (62) lists some of the contexts that allow existential readings (note that this is not to say that they do not allow question readings):\(^{18}\)

---

\(^{17}\) These theories were developed prior to the rise of minimalism, and at that time, binding and movement were considered different operations (though some form of unification was sought). On the other hand, if we are to pursue the unification of movement and binding (considering they are both feature driven and forming LF-chains), then relativizing the notion of phases seems to us to be on the right track. See Simpson (2000).

\(^{18}\) It would be helpful to provide a way of testing the intuition about existential and interrogative interpretation of *wh*-phrases. One good way of doing so is to add a clarifying question (*you mean who/what*) or a sluicing question (…, *but I forgot who/what*). The existential reading is allowed only if the sluicing or the clarifying questions sound natural. For example:

(i) A: Zhangsan xihuan shei ma? B: Ni shi zhi shei?
   ‘Does Zhangsan like someone?’ ‘You mean who?’

(ii) Wo yiwei Lisi chi-le shenme, keshi wo wang-le shi shenme.
   ‘I thought Lisi ate something…but I forgot what it is.’
(62) Environments that licenses an existential reading for *wh*-words in Chinese

a. Yes/No Question Particle
Zhangsan chi-le shenme ma?
Zhangsan eat-Asp what \( Q_{\text{yes/no}} \)
i. ‘Did Zhangsan eat something/%anything?’
ii. *‘What did Zhangsan eat?’

b. Non-interrogative verb
Zhangsan yiwei Lisi chi-le shenme
Zhangsan think Lisi eat-Asp what
i. ‘Zhangsan thought Lisi ate something.’
ii. ‘What did Zhangsan think that Lisi ate?’

c. Epistemic Modal adverb
Zhangsan dagai chi-le shenme
Zhangsan probably eat-Asp what
i. ‘It is likely that Zhangsan ate something.’
ii. ‘What is it likely that Zhangsan eat?’

d. Negative sentences
Zhangsan mei chi shenme jiu lai le
Zhangsan Neg eat what then come Perf
i. ‘Zhangsan came without eating something/%anything.’
ii. ‘What is it that Zhangsan came without eating?’

On the other hand, there are contexts where existential readings are considered much degraded:

(63) a. Zhangsan xihuan chi shenme (?)
Zhangsan like eat something
i. *??‘Zhangsan likes eating something.’
ii. ‘What does Zhangsan like eating?’

b. Zhangsan daodi kanjian shei? (Huang & Ochi 2004)
Zhangsan to.bottom see who
i. *‘Zhangsan saw someone the hell.’
ii. ‘Who the hell did Zhangsan see?’
c. Zhangsan xihuan shei ne?
   Zhangsan like who Q_{\text{wh}}
   i. *‘Does Zhangsan like someone?’
   ii. ‘Who does Zhangsan like?’

In (63a), the lack of existential force of this sentence (a non-episodic sentence; see Chapter 5 for discussion) causes the \textit{wh}-word preferably to be interpreted as a question. Examples in (63b-c) show that other strong operators (strong interrogative adverb \textit{daodi}, \textit{wh}-question particle \textit{ne}) force the interrogative reading of the \textit{wh}-words in Chinese.

Adopting P&T’s approach, let us assume feature valuation and interpretability are independent notions. Let us further suppose that \textit{wh}-words in Chinese carry an unvalued feature relevant for question and existential readings, and it is interpretable (there is no need for a \textit{wh}-word to move). We shall call this relevant feature in Chinese a \textit{Q(uantificational)-feature}. Unlike the \textit{wh}-words in English (with an uninterpretable valued u\textit{WH}[^+\textit{wh}] feature), which require a [+\textit{wh}] Complementizer, Chinese \textit{wh}-words have no intrinsic value with respect to its \textit{Q}-feature and can agree with an existential [-\textit{wh}] or question [+\textit{wh}] operator, as in Aoun & Li (1993a), Li (1992), and Shi (1994). The differences between English and Chinese \textit{wh}-constructions can be schematized as follows:¹⁹

¹⁹ The analysis presented here recalls the approach in Simpson (2000), which in several ways guides the lines of inquiry in this chapter. In Simpson (2000), the term ‘checking at a distance’ is used, which is reminiscent of long-distance agreement in Chomsky’s later works. Examining the different \textit{wh}-movement languages (English, Hindi, Iraqi Arabic, and Romanian), his conclusion is that the domains that allow long-distance checking are language specific, related to different triggers of \textit{wh}-movement. The analysis here is in effect heading toward the same direction, but formulated in a ‘feature-agreement’ fashion.
The properties of Chinese *wh*-words then serve as a good diagnostic tool for the theories in discussion. The P&T model instantly encounters some problems.\(^{20}\) Specifically, a *wh*-word in Chinese is not valued, nor uninterpretable for the interrogative probe. Therefore, agreement would never occur if their analysis were adopted. Likewise, the Boskovic model also runs into several puzzles. Recall that Boskovic assumes that it is the *wh*-word per se that triggers agreement (before they are valued, they stay active). Examples from Chinese dictate otherwise. In fact, a finer distinction is called for between the operators (as we shall see immediately), and importantly, the strong requirement of the operator to form interpretable chains overrides the activation condition (of Goals) assumed in the Boskovic model (this is what we mean by ‘Full interpretation must be met in a domain’ in our definition of agreement domain).

Let us now review the licensing and intervention conditions in Chinese questions in Li (1992) and Aoun & Li (1993). First, consider the conditions where we have an interrogative *wh*-operator (Op\([+wh]\); represented by a question particle *ne* or an interrogative verb *xiangzhidao* ‘wonder’), non-interrogative existential operator (\(\exists_{[−wh]}\);
represented by a epistemic modal adverb *haoxiang* ‘likely’), and a *wh*-word (*shenme* ‘what’):

(65) a. Op[+]wh] … ∃[-wh] … *wh*-word
b. ∃[-wh] … Op[+]wh] … *wh*-word
d. ∃[+]wh] … ∃[-wh] … *wh*-word

The following sentences illustrate the possible readings in (65), respectively:

(66) a. Zhangsan yiwei Lisi *haoxiang* chi-le *shenme ne* Zhangsan think Lisi likely eat-Asp what Q
   (i) ‘What does Zhangsan think Lisi is likely to eat?’ *(ok) Direct Q*
   (ii) *Zhangsan thinks what Lisi is likely to ate?’ *(*Indirect Q)
   (iii) *Does Zhangsan think that Lisi probably ate something?’ *(something)

b. Zhangsan *haoxiang* xiangzhidao Lisi chi-le *shenme* Zhangsan likely wonder Lisi eat-Asp what
   (i) *What is Zhangsan likely to wonder Lisi ate?’ *(Direct Q)
   (ii) ‘Zhangsan seems to wonder what Lisi ate.’ *(ok) Indirect Q)
   (iii) *Zhangsan seems to wonder Lisi ate something.’ *(something)

c. *Zhangsan xiangzhidao Lisi chi-le *shenme ne* Zhangsan wonder Lisi eat-Asp what Q

d. Zhangsan *bu renwei* Lisi you chi *shenme* Zhangsan Neg think Lisi Aux eat what
   (i) ‘Zhangsan did not think Lisi ate anything’ *(polarity)
   (ii) ‘Zhangsan did not think that Lisi ate something’ *(non-polarity)

The possible scenarios reviewed here show that the *wh*-chains in Chinese are subject to
two conditions: (i) a [+wh] operator forces the agreement with a *wh*-word; and (ii) a [-wh]
operator may agree with a *wh*-word if no [+wh] Q operator triggers agreement (Aoun &
Li 1993; Li 1992; Shi 1994). We may therefore conclude that the [+wh] operator
introduces a phase of agreement for the [wh] feature agreement in Chinese. The agreement patterns available for the paradigms in (65) are summarized as follows (the underlined feature are the valued ones):

\[
\begin{align*}
(67) & \quad \text{a. } Q_{[+\text{wh}]} \cdots \exists_{[-\text{wh}]} \cdots \text{wh-word}_{[+\text{wh}]} \\
& \quad \text{b. } \exists_{[-\text{wh}]} \cdots Q_{[+\text{wh}]} \cdots \text{wh-word}_{[+\text{wh}]} \\
& \quad \text{c. } *Q_{[+\text{wh}]} \cdots Q_{[+\text{wh}]} \cdots \text{wh-word} \\
& \quad \text{d. } \exists_{[-\text{wh}]} \cdots \exists_{[-\text{wh}]} \cdots \text{wh-word}_{[-\text{wh}]} 
\end{align*}
\]

The data from Chinese wh-questions bring challenges to both P&T’s and Boskovic’s theories, especially to their asymmetric approaches to agreement. With regard to P&T’s theory, Chinese wh-questions show that a Probe (the structurally higher one) need not be unvalued in ordered to trigger agreement. Furthermore, a fully functional (interpretable and valued) feature does not necessarily induce an agreement phase; e.g., the non-interrogative \( \exists \)-operator. The latter point, especially, poses problems for both P&T’s and Boskovic’s theories. One might argue that the \( \exists \)-operator in Chinese might be treated on a par with the non-interrogative C in English, like \( C_2 \) in (57), repeated here:
That is, one might argue that the $\exists$-operator is instead inherently unvalued and uninterpretable, namely, $uQ[ \quad ]$, and its interpretation is later assigned by a higher $\exists$-operator. The view cannot be maintained, however. Since each higher non-interrogative $\exists$-operator would eventually have the same property as the lower $\exists$-operator (i.e. it is a $uQ[ \quad ]$) whenever there is no $[+\text{wh}]$ $Q$-operator available. This null hypothesis thus leads to the unreasonable conclusion that any non-interrogative sentence is ill-formed in Chinese.

Turning to Boskovic’s theory, we find that his activation condition is too strong in predicting the behavior of Chinese $\text{wh}$-words. According to the activation condition, once the $\text{wh}$-word enters agreement with a potential Probe, it ceases being active for a structurally higher Probe (due to Minimal Link Condition). This theory thus fails to predict the well-formedness of (67a,d).

A question can be raised why only $Q_{[+\text{wh}]}$ introduces a phase, but not $Q_{[-\text{wh}]}$ (i.e. the $\exists$-operator). A reasonable answer is, as Li’s (1992) approach suggests, the requirement of Full Interpretation: A question operator must bind a variable, while a $\exists$-operator need not.
Recall that in the proposed analysis here, agreement is viewed as an operation working towards eliminating unvalued features, therefore driven by feature matching (related to some interpretation). Therefore, it is natural to regard Full Interpretation as a condition regulating agreement.

2.2.3.3 ‘Feature Geometry’ in Syntax

I would like to propose a refined feature theory that may further capture Li’s intuition. Let us suppose that in addition to a [+wh] feature, the feature matching condition should be also restricted by a verbal [+V] and nominal [+N] distinction (as sub-features of the [+wh] feature).21 The distinction can be backed up by the differences between yes-no questions and wh-questions in Chinese. Instead of adding a question particle ma in the sentence-final position, yes-no questions in Chinese can be represented by the A-not-A form, which is a morphological reduplication rule that targets the closest verbal head (Huang 1991, Tseng & Lin 2010):

(68) a. Zhangsan chi-bu-chi niurou?
   Zhangsan eat-not-eat beef
   ‘Does Zhangsan eat beef?’

   b. Zhangsan hui-bu-hui chi niurou?
   Zhangsan will-not-will eat beef
   ‘Will Zhangsan eat beef?’

   c. C [Zhangsan whether-T/V(=chi) niurou]?

21 In Chapter 3, it will become clear how the [+V] and [+N] features may be treated as features. The fundamental relation {N, V} will give rise to a N-chain and V-chain in the abstract symmetric syntax, and the wh-feature will be assumed to apply in one of the chains.
As represented in (68c), we can view the *A-not-A* question form as a [+wh] feature on T or V (the categorial features of T/V are [+V]). The [+wh] feature, like an English *wh*-word, needs to agree/check its *wh*-feature with C. This means that the question operator on C that agrees with the *A-not-A* question should also be specified with a [+V] sub-feature. On the other hand, the typical *wh*-question operator will be a [+wh] operator that targets [+N] elements.

(69) A dichotomy of Chinese question operators

a. Yes-No question operator: \( Q_{ [+wh, [+V] ] } \)
   (i) *A-not-A* form
   \[
   [ \text{CP } C_{wh} \ldots \text{T/V}_{A-not-A} \ldots ]
   \]
   \[
   Q_{ [+wh, [+V] ] } \quad [+V] \\
   [+wh]
   \]

   (ii) Particle *ma* form
   \[
   [ \text{CP } C_{ma} \ldots \text{T/V} \ldots ]
   \]
   \[
   Q_{ [+wh, [+V] ] } \quad [+V] \\
   [+wh] \rightarrow [αwh] \quad [-wh]
   \]

---

22 The [+V] feature of *yes-no* question operator might also be responsible for the T-to-C movement in *yes-no* question in English.

23 We shall restrict ourselves to nominal *wh*-words like *who* and *what*, setting aside adverbial (verbal) *wh*-words, like *how* and *why*. In fact, Tsai (1999) has noted several differences between nominal and adverbial *wh*-words in Chinese, and he also notes that *zenyang* ‘how’ and *weishenme* ‘why’ may have both verbal and nominal properties in Chinese. The judgments on relevant data, however, are quite difficult to obtain and vary among speakers.

24 In the following, I will use underlines to represent an unvalued feature, \([αF]\) (where α ranges over + or -). The lower case arrow represents the result of feature valuation.
b. Typical *Wh*-question operator: $Q_{[\text{[+wh, } [N]]}$

\[
\begin{array}{cccc}
\left[ \text{CP} \right] & C_{\text{wh}} & \ldots & \text{who/what} & \ldots \\
Q_{[\text{[+wh}, [N]]} & [N] & [\text{[awh]}] & [\text{[+wh]}] \\
\end{array}
\]

In general, the question operator in Chinese is viewed as a Q-operator carrying the [+wh] feature with a sub-feature $[N \lor V]$ (with the logical connective, exclusive *either ... or*), giving rise to the two forms in (69).\textsuperscript{25}

In the same fashion, the $\exists$-operator carries a [-wh] feature with a sub-feature $[N \lor V]$ (with the unmarked logical connective, inclusive *or*), allowing it to enter agreement with any nominal and/or verbal elements in its domain. In the semantics literature, this has been referred to as unselective binding (Lewis 1975):

(70) Unselective binding as multiple agreement

\[
\begin{array}{cccc}
\left[ \exists \right] & \ldots & \text{T/V} & \ldots & \text{wh-word} & \ldots \\
Q_{[\text{-wh, } [N \lor V]]} & [V] & [N] & [\text{[bwh]}] & [\text{[+wh]}] \\
\end{array}
\]

Equipped with this refined feature theory, we can review the intervention conditions in (66a,b), the agreement patterns are shown in (71a,b), respectively:

\textsuperscript{25} With the logical connective exclusive *or*, $[V]$ and $[N]$ cannot both be true, while with the logical connective of inclusive *or*, $[V]$ and $[N]$ can, but need not, both be true.
(66)  
\( \text{a. Zhangsan yiwei Lisi haoxiang chi-le shenme ne} \)
\( \text{Zhangsan think Lisi likely eat-Asp what Q} \)
\( \text{(i) ‘What does Zhangsan think Lisi is likely to eat?’} \quad \text{(*Direct Q)} \)
\( \text{(ii) ‘Zhangsan thinks what Lisi is likely to eat?’} \quad \text{(*Indirect Q)} \)
\( \text{(ii) ‘Does Zhangsan think that Lisi probably ate something?’} \quad \text{(*something)} \)

\( \text{b. Zhangsan haoxiang xiangzhida Lisi chi-le shenme} \)
\( \text{Zhangsan likely wonder Lisi eat-Asp what} \)
\( \text{(i) ‘What is Zhangsan likely to wonder Lisi ate?’} \quad \text{(*Direct Q)} \)
\( \text{(ii) ‘Zhangsan seems to wonder what Lisi ate.’} \quad \text{(*Indirect Q)} \)
\( \text{(iii) *Zhangsan seems to wonder Lisi ate something.’} \quad \text{(*something)} \)

(71)  
\( \text{a. Q … } \exists \text{ … T/V … wh-word[+N]} \quad \text{(cf. (66a))} \)
\( \begin{array}{c}
[+\text{wh}, [+\text{N}]] \\
[\text{-wh}[+\text{N}\lor \text{V}]] \\
[\text{awh}] \\
[\beta\text{wh}] \\
[\text{-wh}] \\
[\beta\text{wh}] \\
[\text{+wh}] \\
\end{array} \)

\( \text{b. } \exists \text{ … Q … T/V … wh-word[+N]} \quad \text{(cf. (66b))} \)
\( \begin{array}{c}
[\text{-wh}[+\text{N}\lor \text{V}]] \\
[+\text{wh}, [+\text{N}]] \\
[\text{awh}] \\
[\beta\text{wh}] \\
[\text{-wh}] \\
[\beta\text{wh}] \\
[\text{+wh}] \\
\end{array} \)

The [+wh, [+N]] Q-operator matches and agrees with the categorial feature [+N] of the wh-word, leaving V as the only element that agrees with the \( \exists \)-operator.\(^{26} \) As the patterns confirm, the driving force of the anti-intervention effect is Full Interpretation, subject to

\(^{26} \) Notice that the [+N] and [+V] feature is not a sub-feature of the wh-words. The wh-words are lexically specified with a categorial feature. Likewise, a complementizer (arguably a verbal extended projection) with [+wh, [+N]] feature is not only specified with a [+V] feature as its categorial feature, but also a [+N] sub-feature in the Q-feature matrix. I see no problems for such a conclusion since the [+N] is a sub-feature of the Q-feature matrix, and the [+V] feature is a categorial feature of C. Therefore, the sub-feature [+N] and the categorial feature [+V] are not in the same dimension. We shall see, moreover, that the [+N] nature of C will play an important role in Chain formation in the next chapter. A following question is whether the wh-feature of wh-words should be specified with a sub-feature as well. One fact, however, suggests that they might. In English multiple wh-questions, like who likes what, we can postulate that who (and what) carries a [+wh, [+N]] feature. This allows who to agree with what in terms of its wh-feature, and therefore, what can be interpreted in situ. Notice that even without what, the structure will not crash since [+N] is neither an unvalued nor an uninterpretable feature that requires a Goal.
the feature matrices in the lexicon. As expected, the nearly reversed agreement patterns are also possible, as confirmed by the following two sentences.

(72) a. Q … \( \exists \ldots \) T/V… \textit{wh-word}_{[+N]}
\[ [+wh, [+V]] \quad [-wh, [+N\lor V]] \quad [+wh] \quad [\beta_{wh}]^{-[-wh]} \]

b. Ni juede [wo xi-bu-xihuan shei] ne
‘What do you think whether I like someone or not?’

(73) a. \( \exists \ldots \) Q … T/V… \textit{wh-word}_{[+N]}
\[ [-wh, [+N\lor V]] \quad [+wh, [+V]] \quad [+wh] \quad [\alpha_{wh}, +N]^{-[-wh]} \]

b. Zhangsan xiangzhidao [Lisi xi-bu-xihuan shei]?
‘Zhangsan wonders whether Lisi likes someone.’

In (72), the verbal question operator agrees with the verbal \textit{yes-no} question. The nominal \textit{wh}-word thus agrees with the \( \exists \)-operator, resulting in the existential \textit{someone} reading (otherwise, the sentence crashes). In (73), it is also necessary for the \textit{wh}-word to be interpreted as existential \textit{someone} (A clarifying question can be added by the listener, ‘\textit{who do you mean by someone}?’) Notice that it is impossible for the \textit{wh}-word and the \textit{yes-no} form to agree with the same \[+wh\] Q-operator since the Q-operator needs to agree with the \[+V\] and \[+wh\] \textit{A-not-A} wh-phrase in order to form an interpretable chain, and
the *-word is lexically specified as a [+N] element. The agreement is thus unavailable because there is no feature matching.\(^\text{27}\)

Notice that the refined feature theory also provides a straightforward explanation for the following agreement pattern without assuming additional LF maneuvers:

\[
\text{(74) a. } Q \ldots \ T/V_{A\text{-not-A}} \ldots \exists \ldots \text{*-word}_{[+N]}
\]
\[
[+\text{wh}, [+\text{V}]] \quad [+\text{wh}] \quad [-\text{wh}, [+\text{N} \lor \text{V}]] \quad [\text{awh} \rightarrow [-\text{wh}]]
\]

b. Zhangsan shi-bu-shi yiwei [Lisi jian-le shei]?
Zhangsan Aux-not-Aux think Lisi see-Asp who
(i) ‘Does Zhangsan think Lisi saw someone?’
(ii) * ‘Who does Zhangsan think whether Lisi saw?’

We observe in (74) an intervention effect triggered by the [+V] \(A\text{-not-A}\) form. The categorial sub-feature of the matrix Q agreeing with the \(A\text{-not-A}\) form, it can no longer agree with the nominal *-word in the subordinate clause. Therefore, only the someone reading is available for the *-word in such cases.

Agreement, then, is not only subject to feature matching, but the matching conditions are also further constrained by the logical relations inside the feature matrix. In the case of

\(^{27}\) Unfortunately, in (72) and (73) we cannot use the particle \(ma\) to test the structure, since \(ma\) is restricted to the sentence final position (and does not occur in the subordinate clause-final position). In Taiwanese, however, this is possible, as in (i). This again confirms our prediction:

(i) Ong-e siungbe.dzaiyaN [CP Li-e siang u gayi-boh]
Ong-e wonder Li-e who have like-no
‘Ong-e wonders whether Li-e likes someone.’
Chinese *wh*-questions, as we have just examined, only a perfect matching between [α wh] feature and its sub-features would allow agreement. The proposed ‘feature geometry’ view is reminiscent of the non-linear phonological theory of the same type (see Clements & Hume 1995, Halle & Vergnaud 1980). It is also plausible that the internal organizations of feature relations are subject to cross-linguistic parameterization. If this is on the right track, many different linguistic variations can be explained through the parametric feature geometry (again, as suggested by the non-linear theory of phonology). Taking *wh*-movement again for example, the analysis of *wh*-movement in Iraqi Arabic and Hindi proposed in Simpson (2000) is quite enlightening. In Iraqi Arabic and Hindi, Tense plays an important part in *wh*-movement. Consider the data from Hindi:

(75) a. Raam-ne [Mohan-ko kise dekhne-ke liye] kahan?
  Ram-Erg Mohan-Erg whom to-see for told
  ‘Who did Ram tell Mohan to look at?’

b. *Raam-ne kahaa [ki KOn aayaa-hE]?
  Raam-Erg said that who has-come
  Intended: ‘Who did Ram say has come?’

In the *wh*-questions in Hindi, as in Iraqi Arabic, *wh*-words remain in-situ in non-finite clauses, but they are forced to move in tensed clauses. The *wh*-word in Hindi, unlike Chinese, is specified with an uninterpretable [+wh] feature that needs to be checked through agreement with C. Following Simpson (2000), it will be assumed that the checking domain is the immediate tensed clause that contains the *wh*-word. With the notion of the relative phases, this amounts to saying that only a finite T may introduce a phase (for wh-feature), but not an infinitive T nor any intermediate C. In terms of the
feature geometry proposed here, we might assume that the *wh*-feature on *C* is (under)specified with \([\alpha_{wh}, [+V]]\) (Tense being an [+V] element), while that on *T* is specified with \([\alpha_{wh}, [+N]]\). This means that a form of ‘successive agreement’ is at work: *T* inherits its *wh*-feature from *C*, while *T* agrees with the *wh*-word. An entailment rule is thus at work in this language:

(76) Tense-*wh* entailment rule in Hindi
   a. \([-tense] \rightarrow [\emptyset \text{wh}]\)
   b. \([+tense] \rightarrow [\alpha \text{wh}]\)

The rule states that only the *T* that is marked with a [+tense] feature will be able to enter a *wh*-feature agreement with a *wh*-word. Unlike the Chinese \(\exists\)-operator, the [-wh] operator in Hindi induces an intervention effect for the *wh*-feature agreement. This can be schematized as follows:

(77) a. \[[C_1 \quad [+wh, [+V]] \quad T_1 \quad \ldots \quad [C_2 \quad T_2 \quad \ldots \quad \text{wh-word}]\]
     \([+V] \quad [-wh, [+V]] \quad [+V] \quad [+N] \quad [+tense] \quad [+wh] \quad [\alpha_{wh}, [+N]] \rightarrow [+wh]\)

b. \*\[[C_1 \quad [+wh, [+V]] \quad T_1 \quad \ldots \quad [C_2 \quad T_2 \quad \ldots \quad \text{wh-word}]\]
     \([+V] \quad [-wh, [+V]] \quad [+V] \quad [+N] \quad [+tense] \quad [+wh] \quad [\alpha_{wh}, [+N]] \rightarrow [+wh] \quad [\alpha_{wh}, [+N]] \rightarrow [-wh]\)
In (77a), schematizing (75a), agreement between the matrix T₁ and the in-situ wh-word is possible, due to the entailment rule (76a) – a non-finite T will not carry a [wh]-feature. Therefore, no phase is introduced by any elements in between, hence the possible agreement between T₁ and the wh-word. In fact, it has been suggested in Dayal (1996) that infinitive clauses in Hindi behave like a (nominalized) gerund clause that does not project a CP (See also Simpson & Bhattacharya 2003: p.132 n. 4). In that case, (76a) and (77a) can be further reduced to the lack of C in the non-finite clauses, and therefore can be dispensed with. Whichever analysis is adopted, it does not affect the analysis proposed here. I shall leave this option open here.²⁸ On the other hand, in a finite subordinate clause, a [+tense] node, like T₂ in (77b), is subject to (76b), so the [αwh] feature of the [+tense] T₂ must agree with the subordinate C₂. This then introduces an agreement phase on T₂, hence the failure of agreement between T₁ and the wh-word.

To overcome the intervention effect and to obtain full interpretation, the wh-word cannot be interpreted in situ, and must undergo overt movement to the domain of T₁, as shown by the well-formedness of the following example (also from Simpson 2000: 95):

(78) kOn Raam-ne kahaa [ki t aayaa-hE]? (cf. (75b))
    who Raam-Erg said that has-come
    ‘Who did Ram say has come?’

²⁸ Following Simpson & Bhattacharya (2003), we might assume that all non-finite clause undergoes obligatory movement to the preverbal position. This movement then allows the wh-phrases inside the non-finite clauses to be licensed by the matrix C by bringing it to the domain of C.
Simpson (2000: 189) notes that another strategy of rescuing the sentence is by employing a *wh*-expletive. Therefore, instead of using the form in (78), (79) is also well-formed:

(79) Raam-ne *kyaa* kahaa [ki KOn aayaa-hE]?  
Raam-Erg Explwh said that who has-come  
‘Who did Ram say has come?’

Simpson argues that the introduction of the *wh*-expletive element will change (or extend) the domain of checking. Translating this idea into the feature geometry analysis, we find again the sub-feature [+V/+N] can be the hidden parameter.

Note that the *wh*-expletive is in verbal form (it occurs in the preverbal adverbial position); therefore, it is reasonable to assume that the *wh*-expletive in Hindi carries the features [+wh] and [+V]. In this sense, the verbal expletive behaves like the non-*yes/no* counterpart in Hindi of Chinese *A-not-A* form (only that the Hindi *wh*-expletive does not have a *yes/no* meaning when it occurs in a preverbal adverbial position, but a typical *wh*-meaning).\(^\text{29}\) Let us assume that the *wh*-expletive originates in the same clause as the *wh*-word, and the two agree in terms of the *wh*-feature. The subsequent raising of the *wh*-expletive then expands the phase of the *wh*-word. The somewhat complicated mechanism can be schematized as follows, which can be called the Tunneling Effect:

\(^\text{29}\) Andrew Simpson (p.c.) points out that the same morpheme, *kyaa* in Hindi, can introduce *yes-no* question when it is used in the sentence-initial position (see Mahajan 1990), in which case, *kyaa* might not be a *wh*-expletive (since there is no associated *wh*-word in the rest of the sentence). The *wh*-expletive in the preverbal adverbial position also recalls the Chinese adverbial *daodi* ‘the hell’ (see Huang & Ochi 2004). We leave this for our future works.
The Tunneling Effect of the *wh*-expletive Movement

An agreement relation becomes possible through movement of the *wh*-expletive, between $C_1$ and the *wh*-expletive (the dotted line). Being in the same domain, the expletive agrees with the *wh*-word in its original position, and the expletive movement then creates a tunnel for the agreement (indirectly through Expl movement) between $C_1$ and the *wh*-word (a mechanism reminiscent of the indirect chain-linking in Brody’s theory). Due to the tunnel created by the Expl, the *wh*-word can therefore be interpreted in situ.

To summarize what we have so far, against the two types of asymmetries of agreement, evidence from Chinese *wh*-questions indicates that agreement does not presuppose an ordering asymmetry (i.e. an uninterpretable feature on Probe must c-command an interpretable feature on Goal), and agreement is not asymmetrically driven by either Probe or Goal. On the other hand, we argue that agreement is a mechanism driven by Full
Interpretation; therefore, agreement is not subject to an ordering constraint. Echoing our conclusion, Agree is defined as in (54), repeated here as follows:

(54) Agree (revised and expanded)

a. For a feature $F$, in a given domain $D$, $[uF] \rightarrow [iF]$ iff there is a matching $[iF]$ in $D$.

b. A domain is a generalized phase, in which the condition of Full Interpretation must be met with respect to all instances of $F$.

Agree Condition (a) can now be understood in two ways: (i) an unvalued feature needs to be specified with an interpretative value through agreeing with a valued element inside its domain, and/or (ii) a valued feature needs to be linked to other matching features if these features ultimately contribute to the same interpretation (i.e. the obligatory linking of all instances of the same feature). In terms of feature interpretability, this amounts to saying that an unlinked feature is uninterpretable, and therefore must be linked to an interpretable feature (recall Brody’s theory of radical interpretability).

As for Agree Condition (b), the domains, which we call generalized phases, are defined over the feature matrices that give rise to some interpretation. The requirement of Full Interpretation hence plays a decisive role in defining the size of phases. It was further argued that the features matrices are organized in a way more subtle than previously thought, and the intervention effects of feature agreement may be captured through fine characterizations of the internal organizations of the feature matrixes.
2.3 On Anti-Symmetry: A critical remark on Kayne (1994)

2.3.1 Summary of Kayne (1994)

Kayne (1994) proposes that syntax is inherently asymmetric in that all syntactic relations are totally non-associative and non-commutative (recall the hypothesis in (14b)). The non-associativity of syntax comes from its antisymmetric c-command requirement (syntax rules out symmetric c-command as an option), while the non-commutativity of syntax comes from a hypothesized universal ordering of syntax (Specifier - Head - Complement: S-H-C). Kayne argues that these requirements are compatible with a strict X-bar theory, shown as follows:

\[
\begin{array}{c}
\text{(81)} \\
\begin{array}{c}
\text{XP}_1 \\
\text{YP} \\
\text{XP}_2 \\
\text{X} \\
\text{ZP}_1 \\
\text{WP} \\
\text{ZP}_2 \\
\text{Z} \\
\text{…}
\end{array}
\end{array}
\]

\[
(\alpha P_n \text{ are segments of } \alpha P, \text{ and the category } \alpha P = \text{def } \Sigma \alpha P_n, \text{ the sum of its segments})
\]

In the strict X-bar schema, YP c-commands X, X c-commands WP, and WP c-commands Z, but not vice versa. Therefore, YP asymmetrically c-commands X, X asymmetrically c-commands WP, and WP asymmetrically c-commands Z.\(^{30}\) Kayne proposes that the

---

\(^{30}\) The definition of the c-command relation in Kayne (1994:16) is as follows:
(i) X c-commands Y if and only if:
asymmetrical c-command relations (>) is an isomorphism mapped to the precedence relations (^) of the terminal leaves dominated by the categories. This is referred to as Linear Correspondence Axiom (LCA):

(82) a. XP₁
    YP
   △ X
  α ZP₁
   β WP
  θ Z
   φ

b. Linear Correspondence Axiom (LCA):

   (X > Y) → (t(X) ^ t(Y)), where t(Δ) =def the terminal node(s) immediately dominated by the category Δ.

Applying LCA on the structure, we thus obtain the linear sequence in (83d):

(83) a. YP > X = t(YP)^t(X) = α^β (by LCA)
b. X > WP = β^θ (by LCA)
c. WP > Z = θ^φ (by LCA)
d. α^β^θ^φ (by transitivity)

---

a. X and Y are categories (not segments)
b. No segments of X dominate Y
c. Every category that dominates X dominates Y

The linear ordering is defined over PF precedence: If X precedes Y, then X is represented earlier than Y at PF.
This is the source of the asymmetric non-associativity. It comes from the null assumption that hierarchical relation is an isomorphism to the linear precedence. This is not sufficient, though, if we consider the structure in (84), which is symmetrically mirrored from (82a) by commutativity. Interestingly, after applying LCA, the same linear ordering is obtained (since commutativity does not alter the asymmetric c-command relations):

(84)

To rule out commutativity, Kayne assumes a stronger asymmetry is needed in syntax, the asymmetric time axis, which prefers $\alpha$ as the initial element:
While (85) straightforwardly follows from the direction of time, (86) does not; hence, the latter violates the apparent isomorphism of LCA. Kayne thus conclude that the only structure that is allowed in Universal Grammar is the Spec-Head-Complement structure. One of the applications of this idea is the universal ordering of Subject-Verb-Object
(SVO). Clearly, languages are not all SVO on the surface, as we know. Kayne argues that
the non-SVO orderings must be derived from SVO through movements. To wit:

\[(87)\]

\[
\begin{align*}
&\text{a. } S O V = S V O \rightarrow [S [[O] V [O]]] \\
&\text{b. } V O S = S V O \rightarrow [[V O] [S [V O]]] \\
&\text{c. } O V S = S V O \rightarrow [O [V [O]] S [V O]]
\end{align*}
\]

In conclusion, for Kayne syntax is neither associative nor commutative, thus is purely
asymmetric. Its lack of associative symmetry comes from LCA, while its lack of
commutative symmetry is a reflection of the time asymmetry.

### 2.3.2 The Hidden Symmetry in the Observed Asymmetry

Kayne (1994) not only adopts the option in (14b), but also assumes an even stronger form,
where symmetry is totally eliminated from the grammatical system:

\[(88)\]

Syntax is both *non-associative* and *non-commutative* (and therefore asymmetric),
and its asymmetry is fully represented at PF and LF by isomorphism.

At first sight, Kayne’s theory seems to follow directly from the latter part of the Curie’s
principle of dissymmetry (see Note 5) that if certain effects reveal dissymmetry (lack of
symmetry), then this asymmetry are attributed to asymmetric causes. However, Curie’s
principle does not dictate (and in a deeper sense, it actually argues against) that if effects
are asymmetric, then the whole system is robustly asymmetric. We have seen that, in
Kayne’s account, the sources of asymmetry come from time and the assumption that the
derivational hierarchy corresponds to linear sequence in an isomorphism (the LCA).
Strictly speaking, neither of these causes are strictly internal to narrow syntax. The first
cause (asymmetry of time) is totally extraneous to the grammatical system, and the
second cause builds on strict X-bar theory that narrow syntax has to follow. However, this
assumption has been challenged as artificial and unnecessary (Chomsky 1994),\(^3\) and in
effect, the assumption of LCA needs to involve conceptual redundancy in order to capture
the symmetric patterns from the asymmetric design, as we are going to argue later. The
conclusion Kayne arrived at that symmetry is eliminated from the grammatical system
comes from the observation that there is no perfect symmetry in syntax. However, this is
not an argument to dispute symmetry in the system in the first place. For example, it is
almost impossible to observe a perfect circle in reality (or a perfect symmetric
phenomenon, because such a ‘phenomenon’ will either be symmetrically invariant, and is
therefore not easily detected or observed, or they will be distorted by other asymmetric
factors in the ‘chaotic’ nature). However, this does not falsify the symmetry in the
mathematical model that defines a circle. A quote from Stewart & Golubitsky (1992) is
relevant here:

(89) ‘The issue is the relation between a mathematical model and the reality that it is
supposed to represent. Nature behaves in ways that look mathematical, but nature
is not the same as mathematics…. The assumption of perfect symmetry is
excellent as a technique for deducing the conditions under which
symmetry-breaking is going to occur.’ (p.16)

\(^3\) In fact, adopting a strict X-bar theory already suggests that symmetry cannot be totally eliminated from
syntax. The X-bar theory represents an invariant clause structure that is recursively applied in syntax. The
invariance is therefore a type of symmetries (translational symmetry) that is observed in syntax.
Similarly, observing that the audible/visible forms in language are never perfectly symmetric does not falsify the validity of a symmetric computational system that tries to explain it. Consider also the remark in Brody (2003:205): ‘It is the departures from symmetry, rather than the symmetries, that are typically taken to be in need of explanation.’

On the other hand, we argue that the core computational system (i.e. narrow syntax) only encodes symmetric relation; therefore, not only do we expect to observe symmetry somewhere in the effects, but it is also possible to deduce the sources of asymmetry when the observed effects are asymmetric. Indeed, symmetry can be observed in grammar when we consider it from a universal point of view (i.e. we collect the broken symmetry to restore the global symmetry in the system). To see this, let us repeat the properties of PF and LF in (13):

\[(90) = (13)\]
\[\begin{align*}
  a. \text{The elements concatenated by PF operations are non-commutative (but are } \text{associative).} \\
  b. \text{The elements concatenated by LF operations are non-associative (but are } \text{commutative)}
\end{align*}\]

Despite their asymmetric properties, these interfaces still retain part of the symmetric properties. The symmetry appears to be trivial because we do not usually observe it in a single language (due to the fact that the observed forms are the union of PF and LF). For
example, if we observe English, we would not expect to find the form: [[[bit [its owner] every pug]]] in this linear order (although the LF properties of c-command is equivalent to the observed [every pug [bit [its owner]]]). The hidden symmetry, however, can be observed cross-linguistically (though they might be broken in each language). Let us compare adjuncts in English and (Mandarin) Chinese:

(91)  a. John [[saw [a man]] [using binoculars]]
    ‘By using binoculars, John saw a man.’
  b. John [saw [a man [using binoculars]]]
    ‘John saw a man who is using binoculars.’

(92)  a. Zhangsan [[yong wangyuanjing] [kanjian [yi ge ren]].
    Zhangsan use binoculars see one CL person
    ‘Zhangsan, using binoculars, saw a man.’
  b. Zhangsan [kanjian [[yong wangyuanjing de] [yi ge ren]].
    Zhangsan see use binoculars DE one CL person
    ‘Zhangsan saw a man who is using binocular.’

The patterns show that English and Chinese adjuncts occur in mirror symmetry to each other. Let us illustrate this by using the simplified syntactic trees below:
Having shown this mirror symmetry, however, is not enough. To complete our argument that LF is commutative in a universal scale, we also need to consider the hierarchical relations of these adjuncts. If LF is commutative, we should expect that the mirrored linear ordering will retain the original hierarchical relations (cf. the Calder-like structure in Uriagereka 1998 and Prinzhorn and Vergnaud 2004). This is confirmed by the following examples:

(94) a. Students own at least two computers [in most universities] [in every developed country].

b. [zai mei ge yifazhan guojia], xuesheng [zai dabufen daxue li] in every CL developed country student in most university in dou yongyou liang tai yishang de diannao all own two CL up DE computer ‘as in (a)’
Note that in each of the examples, the adjunct scope is [every country] > [most universities], but not the reversed.\footnote{Consider the following situation: Suppose in two developed countries, Country M and Country T, M has 10 universities and T has only 3 universities. The sentence will be true only if students have two or more computers in most schools in M and in most schools in T, say, in 8 universities in M and 2 universities in T, indicating that every has scope over most. On the other hand, the sentence is not true in the following situation (where most > every in scope): Students have two or more computers in all universities in M, but in none in T.} The commutativity at LF is confirmed: The hierarchical relations are maintained despite the mirrored linear orders. The symmetry, therefore, exists, but is often hidden due to the fact that the observed outputs are a mixture of two types of asymmetry (non-commutative PF and non-associative LF). The hidden/broken symmetry can be reconstructed and identified by observing the system globally; That is, each observable state is related to one another by symmetry (Stewart & Golubitsky 1992:58).

Kayne might account for the rightward adjunctions represented in (93) by means of complex movements (to account for the hidden asymmetry in the symmetric patterns). For example, (93a) would have the following structure (the movement will take place in English, but not in Chinese):

\begin{diagram}
  \[ \Sigma P \]
  \[ \Omega P \]
  \[ \wp_{1} \]
  \[ \text{using binoculars} \]
  \[ \Sigma \]
  \[ \wp_{1} \]
  \[ \Omega P \]
  \[ \text{saw a man} \]
\end{diagram}
Two questions can be raised here: (i) What motivates/triggers the extra movements and the extra categories (the $\Omega P$ and $\Sigma P$) in (95)? (ii) What restricts the movements and the categories? The answer is an unfalsifiable one: the LCA (since if we ask the opposite questions, the answer still is the LCA). Kayne’s theory aims at a restrictive theory of the base structure, but the pay-off is an unrestrictive theory of transformation. Equipped with the unrestrictive allowance for movements, several questions arise. One of the fundamental motivations for Kayne’s (1994) asymmetric system is the question ‘why is there no perfect mirror symmetry between two languages?’ Kayne’s answer is the total elimination of symmetry (as we have just summarized). However, this very same question is now thrown back to the asymmetry camp. With unrestrictive movements, why are we not able to find apparent symmetric patterns? Apparently, there are other asymmetric causes than the syntax proper that generates this surface asymmetry. In view of the unrestrictive movement theory, Leung (2007) also argues against LCA on architectural grounds. Since the costless movements and extra categories are in many instances designated simply in order to derive the observed PF output, it may be assumed that movements are PF-motivated. This suggests that transformations in narrow syntax can retrieve information by looking (very far) ahead. Ernst (2002:236) also raises a similar concern by pointing out the problem of locality in Kayne’s treatment. Note that in (95), wh-extraction is still possible:
Adopting Kayne’s structure in means that the \textit{wh}-phrase raises from a position that is in a specifier of a specifier, a CED violation (Huang 1982), but the sentence is fully grammatical. This means that the \textit{wh}-phrase should not have raised from such a position.\footnote{Note that these problems disappear if we assume that LCA is a pure PF condition on linearization (taking the position in Chomsky 1995), or an apparent property of the ‘derived’ phrase structures (see the next chapter).} Adopting the commutative structure, however, will easily account for these properties. We therefore conclude that symmetric structure can be found from the point of view of Universal Grammar. The simplest way of capturing the symmetric effects, then, is to assume that there is a symmetric cause in the grammatical system. In fact, symmetry being a theoretically preference by default, any system that tries to derive symmetry from asymmetry will be subject to the same problem of needing to adopt otherwise unmotivated and redundant transformations. Let us illustrate this point with a simple computational model, such as arithmetic.\footnote{I owe the arithmetic proof to a personal communication with Jean-Roger Vergnaud.} We know that addition is a symmetric function, while subtraction is not. Therefore, \(1+2 = 2+1\), while \(1-2 \neq 2-1\). As a standard practice, we can, however, derive subtraction from addition and another symmetric transformation rule: the additive inverse. Let us define additive inverse as follows:

\[(97)\quad y \text{ is an additive inverse of } x \text{ iff } x + y = 0\]
The rule is symmetric since it defines a mirror image of \( x \) (i.e. \( x \) is an inverse image of \( y = y \) is an inverse image of \( x \)). In other words, \( y = (-x) \) if and only if it is an additive inverse of \( x \). We can now define \((a-b)\) as \((a+(-b))\), and it is equivalent to \((-b)+a\) given commutativity. \((a-b)\), on the other hand, is not equivalent to \((b-a)\) because subtraction is an asymmetric relation. In the latter case, two symmetric operations seem to yield an asymmetric output. Applying Curie’s principle, we correctly predict that there must be an asymmetric cause somewhere during the latter derivation. Like PF, this asymmetry is caused by the asymmetric linear relation (the convention of doing arithmetic is also from left to right). Notice that \((b-a)\) is equivalent to \((-(-a)+b)\); therefore, we were actually applying the inverse transformation to the first number/time slot, but not the second one.

In the original formula \((a-b) = (a+(-b))\), however, the inverse transformation is applied to the second number/time slot. Therefore, the reason why \((a-b)\) is not equivalent to \((b-a)\) is just the same reason why \textit{dogs bit men} is not equivalent to \textit{men bit dogs} (at PF). That is, there is an extraneous asymmetric linear relation (the temporal sequence of PF) that is imposed upon the inherent symmetry of the system.\(^{35}\)

\(^{35}\) Note that a deduction in the reversed direction (i.e. to derive addition from subtraction) is quite redundant and turns out to be unnecessary. First we need to show that \((-(-b))=+b\), and therefore \(a-(-b)=a+b\). However, in order to prove the former, the operation addition is needed: Given \(b+(-b) = 0\), \(b = 0-(-b) = b\).
CHAPTER 3 SYMMETRIC SYNTAX AND MINIMAL COMPUTATION

It was argued in Chapter 2 that the core operations in narrow syntax, Merge & Agree, are both symmetric relations, and narrow syntax is both commutative and associative. Therefore, the standard asymmetric syntactic theory, which creates a hierarchical phrase structure (and linear orderings) by Merge should be revised. This chapter sets out to serve as an introduction to a syntactic theory that carries out this revision under the guidance of the general principles of symmetry, which is compatible with the proposals in Prinzhorn & Vergnaud (2004), Vergnaud (2009), Liao & Vergnaud (2010), and McKinney-Bock & Vergnaud (2010). The goal of the proposed syntactic theory is to reduce narrow syntax to minimal computations (i.e. narrow syntax only involves a set of local relations) that do not presuppose, or generate, asymmetric (hierarchical or linear) structures. It will be shown that this revision may provide new thought to some of the long standing problems of the standard hierarchical phrase structural syntax. In the proposed theory, a narrow syntax would be formulated as symmetrical structures that are governed by the primitive syntactic relations (the relations between noun and verb, between substantive and functional categories, etc.), the contents of which will be made explicit as our discussion proceeds.

One indication of the symmetric nature of syntax can be extracted from the recursive parallel patterns in syntax. The sources of parallelisms in syntax indicate that there are hidden constants that drive the primitive syntactic computation. Following Prinzhorn &
Vergnaud (2004), Vergnaud (2009), and subsequent works, we argue that these primitives are a set of coupled domains that represent the primitive syntactic relations: Specifically, these fundamental relations include (i) the nominal-verbal domain, represented as \{N, V\}, (ii) the functional-substantive domain, represented as \{Fn, Sb\} (by which each substantive item is given a functional role at LF), and (iii) a connective pair \{k, k’\}, which extends the structure (creating the extended projections). Prinzhorn & Vergnaud (2004 et seq.) propose that narrow syntax should be understood as an abstract representation generated by these coupled domains. That is, narrow syntax is a Cartesian product of the core syntactic coupled domains (CDs), and the standard phrase structures are constructed from the abstract narrow syntax. We shall refer to this hypothesis as the Prinzhorn-Vergnaud Conjectures, formalized as in (98):

(98) The Prinzhorn-Vergnaud Conjectures
a. Narrow Syntax (NS) is a Cartesian product of the core syntactic coupled domains (CD), and Merge applies to any two adjacent nodes in NS:
   \[ NS = CD_1 \otimes CD_2 \otimes CD_3 \]

b. Given (a), Merge applies only to lexical items (formatives in the sense of Chomsky 1965), which is realized as a node in NS.

c. Phrase-markers are constructed from the abstract NS.

Given that the fundamental relations are identified as \{N,V\}, \{Fn,Sb\}, and \{k,k’\}. Narrow syntax is therefore a representation generated by \{N,V\} \otimes \{Fn,Sb\} \otimes \{k,k’\} = \{(N,Fn,k),(N,Fn,k’),(N,Sb,k),(N,Sb,k’),(V,Fn,k),(V,Fn,k’),(V,Sb,k),(V,Sb,k’)\}. Each node in the cubical lattice here represents a syntactic context where a lexical item can appear (cf. the contextual features in Leung 2007), and Merge characterizes the syntactic relation
between any two adjacent nodes (vertices) in each dimension of the cubical lattice.

Following the terminology in Liao & Vergnaud (2010), the structure will referred to as Merge-markers (M-markers), in contrast to the Phrase-Markers (P-markers) in the standard Chomskyean syntax (however, it will later be demonstrated that the proposed theory, in many ways, resembles the earlier transformational grammar in the Aspect model of Chomsky 1964, 1965). The corresponding Cartesian product can be visualized as the following graphic representation, where each vertex in the M-markers represents a skeletal position for a lexical item:

(99) M(erge)-Markers

The structure is symmetric with respect to transformations since the linear orders and hierarchical relations are not defined. Therefore, any apparent transformation that applies to the structure, e.g., a 90° rotation, yields an identical syntactic structure:
In addition, the structures of M-markers are also symmetrically ordered. That is, any transformations of the axes leave the structure invariant: (N, Fn, k) = (Fn, N, k) = (k, N, Fn), etc. Each node in the M-markers can be realized by a lexical item (functional or substantive), and the matrix of the syntactic relations in the node defines the syntactic role played by the lexical item (e.g. (N,Sb,k) defines a substantive nominal root). Note that the strict locality of the core syntactic relations is directly derived from this theory because each coupled relation is (by definition) computed in a local fashion. An illustration can be provided with the structure in (101), which focuses on the bottom dimension.
First of all, the one-dimensionally contrastive pair, \((N, Sb, k)\) and \((V, Sb, k)\) reflects the N-V relation between a substantive \(V\) and a substantive \(N\), which plays a role in the theta relations, one of the set of strictly local relations (Williams 1994). Another one-dimensionally contrastive pair, \((V, Fn, k) = Asp\) and \((V, Sb, k) = V\), reflects the Substantive-Functional relation between a functional \(V\) (e.g., Asp) and a substantive \(V\). Similarly, the minimally contrastive pair \((N, Fn, k) = D\) and \((N, Sb, k) = N\) represents the relation between the functional \(D\) and the substantive \(N\). In this respect, the proposed theory differs from the standard assumption that a substantive element is embedded under a series of functional projections. However, it will be argued that each functional projection is coupled with a substantive item, and it is the functional item that defines the LF role (and the syntactic category) played by the substantive item.\(^{36}\) It is thus predicted

\[\text{(101)} \quad \text{Mod} = (V, Fn, k') \quad \text{Asp} = (V, Fn, k) \quad \text{D} = (N, Fn, k) \quad \text{D} = (N, Sb, k') = N \quad \text{D} = (N, Sb, k) = N \]

\[\text{Asp} \quad V \quad \text{D} \quad N\]

\(^{36}\) The functional items may be morphologically realized as independent lexical items (as the grammaticalized items in an analytical language like Chinese), or they may be uniformly realized by the
that a substantive item may occur in many functional environments and play the grammatical role of a grammatical functional item. This analysis thus gives us a new direction of looking at what has been referred to as ‘grammaticalization’ in the literature. We shall see that examples of this type are abundant in an analytical language like Chinese.

The other fundamental relation involves the grammatical connectives that extend the structures. Let us assume that these grammatical connectives also come in pairs, and represent them by \{k, k’\}. It is argued that the parallelisms of the Chomskyean derivational phrases (Chomsky 2001), i.e., the selections between C-T and the v-V, reflect the coupling of \{k, k’\}. Turning back to the structure in (101), a pair that is contrastive in two dimensions, a substantive N (N, Sb, k) = ‘the N Root’ and a functional verbal projection (V, Fn, k’) = Aspect, is not involved in any direct syntactic relation (since they stand in diagonal relation), and any relations between them must be associated by the intermediate elements (through D or the root V). The following principle is derived:

\[(102) \quad \textbf{The Locality Principle of Syntactic Relations} \]

A syntactic relation \(R\) between the node \(X\) and the node \(Y\) is established if \(X\) and \(Y\) are adjacent nodes in a Merge-marker. That is, \(X\) and \(Y\) is a one-dimensionally contrastive pair.

e.g. \(X = (A, B, C)\) and \(Y = (A’, B, C)\).

Essentially, the proposed theory argues that the ‘narrowest’ syntax consists of a set of Merge-markers, each of which represents a domain in which the primitive syntactic
relations are satisfied. For example, a simple sentence should involve at least the following two M-markers as the base structure:

(103)  a. The C-T domain

(103)  b. The v-V domain

Echoing the main thesis that the translation from syntax to interfaces is a process of symmetry lowering, the symmetric M-markers would be translated to asymmetric phrase structure that is accessible to the interfaces. This is achieved by imposing asymmetric direction-setting among the fundamental relations in the symmetric M-markers (Prinzhorn & Vergnaud 2004).

This chapter will be structured as follows. It will be shown in Section 3.1 that many earlier proposals also embrace the direction taken in the theory proposed here. Coincidentally, these prior proposals have all stumbled upon the parallelisms in syntax. I
argue that the source of these parallelisms is the symmetric pairs of syntactic relations. These fundamental relations are introduced in Section 3.2, along with the structure of Merge-markers. In Section 3.3, it will be demonstrated how the asymmetric phrase structures are derived from the symmetric M-markers.

3.1 On the Parallelisms in Syntax: The Hidden Parameters

One of the long-term goals of the generative linguistics (and especially, of the Minimalist Program) is to show that language is an optimal design, in the sense that the theory of language observes the principles of economy and simplicity that yields computational efficiency (Chomsky 1994, 1995, 2001, Collins 1997, Yang 1997). Here, I adopt the assumption of optimal design made in Bowers (2001) and Frampton & Gutmann (1999, 2002), who follow the minimalist spirit characterized in Chomsky (1995): 37

(104) a. Language is an optimal solution to legibility condition. (Bowers 2001:8)

b. A derivational system is optimal to the extent that the end products of its derivations meet the interface requirements, with the need for filtering out defective products kept to minimum (Frampton & Gutmann 2002:96).

The two assumptions share the same guideline that derivations of syntax merely play a role that ultimately provides instructions for the interfaces (LF: how to interpret and/or construct a semantic interpretation with respect to the conceptual-intentional module, and PF: how to produce/perceive the relevant articulators/gestures in the sensory-motor

37 These two conditions can be interpreted as a strong version of the bare output condition in Chomsky (1995: 221).
In this view, the objects created in syntactic derivations are always well-formed and legible to the interface systems. Ungrammatical sentences are ruled out as early as possible during derivations (before they are sent to the interfaces). Computational efficiency is therefore achieved by highly restricted derivational conditions in narrow syntax. This allows us to minimize the filtering conditions at interfaces (these filtering conditions are unwanted objects unless they are empirically well-supported). The other derivational condition that facilitates the computational efficiency is locality. That is, syntactic computation should be as close as possible; i.e., local computation. Therefore, the computational space of determining whether a syntactic product is legible should be minimized.

To illustrate, let us consider how the principles of minimal computation are implemented in standard theory. The standard theory assumes that merge is a bottom-up incremental building process, and each execution of Merge is local. Therefore, in a sentence like *John stole the car*, the sentence is approximately constructed as follows (irrelevant steps omitted).

\[
\begin{align*}
(105) & \quad a. \text{Merge (the, car)} & \rightarrow & \text{the car} & = O(a) \\
& \quad b. \text{Merge (steal, O(a))} & \rightarrow & \text{steal the car} & = O(b)
\end{align*}
\]

38 Note the theory, as a general practice in the generative grammar, is beyond the speaker/hearer distinction (Chomsky 1964).
c. Merge (Tense, O(b)) → steal-Past the car = O(c)

d. Merge (John, O(c)) → John steal-Past the car = S

One question is what prevents Merge from randomly taking two objects and forming an illegible LF/PF object (for example, Merge (Tense, O(a)) results in the illegitimate object in English *the-Past car). Regarding this question, the standard theory, however, has not been very explicit. Chomsky (2008), for example, introduces the Edge Features as an internal drive for Merge:

(106) a. A property of an LI [lexical item] is called a feature, so an LI has a feature that permits it to be merged. Call this the edge feature (EF) of the LI. (p.139)

b. Let us return first to the properties of EF…. If an LI $\alpha$ enters a derivation and its EF is not satisfied, the resulting expression will often crash, but not always; say, the expression “No.” If EF is minimally satisfied for $\alpha$, then $\alpha$ has a complement, to which C-I [Conceptual-Intentional Interface] will assign some interpretation; a theta-role in some configuration. (p.144)

c. Merge can apply freely, yielding expressions interpreted at the interface in many different kinds of ways. They are sometimes called “deviant,” but that is only an informal notion. Expressions that are unintelligible at the SM [Sensory-Motor Interface] may satisfy the most stringent C-I conditions, and conversely…. The only empirical requirement is that SM and C-I assign the interpretations that the expression actually has, including many varieties of “deviance.” (p.144)

If Merge is regulated by edge features, then Agreement plays a role here. That is to say, the edge features must agree between the two merged items in some way. It is not clear, however, what specific contents Chomsky would assign to edge features. From (106b, c), it looks like the contents of edge features are rather empty, since Merge can apply freely,
generating expressions that crash at LF, but converge at PF, or the other way round.
However, this does not seem fully compatible with the idea of optimal design, since it implies that LF and PF are still considered strong filters of the derivational outputs, filtering out derivations that have already crashed at narrow syntax. The position advocated in Chomsky (2008), then, is likely to run into a dilemma. On the one hand, we would like the ungrammatical (PF and LF ineligible) expressions to be ruled out as soon as possible (due to computational efficiency), while on the other hand, some apparently crashed expressions should still need to be considered, since they might still be interpretable in some other ways.

Some proposals that might provide clues to a solution to this dilemma will be reviewed in this section. As we are going to see in this section, Collins (2002) and Bowers (2001) try to regulate the operation Merge by restricting the types of merges possible to those compatible with some syntactic relations. In addition, Hiraiwa’s (2005) proposal of the matching supra-categories can also be viewed as a condition regulating possible types of merge. Going back to the dilemma, then, a derivation would be immediately ruled out, if the ‘schema’ of Merge is not followed in the derivation (i.e., a derivation that does not meet the appropriate syntactic conditions). On the other hand, all derivations following the schema of Merge would have a chance to reach the interfaces (whether they will be considered ill-formed or not in the end), where the interfaces, if any, would then assign/filter out the expressions with/without appropriate meaning. For instance, the
famous colorless green idea would be an example, to which the C-I component fails to assign a meaning, but it is nevertheless legible for the PF interface.

3.1.1 Relational Syntax: Bowers (2001)

Following the theory of eliminating labels in Collins (2002) (See also Chapter 2, Section 2.2.1.1), Bowers (2001) argues that standard phrase structures should be dispensed with, and syntax should be understood instead as (asymmetric) relations between lexical items. The basic relations are identified as Subcategorize (SUBCAT), Select (SEL), and Modify (MOD). SUBCAT holds between a nominal category and a verbal category (in a way that the nominal category saturates the semantic function of the verbal category). SEL holds between two categories of the same type, i.e. the extended projections, and the semantic function of Sel is to extend the meaning. On the other hand, MOD is an optional relation that holds between two distinctive units (e.g. slowly and eat). As an example, let us consider the syntactic relations of following sentence:

(107) Syntactic relations in The boys read the boring book.

a. MOD (boring, book)  
b. SEL (the₁, book)  
c. SUBCAT (read, the₁)  
d. SEL (v, read)  
e. SEL (the₂, boys)  
f. SUBCAT (v, the₂)
Representing the sentence in a graphic way, we obtain the structure as follows (the alphabets represent the set of relations in (107)):

(108)

Bowers further assumes that the linear structures at PF are also dictated by syntactic relations. In his theory, linearization is a function that takes a syntactic relation as an input and returns an output of linear word order. In English, Bowers assumes the following linearization rules (where \( f(R) \) stands for the linearization function applying on a relation \( R \), and \( x-y \) stands for the linear order ‘\( x \) precedes \( y \)’ at PF):

(109)

\[
\begin{align*}
  \text{a. } & f(SEL(x,y)) = x-y \\
  \text{b. } & f(SUBCAT(x,y)) = y-x \\
  \text{c. } & f(MOD(x,y)) = x-y \text{ or } y-x \\
\end{align*}
\]

Applying the linearization function \( f(R) \) to the relations \( R \) in (107) results in the following linear orders. The left-hand side represents the output of a single linearization function, and the right-hand side shows the accumulated outputs:
(110) *The boys read the boring book.*

\[
\begin{align*}
\text{a. } f(\text{MOD} (\text{boring, book})) &= \text{boring-book} & \rightarrow & \text{[boring book]} \\
\text{b. } f(\text{SEL} (\text{the}, \text{book})) &= \text{the-book} & \rightarrow & \text{[the [boring book]}} \\
\text{c. } f(\text{SUBCAT} (\text{read, the})) &= \text{the-read} & \rightarrow & \text{[[the boring book] read]} \\
\text{d. } f(\text{SEL} (\text{v, read})) &= \text{v-read} & \rightarrow & \text{[read-v [the boring book]}} \\
\text{e. } f(\text{SEL} (\text{the}, \text{boys})) &= \text{the-boys} & \rightarrow & \text{[the boys]} \\
\text{f. } f(\text{SUBCAT} (\text{v, the}), \text{boys}) &= \text{the-v} & \rightarrow & \text{[the boys [read-v [the boring book] read]]}
\end{align*}
\]

Taking Step (a) and Step (b) together, the output string *the-boring-book* is generated. The linearization functions then continue. When the linearization arrives at Step (d), Bowers assumes that a phonologically empty head, such as the light verb in English, will trigger head movement, represented in the right-hand part of Step (d). Therefore, the verb is pronounced in the position of the light verb. The linearization functions eventually generate the desired output in Step (f). It is important to note that the ordering of relations listed in (107) or (110) reflects the sequence of the derivation. Therefore, MOD(boring, book) must precede SEL(the, book). If put in the opposite order, the generated output will become the ungrammatical sequence in English: *boring-the-book*. Bowers attributes the order of syntactic relations to the LF properties of the lexical items. Assuming the type-theoretical approach to LF in Chierchia (1984), Bowers argues that the composition of syntactic relations should reflect the compositionality of the semantic types. Therefore,
if $\text{SEL}(\text{the, book})$ preceded the $\text{MOD}(\text{boring, book})$, the derivation would be blocked since 

*the book* would be formed first, generating an entity expression that does not match the type-theoretic need of a modifying relation (which requires a predicate/property expression). We will not dwell on this point. It is controversial to assume a type-theoretical approach as a blueprint for syntactic derivations, since type-theoretical compositional semantics is itself a generalization from compositional syntactic structures. Therefore, adopting type-theory as a blueprint for syntax only leads to a circular conclusion. In addition, as will be argued, type-theory fails to predict some of the important empirical facts in language (e.g. the split DP-hypothesis in Sportiche 2005. See Section 3.1.2).

Nevertheless, the spirit of Bowers’ theory is close to the theory proposed here in many aspects. It seeks for a minimalist syntax that only involves minimal computations by eliminating the superfluous notions of phrase structures in narrow syntax (a direct consequence of Collins’ label-free theory), and by restricting merge as relations between items in the lexicon. However, the theory proposed here departs from Bowers’ theory in the following aspects. First, Bowers assumes that all syntactic relations are asymmetric by definition. However, Selection is a mutual term. In terms of extended projection, saying N selects D or D selects N is equally informative. The direction has little theoretical significance. In addition, even though Subcategorization seems to represent an asymmetric relation (where V unilaterally assigns a theta-role to N), and can be
generalized as one of the N-V relations. In standard theory, the N-V relation is what defines (Spec-Head) checking configurations, such as Case, *wh*-feature, and so on.

Alternatively, we may adopt a generalized theory presented in Prinzhorn & Vergnaud (2004), Vergnaud (2009), and subsequent works, in which merge is reduced to two basic types: EPP-merge and Head-merge. The former leads to a checking configuration (a generalized spec-head checking relation corresponding to Bowers’ SUBCAT), while the latter corresponds to a head-selection configuration (to Bowers’ SEL). Consider the following representation, in which the horizontal relations ((F_{Asp}, D_{the}) and (V_{win}, N_{prize}) in the solid lines) represent EPP-merge, while the vertical relations in the dotted lines, (F_{Asp}, V_{win}) and (D_{the}, N_{prize}), represent Head-merge. Similar to Bowers’ theory, we arrive at the graphic representation in (111b):

\[(111)\]

\[a. \text{John will}\ \boxed{\text{FP } F \text{ win the prize}} (\text{where } F \text{ is an extended verbal functional projection; e.g. } F= \text{Asp})\]

\[b. \quad F_{Asp} \quad D_{the} \quad (V,Fn) \quad (N,Fn)\]
\[\quad V_{win} \quad N_{prize} \quad (V,Sb) \quad (N,Sb)\]

As introduced earlier in Section 1, the relations in (111) can be further decomposed to two fundamental coupled domains: (N, V) and (Fn, Sb), as shown in (111c). Two types of (N, V) relations can be identified: Subcategorization is the (N, V) relation that holds in
the substantive domain. In the functional domain, the Case-checking relation is one of the representative relations.\textsuperscript{39}

The theory proposed here also (crucially) departs from Bower’s theory in assuming that functional items are merged in a separate tier from the substantive items, as shown in (111). This differs from Bowers’ assumption that the functional-substantive relation Selection, e.g., $\textit{SEL}(D, N)$, must precede the relation Subcategorization, e.g. $\textit{SUBCAT}(V, D)$. Bowers bases his assumption on type-theoretic compositionality. In addition to the controversial role of type-theoretic semantics in narrow syntax, the type-theoretic view may lead to some serious problem in syntax. As we are going to see in the next subsection, Sportiche (2005) and Lebeaux (2000, 2009) both argue at length that merge of substantive items and merge of functional items should be separated. Sportiche further argues that DP should always be regarded as a split structure, where D is merged outside NP. This means that although D and N are pronounced as a single unit DP at PF, the empirical facts show that they are actually separately introduced in the derivation of narrow syntax. If these authors are on the right track, it is further doubtful whether type theoretic compositionality (a large part of which is merely a generalization from surface structure) really plays a role in the formation of syntactic structures.

\textsuperscript{39} Other functional checking relations might be related to telicity feature checking (see Chapter 4) or \textit{wh}-feature checking (see Section 3).
### 3.1.2 Split Merge: Sportiche (2005) and Lebeaux (1988 et seq.)

Based on A-movement reconstructions, Sportiche (2005) and Lebeaux (1988, 2000, 2009) conclude (or the latter implies) that D and NP cannot be concatenated as a single base-generated constituent. Their analyses are summarized in this subsection. Adopting a rather standard view, A-movements do not reconstruct at LF:

(112) From Chomsky (1995) and Lasnik (1999)

   a. *John, expected [him, to seem to me [t to be intelligent]]
   b. Everyone seems [not to t be there yet]

   (i) every > not (total negation)
   (ii) *not > every (partial negation)

In (112a), reconstruction of him to the trace site should provide an escape from a principle B violation, and reconstructing everyone to t in (112b) should allow the sentence to have a partial negation reading. It therefore appears that A-movements do not reconstruct at all. However, as first pointed out by Lebeaux (2000, 2009), and later by Fox (1999) and Boeckx (2001), A-movements elsewhere do show reconstruction effects. Consider the following examples:
(113)  a. Two women seem to be expected to dance with every senator.  
(two > every; every > two)

           b. Two women seem to each other to be expected to dance with every senator.  
(two > every; *every > two)

(114) His first book tends to please every man.

(113a) and (114) provide strong evidence that the raised subject *two women* and *his first book* undergo reconstruction: the subject *two women* can be distributed to *every senator*, as in (113a), and the pronoun in *his first book* can be bound by *every man*, as in (114). Sentence (113b) further indicates that it is not the cyclic QR of *every senator* that is involved here, but it is the reciprocal *each other* that blocks the reconstruction of the subject. If the wide scope of *every senator* were derived through raising of the universal quantifier, there would be no reason that *each other* should block the reading. On the other hand, a plausible theory is that *each other* requires *two women* to remain in situ (as a binder of the reciprocal at LF due to Binding Principle A), hence bleeding the reconstruction of *two women*, and no wide scope reading of the universal quantifier is obtained.

If A-reconstruction of the raising subject can be maintained, the question is why the reconstruction effect is not observed in (112). Consider another sentence like (115):
If the man reconstructs, as shown in (115b), the sentence should violate Principle C, which is an everywhere condition. Now we have a paradox here: reconstruction sometimes applies, and sometimes it cannot apply. Lebeaux’s own solution is to separate the syntax of substantial items from that of functional items. He hypothesizes that all DPs are represented by an empty category in the underlying structure, and the lexical content of these empty categories (represented as e) are only filled later in the derivation, a process he calls Overlay. To illustrate how this works, let us consider the derivations in (116):

(116)  a. seems to himself e to like cheese. (e raises to the subject position)
    b. e seems to himself t to like cheese. (Overlay: e → [the man])
    c. The man seems to himself t to like cheese. (Binding)

Though attractive in certain ways, there are problems in Lebeaux’s account. Lebeaux argues that only substantive elements undergo Overlay (since it comes from a Theta-substructure), but this is not the exact execution in (116), which takes the whole DP (including D) to be the overlaid site. (116) should therefore be understood as (117) if the idea in Lebeaux (2000) is to be strictly maintained:
(117)  a. seems to himself the pro to like cheese.
       b. The pro seems to himself t to like cheese.
       c. The man seems to himself t to like cheese.

Now the theory does not quite go through as before. We need additional stipulations, such as the requirement that binding applies after overlay (i.e. an incomplete DP will not serve as an antecedent of binding). This can be problematic. The DP consisting in only a functional item, such as the in (117a), should readily be able to behave as an R-expression (and therefore immediately subject to Principle C) since it is the semantic function of a determiner (an article or a pronoun occupying the D position) that makes a nominal expression ‘referential.’

There is one way to circumvent this problem and to simplify Lebeaux’s analysis, the cost of which is to sacrifice a standard DP analysis (i.e. a DP comes to the derivation as a non-split single constituent). A split-DP analysis is found in Sportiche (2005). Simply put, sentence (116) is analyzed in the following fashion:

(118)  [The, seems to himself, [to man like cheese]] (underlying form)

       → The man seems to himself to-man like cheese (surface form)

Under the copy theory of movement (Chomsky 1995), radical (total) reconstruction should be expected (unless we impose external conditions on reconstruction, such as the
preference principle, which seems *ad hoc* and problematic; see Lasnik, Uriagereka & Boeckx 2005). Since A-movements do show reconstruction effects, an analysis like (118) seems to be a viable solution to the reconstruction paradox. Another contrastive pair is like (119) (= (112b)):

(119)  a. Everyone isn’t there yet.  (not>every; every>not)
        b. Everyone seems not to be there yet.  (*not>every; every>not)

The sentence (119b), then, is to be analyzed as (120), where *every* does not reconstruct under the scope of *not* (since it is base-generated in the main predicate):

(120)  [Every seems [not to one be there yet]]

If this type of split-DP analysis is on the right track, we conclude that (i) DP is not single constituent by itself in the underlying structure, and a Determiner is introduced separately from N(P) in the course of a derivation, (ii) the argumenthood of a verb is satisfied by a bare NP, rather than a full DP, and (iii) there are independent conditions governing the position where D can be introduced.

What is crucial here is the proposal that D and N are separately merged, which can be taken as an indication that possibly any functional and substantive item pair might also be merged split from each other if a radical version of Sportiche’s insight is adopted. The standard theory has difficulties adopting this position, however, due to the assumption
that DP is always formed as a single constituent before it is merged with the verbal element. This assumption comes from the observation that in the surface structure, D and N are always pronounced as a unit. However, surface structures are sometimes misleading, as often seen in other syntactic constructions. An element pronounced at some surface position X is often interpreted at another position Y (e.g. wh-constructions, relative clauses, etc). The split D-N merge, then, is simply a reversed situation that should be theoretically plausible (D is interpreted at a position X, but pronounced at another position Y). Assuming the standard syntactic structure, however, is hardly possible to escape from Sportiche's (and Lebeaux's) reconstruction paradox. In the proposed analysis, on the other hand, it is natural to expect the separation between functional and substantive items. The couplings of functional and substantive items are merged split from each other in independent dimensions, as shown by the following illustration (modified from (111)):

(121) a. John will \([FP F \textbf{win every prize}]\) (where F is a extended verbal functional projection; e.g. F= Asp)

b. \[D_{\text{every}} F_{\text{Asp}}\]

c. \[FP\]

The horizontal parallelisms illustrate the split merge. The structure, if roughly translated to a more familiar tree representation (in the X-bar convention), will be (121c), in which
the labels and the maximal projections are specified. Where the standard structure has a hard time generating the long-distance relation between D and N (in order to solve the reconstruction paradox), the theory proposed here argues that the seemingly long-distance relation is encoded in a ‘deeper’ level, the Merge-marker, as in (121b), and the reconstruction paradox is simply an indication that such a level of representation exists. In Chapter 5, it will be further argued that the hypothesis of parallel merge may shed light to the long-standing problem relating to the syntax and semantics of indefinite NPs.

3.1.3 The Supercategorial Theory: Hiraiwa (2005)

Two types of parallelisms are discussed in Hiraiwa (2005): the CP-DP parallelism and the c-t parallelism. The former type of parallelism is a familiar one that is similar to the one discussed in the previous section 3.1.1, where it is argued that the generalized N-V relations can be described as a primitive coupling of the {N, V} pair (we return to this point in Section 3.2.1), and the parallelism between DP domain and CP domain, can be regarded as an extension from the primitive pair. As for the latter type of parallelism, Hiraiwa (2005) proposes a supercategorial theory, which gives rise to (the recursive) translational symmetry of syntax.\(^{40}\) Hiraiwa argues that every category can be reduced to a phase-category (c-category) and a non-phase category (t-category). The phrase structure, then, is viewed as recursive projections of the c-category and t-category onto the CP-domain and DP-domain:

\(^{40}\) Translational symmetry is the invariance under translational transformations. For example, the recursive functions: \(S \rightarrow \text{NP-VP} \) and \( \text{VP} \rightarrow \text{V-S} \), which generate the infinite output, \( \text{NP-V-NP-V-NP-V-...} \), has translational symmetry since the output is an invariant repetition of the sequence (NP-V). A real life example is the wall paper that has a repeating pattern.
(122) The Supercategorial Theory (Hiraiwa 2005: 24)
   a. Each head that is not a phase head $c$ is category-neutral.
   b. Each $c$ head determines the categorial status of its complement.
   c. $c$ and $t$ as a unit act as a probe for Case and agreement.)

(123) Syntax of the Supercategories (a simplified version of Hiraiwa 2005)
   a. The super-categories $(c, t)$

   \[
   \begin{array}{c}
   \text{c} \\
   \text{c} \\
   \text{t} \\
   \text{t} \\
   \sqrt{\text{root}}
   \end{array}
   \]

   b. Extended projections of the super-categories: multiple occurrences of $(c, t)$

   ![Diagram of extended projections]

   c. Extended projections in (b) realized in the CP and the DP domains
   (i) CP domain

   \[
   \begin{array}{c}
   \text{CP} \\
   \text{C} \\
   \text{TP} \\
   \text{T} \\
   \text{vP} \\
   \text{v} \\
   \text{AspP} \\
   \text{Asp} \\
   \sqrt{\text{root}}
   \end{array}
   \]

   (ii) DP domain

   \[
   \begin{array}{c}
   \text{DP} \\
   \text{D} \\
   \text{PossP} \\
   \text{Poss} \\
   \text{nP} \\
   \text{n} \\
   \text{NumP} \\
   \text{Num} \\
   \sqrt{\text{root}}
   \end{array}
   \]
For the purpose of the present discussion, we shall set aside Hiraiwa’s hypothesis on agreement in (122c) and focus on the structural formulation. Interestingly, the central hypothesis of Hiraiwa’s theory is in line with the main thesis in this chapter: The parallelisms in syntax indicate that there are (hidden) invariant constants in syntax that guide the building of the syntactic structures. In fact, Hiraiwa’s theory can be decomposed into two primitive relations: the $t$-$c$ relation and the $N$-$V$ relation. This, then, can be modeled mathematically in the following way: narrow syntax is a recursive application of $\{t, c\} \times \{N, V\}$ onto embedding structures. This then gives rise to a highly-restricted system of possible applications of Merge.

The theory proposed here, however, makes precise certain conjectures in Hiraiwa (2005). One aspect concerns the status of the root node in his theory. Generalizing the root hypothesis (Borer 2005a, b, Marantz 1997, among others), Hiraiwa argues that the categorial status of the $t$-category is determined by the immediate dominating $c$-category. In this sense, the root nodes in the structures in (123) seem to be redundant, as the lowest $t$-category should behave as a root node, whose category status is determined by its immediately dominating $c$-category (i.e. the various $c$-$t$ relations: C-T, D-Poss, v-Asp and n-Num). The theory developed here, on the other hand, revises Hiraiwa’s theory and proposes a more consistent theory, in which the $c$-$t$ relations are further decomposed into two fundamental relations: $\{\text{Func, Subt}\}$ and $\{k, k’\}$. Consider the syntactic graph derived from the primitive relations (with focus on the verbal domain):
The former relation \{\text{Func, Subt}\} concerns the notion of substantive ‘root’ and the functional category that assigns the root its categorial status. However, contrary to what is typically assumed, it will be argued that every functional category is paired with a substantive root, so it is the functional category that determines the LF function of each substantive root. As for the later relation \{k, k’\}, depending on the different syntactic levels (what has been dubbed the \textit{c-t} relation in Hiraiwa’s theory), a version of (124) can be (125) or (126):

\begin{enumerate}
\item The functional dimension of \{k, k’\} in the verbal domain = C-T
\item The substantive dimension of \{k, k’\} in the verbal domain = V_1-V_2
\end{enumerate}
a. The functional dimension of \{k, k'\} in the verbal domain = Mod/Asp-Asp
b. The substantive dimension of \{k, k'\} in the verbal domain = V₁-V₂

In this sense, the theory proposed here makes a hypothesis that is quite different from standard assumptions. It is argued here that every level of projection in syntax has a substantive side as well as a functional side. The former accounts for the fact that every projection inherently carries some primitive concept (be it a more concrete concept or a derived ‘metaphoric’ concept), while the latter (the functional side) determines how the concept is interpreted at LF. That is to say, in every projection, the functional side assigns a specific LF function to the paired substantive roots (and determines its category). The hypothesis in the proposed theory therefore predicts that a substantive item can be used in a functional environment, and the LF function/meaning of that lexical item would share the primitive concept of the substantive root. One indication of such multiplicity of lexical items can be observed in ‘grammaticalization’, in which a substantive item occupies a functional syntactic position, and as a result, behaves as a functional item in syntax. It should be noted that standard generative syntactic theory does not provide a precise means to account for this process (one way to account for it is a head movement account, which faces some serious challenges; See Section 3.2.2). In Cognitive Semantics,
however, it is usually argued that grammaticalization reflects a metaphorical use of the ‘concepts’ of substantive items (Heine, Claudi & Hunnemeyer 1991, Lakoff & Johnson 1980). The theory proposed here incorporates the analysis of Cognitive Semantics and argues that the so-called metaphorical uses result from the fact that a substantive root occurs in a functional environment, and therefore its concept is assigned to a certain grammatical function at LF (that often carries a more abstract aspect of the concrete concepts of a substantive root).

Examples of this kind are systematically well documented in many languages. We shall return to this issue in §3.2.2. Another revealing example of this analysis will also be discussed at length with respect to the numeral-classifiers in the nominal constructions in Chapter 4.

3.2 Conditions of Merge: Fundamental Couplings in Syntax

As reviewed in the previous section, recent theories that deal with the parallelisms in syntax all stumble on the origins of syntactic patterns, which suggest that there are hidden elements that are fundamental in syntactic theory. The main theorems of previous approaches can be summarized as follows:

(127) a. The patterns of syntax are tailored by hidden constants.

b. The hidden constants are relational (i.e. they are realized as syntactic relations between lexical items)
c. These relations are inherently **local** and **symmetric** (In the proposed analysis, these relations are identified as \{N, V\}, \{Func, Subt\}, and \{k, k'\}).

The proposed theory represents a unification of the insights of these proposals, and relates them under the notions of **minimal computation** and **symmetry**.

The goal of this section is to provide a characterization of the relations that underlie the operation Merge. It will be argued that these conditions can be formulated as extended edge features (extending and sharpening the notion of edge features in Chomsky 2008). The primitive syntactic relations: \{N,V\}, \{Subt, Func\}, and \{k, k'\}, will be viewed as different matching conditions for the relevant features. It is argued that these extended-projection features are saturated in a simultaneous fashion, creating a multidimensional structure, as demonstrated in the opening section.

### 3.2.1 On the \{N, V\} Relation

One well studied domain of parallelisms in syntax is the assumed existence of parallel projections associated with nominal and verbal categories, as argued in Borer (2005a, b), Megerdoomian (2002), Grimshaw (2000), Hiraiwa (2005), Vergnaud & Zubizarreta (2001), Prinzhorn & Vergnaud (2004), etc.. In addition, as shown in the previous section, Bowers (2001) identifies the primitive N-V relation as a subcategorization relation, but N-V relations can cover much broader grounds than subcategorization. In fact, N-V relations in different hierarchical levels are realized in various ways, corresponding to the
Spec-Head checking relation that Chomsky (1995) proposes in early minimalism. The various N-V relations can be illustrated as follows (cf. Vergnaud & Zubizarreta 2001):

(128)  
\[ \begin{align*}
\text{a. } & \text{wh/Focus} - \text{C}_1[+\text{wh}]/[+\text{focus}] \quad \text{wh-/focus checking} \\
\text{b. } & \text{DNom} - \text{T}_1[+\text{finite}] \quad \text{Nominative Case} \\
\text{c. } & \text{DAcc} - \text{v}_1[+\text{transitive}] \quad \text{Accusative Case} \\
\text{d. } & \text{Num/CL} - \text{Asp} \quad \text{Telicity} \\
\text{e. } & \text{N} - \text{V} \quad \text{Theta-role}
\end{align*} \]

(128a) represents the Spec-Head checking between a C head and a D_{wh} specifier with respect to wh-movement/feature agreement and focus movement/agreement, which are in complementary distribution to each other in a single sentence due to the fact that they are subject to the same type of quantificational force (Rooth 1985, Vergnaud & Zubizarreta 2006). For example, a focused element, represented in Mandarin by shi... ;it is...’ and eryi ‘only’, always blocks an interrogative reading of wh-phrases in Chinese. In such a focus environment, a wh-phrase can only be interpreted as an indefinite NP (as discussed in the previous chapter):

(129)  
\[ \begin{align*}
\text{a. } & \text{Shi } \text{Zhangsan, } \text{dai-le } \text{shenme lai gei } \text{Lisi (*?)} \\
& \text{Aux Zhangsan bring-Asp what to give Lisi} \\
& \text{(i) } \text{‘It is ZHANGSAN (not others) that brought something to Lisi.’} \\
& \text{(ii) *‘What is it that Zhangsan (not others) brought to Lisi?’}
\end{align*} \]
b. Shei xihuan [Lisi eryi] (mei you qitaren)
   who like Lisi only not have other
   (i) ‘Some likes only LISI, (but not others).’
   (ii) *‘Who like only Lisi (but not others)?’

(128b,c) are the feature checking of the structural Cases, Nominative and Accusative, between the nominal functional category D and a verbal functional category, a finite T and a transitive v, respectively. (128e) illustrates the substantive N-V relation, the theta configuration, which is argued to be one of the strictest local relations in syntax (Williams 1994).

A further special relation is (128d), which represents the aspectual checking of telicity. It is commonly argued that the aspectual telicity is contributed by both nominal and verbal domains (Verkuyl 1993, Borer 2005a, b). Observe the following example from Verkuyl (1993:22):

(128) The compositionality of telicity

a. Judith ate three sandwiches.  [Delimited V]+[Specified-Q Arg.]
b. Judith ate sandwiches.  [Delimited V]+[Unspecified-Q Arg.]
c. Judith wanted a sandwich.  [Non-delimited V]+[Specified-Q Arg.]
d. Judith wanted sandwiches.  [Non-delimited V]+[Unspecified-Q Arg.]

(129) a. Judith ate three sandwiches in/#for an hour.  [telic]
b. Judith ate sandwiches #in/#for an hour.  [atelic]
c. Judith wanted a sandwiches #in/for an hour.  
    [atelic]

d. Judith wanted sandwiches #in/for an hour.  
    [atelic]

The crucial observation here is that telicity arises from feature combinations of nominal and verbal categories. The relevant feature in the verbal category is an aspectual one, related to the event type, or Aktionsart, of the predicate. The relevant feature in the nominal category is related to the numeral expression, only a count argument with specified quantity will trigger telicity. Adopting Verkuyl’s work, then, telicity can be formulated through feature agreement/checking (cf. Borer 2005a, b). Aspectual telicity being semantically related to the verbal domain, it can be assumed that aspectually delimited verbs carry an LF-interpretable unvalued [bounded] feature, and the non-delimited verbs an interpretable valued [-bounded] feature, while the argument carries an uninterpretable, but valued [bounded] feature: [+bounded] for arguments with specified quantities, and [-bounded] otherwise. The idea can be worked out straightforwardly in the following mechanism (where \( i/u[F] \) stands for feature interpretability; \( [+/-F] \) for feature value, and \( _{-F} \) for unvalued feature, recalling the terminology in Pesetsky & Torrego 2007):
(130) Feature Agreement/Checking Model for Aspectual Telicity

<table>
<thead>
<tr>
<th>Verb type</th>
<th>Argument type</th>
<th>Aspectual Telicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. delimited</td>
<td>specified quantity</td>
<td>telic</td>
</tr>
<tr>
<td>i[bounded]</td>
<td>u[+bounded]</td>
<td>i[+bounded]</td>
</tr>
<tr>
<td>b. delimited</td>
<td>unspecified quantity</td>
<td>atelic</td>
</tr>
<tr>
<td>i[bounded]</td>
<td>u[-bounded]</td>
<td>i[-bounded]</td>
</tr>
<tr>
<td>c. non-delimited</td>
<td>specified quantity</td>
<td>atelic</td>
</tr>
<tr>
<td>i[-bounded]</td>
<td>u[+bounded]</td>
<td>i[-bounded]</td>
</tr>
<tr>
<td>d. non-delimited</td>
<td>unspecified quantity</td>
<td>atelic</td>
</tr>
<tr>
<td>i[-bounded]</td>
<td>u[-bounded]</td>
<td>i[-bounded]</td>
</tr>
</tbody>
</table>

In (130a, b), the delimited verbs are unspecified for their boundedness feature (verbs that carry a potential endpoint, such as *eat (some amount of food)*, *read (some amount of books)*, and *run (for some amount of distance)*). They agree with the boundedness feature of their arguments, which is uninterpretable in the nominal domain. The feature agreement then values the unvalued features on the delimited verbs, resulting in different aspectual telicity values interpreted at LF (and erases the uninterpretable telicity features on the arguments).

The non-delimited verbs in (130c, d), on the other hand, carry a [-bounded] feature inherently, and therefore, the values on the verbs will not vary with agreement. The arguments check their uninterpretable feature against the verb, under the condition of ‘feature’ matching (but not necessarily ‘value’ matching). The feature agreement/checking here only ensures that the uninterpretable features on the nominal arguments will be valued (and hence admissible to LF interpretations).
The crucial observation here is that under the proposed mechanism, telicity is formulated just like the Case checking or wh-feature checking mechanisms. This allows us to analyze telicity as a type of N-V relations, as suggested in Verkuyl (1993) and Borer (2005a, b).

It is useful to point out a contrast between the proposed theory and standard phrase structure here. The early minimalist approach in Chomsky (1995) assumes that checking is defined strictly between a head and its specifier position. Therefore, it usually gives rise to movement (whether this is covert movement at LF or overt movement at narrow syntax). In order to minimize LF movement, however, the recent minimalism assumes that some features can be checked in a long-distance fashion without covert LF movement or overt syntactic movement. The former approach makes some predictions that are too weak or too strong, while the latter approach results in certain theory-internal complications of feature checking/agreement mechanism.

Consider the former, and rather standard, assumption on Accusative Case checking. Chomsky (1995) argues that object in English raises from the complement of the main verb V to [Spec, v] to check Accusative Case with the light verb v:

(131)

```
(131)          vP
               /   \                  
       DP1     v'                   
          /      \                
         D      N v                
       /  \     \  \            
      the man [Case] VP          
               /   \           
              V kick t_i       
```
Two types of N-V relations can be found in a simple construction as (131): One is the theta-relation, which arguably holds between the substantive N (man) and the substantive V (kick). The other is the Case-checking relation, holding between the functional D (the) and the functional light verb v. Vergnaud (2009), however, points out that such a structural representation in fact over-generates and under-generates some of the syntactic relations. For the substantive N-V relation, the system overgenerates the relation between the functional D and the substantive V, and it undergenerates the direct and local relation between N and V (since D is always in between), as in (132):\(^{41}\)

\[(132) \quad [\mathit{VP \ V [\mathit{DP \ D \ NP}]}]\]

On the other hand, DP movement to [Spec, v] for Case checking also overgenerates the relation between v and N(P), and again, undergenerates the direct Spec-Head checking between D and v, as shown in the following:

\[(133) \quad [\mathit{vP [\mathit{DP \ D \ NP}] v\ldots}]\]

Recent minimalism (Chomsky 2001), however, assumes that Case features are checked, not by movement, but by long-distance agreement, as reviewed in the previous chapter.

---

\(^{41}\) One might argue that it is the whole DP that is assigned a theta role. Empirical facts, however, indicate that this might not be the case. For example, when there is no D present, as in the N-V compounds: fox-hunting, money-raising, house-building, and truck-driving. It is clearly the case that only certain theta relations can form such compounds, indicating that D does not participate in the theta relation.
The idea is that Case features are dissociated from movement since movement is driven by independent features, referred to as EPP-features, which require a phonologically overt element to extend the structure (by raising the DP or inserting an expletive in [Spec, TP]) in Chomsky (2001) and subsequent works. Concerning Accusative Case, it is then assumed that an object may remain in situ, and its Case feature is checked by agreeing with the relevant feature of the (transitive) light verb $v^r$ in the same phase:

$$(134) \quad [vP [vP [DP \downarrow [NP N]_]]] \quad \text{‘kick a man’}$$

DP will raise to [Spec, $v$] only if the light verb carries an EPP-feature. A complication arises, however, concerning the disassociation between Case features and the EPP-feature. Under the theory of Agreement, the object does not have to raise to [Spec, $v$] either overtly or covertly in order to check its Case feature, indicating that the light verb $v$ does not carry an EPP-feature; however, the story becomes more complicated when we consider Exceptional Case Marking (ECM) constructions:

$$(135) \quad \begin{align*}
\text{a. Mary believes Tom to be a coward.} \\
\text{b. Susan will prove Jill to be innocent.}
\end{align*}$$

Many works have shown that in ECM constructions, the object of the main clause does raise from the embedding clause (Hong & Lasnik 2010, Koizumi 1993, Lasnik 1999,
2001a, Postal 1974, Runner 2006, among others). Therefore, the sentences have the structures as follows:

(136) a. Mary believes Tom [Tom to be a coward].
   b. Susan will prove Jill [Jill to be innocent].

One piece of evidence for this account comes from adverbial positions and phrasal verbs in ECM constructions in English:

(137) a. Mike expected Greg incorrectly [Greg to take out the trash].
   b. She made Jerry out [Jerry to be famous].

These sentences provide strong pieces of evidence for overt object raising. Let us dwell on this point a little bit. In ECM constructions, the raised objects checks the Accusative case with the light verb in the main clause, but they do not have to raise (long-distance agreement should be able to check the Case feature since no strong phase occurs between the main clause and the embedded clause). If Case is not a driving factor for raising, then it must be a special category that carries an EPP feature that drives the raising-to-object movement out of the embedded clauses. The question, then, is to ask what the category is and where its EPP feature comes from. Lasnik’s answer is that a special functional projection, called AgrP, is responsible for the raising-to-object movement (while others may simply assume an FP), and it is the EPP-feature on the functional category that
triggers the raising-to-object movement. This account, however, says little about the source of the EPP-feature (In fact, the status and the content of EPP-feature has remained largely unknown in the system, in spite of being extensively used in various analyses). The analysis therefore seems ad hoc. We can even question why this functional category should appear only for the ECM verbs to check Case-features, but the category does not appear, or does not carry an EPP feature, in the non-ECM constructions (recall that the object does not move in non-ECM constructions). One source of the EPP in this exceptional configuration, however, might be a mixed result of the Case Directionality parameter (Li 1990), and the Case Adjacency Condition, proposed in Stowell (1981) and Chomsky (1981): a Case assigner and a Case receiver must be adjacent to each other and are subject to certain linear orderings (hence the raising-to-object in ECM, but non-raising in non-ECM objects). If this is on the right track, the source of EPP, after all, should be attributed to the (PF-side) properties of Case. In conclusion, the success of a theory that dissociates Case from EPP-feature relies on the precise notion of EPP-feature. Unfortunately, in the standard theory of minimalism, this is not made explicit.

One way to neutralize these problems is to adopt the suggestion made in Prinzhorn & Vergnaud (2004), which leads to the theory developed here. Prinzhorn & Vergnaud (2004) assume that a raising verb (e.g. *seem*) should be treated as forming an extended projections of the main verb. The proposal therefore allows the possibility that a functional item is merged into the higher clause, creating a nominal chain across verbal
clauses (the same conclusion arrived at in Sportiche 2005. See Section 3.1.2).\footnote{For reasons to be explained later, I will assume that unaccusative verbs still project a light verb (cf. also Legate 2003).} Example (138) represents the structure (or the Merge-markers) under the analysis of parallel N-V merge (the structure is a simplified one, and will be refined and sharpened in the next section). If we wish to make the structure more compatible with the standard view, the parallel structure in (b) can be roughly transformed to the phrase structure in (c):

\begin{enumerate}
\item[(138)]
\begin{enumerate}
\item a. Every student arrives.
\item b. arrives
\item c. T
\end{enumerate}
\end{enumerate}

The structure is an execution of the parallelism of N-V merge shown in (128). Each of the main verbal projections T-v-V corresponds to a specific syntactic relation: i.e., Nominative Case, Accusative Case, Theta relation, respectively.\footnote{In standard theory, these relations are typically dealt with through the EPP-feature, which requires a Spec-Head relation to be established (Chomsky 2001, 2008).} The former two are functional relations (corresponding to the nominal functional determiner) and the last one a substantive relation (corresponding to the substantive noun). The following structure
illustrates the view that the raising verbs are viewed as extended projections of the main clause:

(139)  a. Every student seems to arrive.

    b. seem to arrive
        ↑        ↑        ↑
        T - V - (C) - T - v - V
    ↓ ↓
    D - N  N
    ↓  ↓
    every student

The proposed structure thus captures the peculiarity of the syntactic relations in the raising constructions. This irregularity can be stated in the following way: An argument obtains a theta relation in the lower clause, but a case relation in the higher clause. This is irregular since in most cases, the Case of an argument is checked in the same clause where its theta relation is established.

In ECM constructions, the same irregularity is found. The two kinds of raisings (raising-to-object and raising constructions) can thus be understood as the same type of representational mismatch between the theta structure and the Case structure in the sense of William (2003: 67):
(140) Raising construction: *Everyone seems to be here*

a. Theta-structure:  [seems] [Everyone be here]
b. Case-structure:  [Everyone T seems] [to be here]

(141) ECM: *John proved Susan to be innocent*

a. Theta-structure:  [John proved] + [Susan be innocent].
b. Case-structure:  [John T proved Susan] + [to be innocent].

In this sense, the raising-to-object in ECM constructions can be viewed as a cross-clausal nominal chain, in parallel to the subject-raising in the raising construction:

(142) a. John [proved the man to be innocent].

b. proved to be innocent

\[\begin{array}{c}
\uparrow & \uparrow & \uparrow \\
\downarrow & \downarrow & \downarrow \\
D - N & - - - - - - - - N \\
\text{the} & \text{man}
\end{array}\]

The only remaining question concerns the PF linearization of the structure, and this is related to the question of where the nominal D-N pair should be pronounced, or in the sense developed here, which occurrence(s) of the ‘nominal chain’ should be pronounced at PF. This question is important for our understandings of the EPP-feature, and may help us to sharpen this mysterious notion. While it is beyond the scope of this dissertation, a
mechanism will be discussed in Section 3.3.2 concerning the translation from the abstract parallel structures to the usual phrase structures.

3.2.2 On the \{Subt, Func\} Relation

The \{Subt, Func\} relation represents another primitive syntactic relation. It has been argued that a substantive item should be analyzed as a lexical ‘root’ that is category-free (Borer 2003, 2005a, b, Marantz 1997), and it is the functional environments of the lexical root that determine the syntactic ‘category’ of the root. Consider the English example in (143):

(143) a. John dreamed a dream.
   b. Susan shelved the book.
   c. Susan put the book on the shelf.

The substantive item *dream* is ambiguous between a verb and a noun. It is only from the syntactic environments that we can tell that the first *dream* is a verb (since it is suffixed by a past tense morpheme –*ed*), and the second one is a noun (due to the determiner *a*). (143b, c) also shows that the substantive item *shelf* can be used as a verb or a noun, depending on the syntactic environment that it occurs in. Likewise, the same phenomenon can be observed quite extensively in Chinese:
The root \( \overline{\text{hong}} \) in Mandarin Chinese, which is associated with the concept of \textit{redness}, can be used as a noun, when it forms a compound with another noun, e.g., \textit{color} in (144a), it can also be used as an adjective (after the degree modifier \textit{hen}), as in (144b), or it can function as a verb (with the meaning of ‘being popular,’ as in (144c).\footnote{The meaning in (144c) is a metaphorical use of the concept of redness, which might be related to the concept of fire, as shown in the phrase \textit{huo-hong} fire-red, which means ‘red as fire’ or, metaphorically, ‘prevailing like fire.’}

A rather standard analysis of such phenomena is through syntactic head incorporation. For example, (143b,c), repeated below, is involved in a derivational procedure, where the root undergoes incorporation all the way up (Borer 2003, 2005a, b, Embick 2004, Hale & Keyser 1993, 1997, 2002, Huang 1997, Richards 2001).\footnote{The idea recalls the implementation of generative semantics in early generative grammar in McCawley’s (1976, 1979b) work (See Huang 1997, and Lin 2001 for complete reviews). Note that in Hale & Keyser’s original theory, head incorporations (what they refer to as ‘conflation’) are applied in an independent representational level, the lexical-syntax level. The distinction, being somewhat irrelevant to our discussion here, is neutralized in the structures presented here.} The derivations of (145a,b) are illustrated in the structures in (146a,b), respectively:
(145)  a. Susan [put the book on the shelf].

b. Susan [shelved the book].

(146)  a.  

\[
\begin{array}{c}
| \text{v} | \\
| \text{VP} | \\
| \text{DP} | \\
| \text{V} | \\
| \text{D} | \\
| \text{N_{root}} | \\
| \text{V_{root}} | \\
| \text{PP} | \\
| \text{P} | \\
| \text{on} | \\
| \text{D} | \\
| \text{N_{root}} | \\
| \text{the} | \\
| \sqrt{\text{shelf}} | \\
\end{array}
\]

b.  

\[
\begin{array}{c}
| \text{v} | \\
| \text{VP} | \\
| \text{DP} | \\
| \text{V} | \\
| \text{D} | \\
| \text{N_{root}} | \\
| \text{the} | \\
| \sqrt{\text{book}} | \\
| \text{P} | \\
| \sqrt{\text{shelf}} | \\
\end{array}
\]

The observation here is straightforward. A substantive root is assigned a category by its syntax, and roots do not have any category as they stand in the lexicon, where they only carry a primitive concept. Therefore, the root \sqrt{\text{shelf}} is a noun if it is embedded in the
functional environment of a determiner, as in (146a), but it is understood as a verb when it moves into a verbal head (and hence appears in a verbal functional environment).

The head incorporation account may also account for the Chinese data in (144), where the root $\backslash hong$ appears in various syntactic environments. However, there are more complicated cases of grammaticalization in Chinese, and the head incorporation account immediately faces challenges when we apply them to these examples. For instance, consider the experiential aspectual marker $guo$, which is grammaticalized from the homomorphic/homophonic verb $guo$.$^{46}$

(147) a. Zhangsan  $jing$-$guo$  xuexiao.
    Zhangsan  pass-over  school
    ‘Zhangsan passed the school.’

    b. Zhangsan  $chi$-$guo$  niurou.
    Zhangsan  eat-Exp  beef
    ‘Zhangsan has the experience of eating beef.’

One might argue that the two morphemes do not share the same root (which is the case in English, where the aspectual markers are suffixes, like $–ing$ or $−en$, which are completely unrelated to a substantive item, which provides a concrete concept). Such an account, however, may be over-simplifying the close relation between the various instances of the

---

$^{46}$ The same observation covers the other two aspectual morphemes in Mandarin: $le$ ‘Perfective Asp.’ and $zhe$ ‘Durative Asp.,’ which are phonologically reduced forms of the substantive words, $liao$ ‘finish’ and $zhao$ ‘attached to (a part of something),’ respectively. Arguably, the aspectual meanings also come from metaphoric uses of the substantive meanings: From ‘to finish’ to perfective aspect, which focuses on the final point of the event, and from ‘to attach’ to durative aspect, which views a part/a point of the event.
same root. It is helpful to borrow the analysis of cognitive semantics here: The two morphemes share the same type of concept related to a certain type of passing/crossing (from passing location to the passing of an event) (Hsiao 2003, Lien 2000). In this sense, it is quite reasonable that they should be regarded as the same lexical root (if the definition of root is defined by ‘concept’). Nevertheless, if the various instances do source from a substantive root, then given standard phrase structure, it is difficult to account for the positions of the main verb (since it represents another instance of another root):47

(148)

The problem, however, can be neutralized in the proposed theory, in which we assume that each functional head is in fact paired with a substantive head/root, and it is the functional head that determines the syntactic status of the substantive head. Therefore, an aspectual marker like –guo comes from an independent root that is merged with the root

47 Wu (2000) argues that a resultative verb forms a complex unit with the main verb, and they undergo head movement to the aspectual head. Under the proposed theory, the same effect is derived by assuming that a resultative verb (like the aspectual marker) is embedded under the functional item, and subsequently forms a chain with the main verb, together with the functional items they are associated with.
of *eat*, while they are paired with their own functional head (see also Acquaviva 2010, who suggests that roots may realize functional nodes):

(149) $$\begin{array}{c}
F_1 \\
\sqrt{guo} \\
\end{array} \quad \begin{array}{c}
F_2 \\
\sqrt{eat} \\
\end{array}$$

The content of the functional projection will eventually assign the root its category and its LF function. In the structure of (149), the two functional heads can be identified as the middle aspect and the inner aspect, respectively, following Smith’s (1991) theory of Aspect:48

(150) $$\begin{array}{c}
\text{Asp}_{\text{mid}} \\
\sqrt{guo} \\
\end{array} \quad \begin{array}{c}
\text{Asp}_{\text{inner}} \\
\sqrt{eat} \\
\end{array}$$

Similar mechanisms are prevalent in Chinese, and they indicate that substantive roots can be paired with many different kinds of functional categories. The substantive verb *you* ‘have’ in Mandarin and *u* ‘have’ in Taiwanese can be used in various environments as a functional item (Tsai 2004):

48 The inner aspect has to do with the dynamicity and event types of the verb (state vs. event), while the middle aspect is related to how the initial and final points of the event are viewed (e.g., perfectivity). See Smith (1991) and Klein (1994).
Another example in Mandarin is the multiple uses of qilai, which is many-way ambiguous among a lexical verb, an aspectual marker, and an evaluative modal marker (Wang 2005):

(152) a. Zangsan qilai le. [Substantive verb]
    Zangsan wake-up Perf
    ‘Zangsan has woken up.’

b. Zangsan chi-le qilai. [Aspectual phase]
    Zhsngsan eat-Asp initiate
    ‘Zangsan starts eating.’

c. Zhe kuai dangao chi-qilai hen hao chi. [Evaluative]
    this CL cake eat-QILAI very good eat
    ‘This cake tastes good.’
In Mandarin, *lai* ‘come’, *qu* ‘go’, and *hao* ‘good’ can also be used as purposive Comp/Infl and clausal conjunction heads, much like the purposive *to* and *in order to* in English (Lin & Liao 2011):

(153) a. Zhangsan mai yi wan tang lai /qu he
    Zhangsan buy one bowl CL soup come/go drink
    ‘Zhangsan bought a bowl of soup to drink.’

    b. Lisi haohao-de dasao fangjian hao zhiliao guomin
    Lisi thoroughly clean room good treat allergy
    ‘Lisi cleaned up his room thoroughly in order to treat his allergy.’

Other revealing examples are *kong* and *hoo* in Taiwanese. The former is ambiguous between a substantive verb, a complementizer, and a sentence-final particle (Simpson & Wu 2002):

(154) a. Ong-e kong i e k’i.
    Ong-e say he will go
    ‘Ong-e says he will go.’

    b. Ong-e siuⁿ kong i e k’i.
    Ong-e think say he will go
    ‘Ong-e thinks that he will go.’

    c. Ong-e e k’i kong.
    Ong-e will go Comp
    ‘Ong-e will go!’
The latter morpheme *hoo* is three-way ambiguous among a substantive verb, a preposition/dative marker, a causative/permitive light verb, and a passive voice auxiliary/light verb (Cheng et al. 1999, Weng 2005): 49

(155) a. Ong-e hoo Li-e jit pun c’e.    [Substantive verb]  
   Ong-e give Li-e one CL book  
   ‘Ong-e gave Li-e a book.’

   b. Ong-e sang jit pun c’e hoo Li-e.  [Dative marker]  
   Ong-e offer one CL book Dat Li-e  
   ‘Ong-e gave a book to Li-e.’

   c. Ong-e hoo Li-e k’ui ch’ia.     [Permissive/Causative]  
   Ong-e let Li-e drive car  
   ‘Ong-e let Li-e drive (his) car.’

   d. Ong-e hoo rang p’a.    [Passive]  
   Ong-e Pass person hit  
   ‘Ong-e was hit.’

In languages with a productive system of affixes, however, this is relatively rare (these irregular patterns often lead to problems for the standard analysis; e.g., the aspectual behaviors of the English motion verbs *come* and *go*; see Jaeggli & Hyams 1993). In these cases, it can be assumed that the (inflectional) affixes are the contents of the functional categories (Borer 2005a, b), and the functional items share the same substantive root, creating the same effects of head movements, or affix-lowering, in the standard analysis:

49 A similar example corresponding to the Taiwanese *hoo* is *rang* in Mandarin, which is discussed in details in Weng (2005).
Adopting the ‘multiple-root’ analysis proposed here, then, we need not postulate a head-movement analysis for grammaticalization (see Roberts & Roussou 1999), but grammaticalized lexical items are simply substantive roots that are directly embedded under a functional item (and hence play the corresponding functional roles at LF). On the other hand, the grammatical operation that is concerned here is restricted to the PF side of grammar. That is, some occurrence(s) of the same root (which form a substantive chain) is/are pronounced at PF. Andrew Simpson (p.c.) has pointed out to me that one of the disadvantages of the head-movement account is the prediction that grammaticalization should fall under the Head Movement Constraint (Travis 1984). That is, head movement may not skip an intermediate head. The patterns of grammaticalization, however, do not quite follow from this constraint. Take Taiwanese *kong* for example. Taiwanese *kong* can be used as a verb ‘say’ and a complementizer. However, no evidence (synchronic or diachronic) has shown that it can occupy Aspect or Tense heads (or any intermediate functional heads), which has an effect that *kong* can be used as an aspectual or tense marker. This therefore shows that adopting a head movement analysis for grammaticalizations does not seem adequate.
3.2.3 On the \{k, k'\} Relation

Combining the two relations introduced so far, the syntactic structure that encodes the two relations simultaneously can be viewed as a Cartesian product (subject to the Prinzhorn-Vergnaud Conjectures) of the two relations, i.e., \{N,V\} \(\otimes\) \{Func, Subt\}. The syntactic graph is represented as follows:

\[
\begin{array}{ccc}
(N, Fn) & \longrightarrow & (V, Fn) \\
| & & | \\
(N, Sb) & \longrightarrow & (V, Sb)
\end{array}
\]

This is not enough, apparently, to capture the syntactic structures, but they are parts of the ‘base’ structures that are extended recursively. Therefore, the functional verbal projection (V, Fn) can be projected as different verbal functional heads and so does the (N, Fn), (N, Sb), and (V, Sb):

\[
(158) \quad \begin{array}{l}
\text{a. } (V, Fn) = C, T, \text{Mod, Asp, etc.} \\
\text{b. } (N, Fn) = D_{wh}, D_{Case}, \text{Numeral, etc.} \\
\text{c. } (V, Sb) = v, V \\
\text{d. } (N, Sb) = CL, N
\end{array}
\]

Among these syntactic projections, some pairs of heads are more likely to enter a selection relation (i.e., the \(c-t\) relation in Hiraiwa 2005). For example, the C-T pair, the Mod-Asp pair, the v-V pair, and the CL-N pair. These are the selectional relations that do
not hold between a substantive-functional pair, or between an N-V pair, but rather, they hold between two nodes that have the same functional-substantial and N-V statuses. Here, it is assumed that a light verb and a classifier are both substantive categories (associated with a given functional item; See Chapter 4 & 5). It should be noted that in standard theory, light verbs and classifiers are generally both assumed to be a functional category, but some theory-internal problems occur with this assumption. A classifier can, like a substantive noun, take a theta-role, while a light verb, like a substantive verb, can assign a theta-role (to the external argument). It has also been suggested that these categories should have a special status of being a semi-functional (or semi-lexical) category (van Riemsdijk 1998). However, in the proposed theory, the distinction between substantive and functional categories is neutralized, since every functional category is viewed as a functional LF role played by a substantive category.

C-T selection can be easily detected in English in the following examples, where a non-finite C selects a non-finite T, and a finite C a finite T:

(159)  a. I hoped for Mary to help me.       (\text{for_{non-finite} to_{non-finite}})
       b. I hope that Mary helped me.        (\text{that_{finite} T_{finite}})

It is also assumed that in passive constructions and unaccusative constructions, where the internal argument undergoes raising to the nominative case position, a ‘defective’ light verb that fails to carry an external argument is selected by the main V in those
constructions (hence triggering the raising of the internal argument). Aspects and (lower) Modals also enter selection in a similar fashion (See Hacquard 2006, and our Chapter 5).

In classifiers languages, it is typical that classifiers (CL) and nouns exhibit selection with respect to certain noun classes. For example, in Mandarin, nouns select (and are selected by) classifiers generally with respect to shape information, or sometimes, with respect to other criteria (See Chapter 4 for details), as the following examples show:

(160)  \text{zhì}_{\text{CL}}: \text{long (thin, inflexible) object} \\
  a. yi \text{ zhì} bi \hspace{1em} b. yi \text{ zhì} bingbang \hspace{1em} c. yi \text{ zhì} xiang \\
  one \text{ CL} \hspace{1em} \text{a CL} \hspace{1em} \text{a CL} \hspace{1em} \text{a CL} \\
  \text{‘a pen’} \hspace{1em} \text{‘an ice stick’} \hspace{1em} \text{‘an incense’}

(161)  \text{jiān}_{\text{CL}}: \text{clothing} \\
  a. yi \text{ jiān} kuizi \hspace{1em} b. yi \text{ jiān} chenshan \hspace{1em} c. yi \text{ jiān} waitao \\
  one \text{ CL} \hspace{1em} \text{one CL} \hspace{1em} \text{one CL} \hspace{1em} \text{one CL} \\
  \text{‘a pair of pants’} \hspace{1em} \text{‘a shirt’} \hspace{1em} \text{‘a jacket’}

The same selection also occurs in the functional domain; therefore, we can argue that a functional projection that is responsible for the mass/count distinction is always selected by (and selects) a numeral (See Chapter 4 for more discussion). These selectional pairs can be verbal (C-T, v-V, etc.) or nominal (CL-N), and can be substantive or functional. This suggests that the force behind the coupling between the selectional pairs is another fundamental relation, which will be referred to here as the \{k, k’\} pair (k for grammatical connectives).
The \{k, k'\} pair is multiplied with the \{N, V\} pair and the \{Subs, Func\} pair, hence creating a multi-dimensional structure that encodes several types of local selections simultaneously. The multiplication can be visualized as the following graph representation:

\[
\begin{align*}
&\text{(N,Fn,k')} & & \text{(V,Fn,k)} \\
&\text{(V,Sb,k')} & & \text{(V,Sb,k)} \\
&\text{(N,Sb,k')} & & \text{(N,Sb,k)} \\
&\text{(N,Fn,k)} & & \text{(N,Fn,k)}
\end{align*}
\]

Essentially, the structure is an extension of the two-dimensional structure in (157). Recall that a grammatical selectional relation is obtained between node X and node Y only if they are adjacent in the Merge-markers (being strictly local in the symmetric syntactic level). The selections of C-T, v-V, CL-N, Mod-Asp, etc., then, will read as different type of local selections by virtue of the binary connective relation \{k, k'\}.

It should be noted that the \{k,k'\} relation that gives rise to the selectional pairs is only one type of the connective relation. Other connective relations include the higher-order connectives that connect sentences (\{and, and\}, \{or, or\}), the merge markers, and the preposition pair like \{from, to\} that connects the lexical nodes. In general, the paired connectives would give rise to the effects of Relator-Linker theory of den Dikken (2006) and several related theories. This topic will be discussed further in the next chapter.
3.2.4 On Merge-Markers and Symmetric Syntax

Putting the fundamental relations all together, let us look into some canonical Merge-markers that correspond to the graphic representation in (162). They will provide illustrations of the selections mentioned in the previous sections: C-T, v-V (Mod-Asp) and CL-N.

The structure in (163) illustrates the C-T domain. The structure in (164) illustrates the v-V, or the Mod-Asp domain, and the structure in (166) the CL-N domain. Note that the terms ‘C-T’ or ‘v-V’ domains are simply names that refer to different Merge-markers. Each Merge-marker is an autonomous domain that encodes a set of syntactic relations created by combining the fundamental relations: \( \{N, V\} \otimes \{\text{Func, Subt}\} \otimes \{k, k'\} \). The C-T domain, for example, encodes not only the selection between C and T (with respect to finiteness), but also encodes the A and A-bar distinctions in the functional D domain, and the corresponding (null operator) op-PRO distinction in the substantive N domain:

(163) The C-T domain
(164) The v-V domain

Turning to the v-V domain, illustrated in (164) above. It can be observed that middle aspect and the root modals (Habitual, Deontic, Abilitative, etc.) occur in a strict selectional relation. For example, in Chinese, overt aspectual markers are not compatible with habitual or deontic modals:

(165)

a. Zhangsan keyi chi(*-le/*-zhe/*-guo) niu-rou.
   Zhangsan can eat –Perf/Prog/Exp cow-meat
   ‘Zhangsan can eat beef.’ *[deontic]*

b. Zhe ge xiangzi gou zhuang(*-le/*-zhe/*-guo) shi ben shu.
   this CL box enough contain –Perf/Prog/Exp ten CL book
   This box is enough to carry ten books.’ *[abilitative]*

c. Gou you(*-le/*-zhe/*-guo) yiba
dog have(-Perf/Prog/Exp) tail
   ‘Dogs have tails.’ *[generic]*

Further discussion on this topic will be presented in Chapter 5, along with Verbal-Nominal interactions with respect to referentiality (which I argue to be one of the main functions of the determiner). It should be noted that in the proposed theory, there is no distinction between a ‘light’ verb and a verb. Rather, the distinction is made only with respect to the functional categories that they are associated with. Therefore, a ‘light verb (in the standard sense)’ is functionally associated with a root modal, while the ‘main verb
(in the standard sense)’ is associated with the middle viewpoint aspect. The ‘nominal’ side of this domain is then associated with the argument structure (e.g. external vs. internal arguments) and their referential properties. These issues will be returned in Chapter 5.

Finally, there is the CL-N domain. The verbal side of this domain reflects telicity checking (Borer 2005a, b) and the event types of the verbal predicate. The nominal side of this domain, on the other hand, has to do with selection between the numeral (plurality) and the mass/count distinction (in the functional layer), as well as selection between a classifier and a noun (in the substantive layer). In contrast to standard assumptions, a classifier will be treated as a substantive item (due to its concrete concept of shape) that is associated with a functional item (i.e. the numeral), while the noun is associated with a functional projection that gives rise to mass/count distinction (Liao & Vergnaud 2010). We shall return to this issue in Chapter 4:

(166) The CL-N domain

\[
\begin{array}{c}
\text{Asp_{telicity}} \\
\text{Num} \\
\text{Asp_{inner}} \\
\text{V} \\
\text{N_{CL}} \\
\text{V} \\
\text{N}
\end{array}
\]
Note that the Merge-markers are symmetric representations, in the sense that the grammatical relations that result in Merge \((x, y)\) remain invariant under any transformations. For example, we could have a reversed structure which transforms the functional domain to the bottom plane, and substantive domain to the upper plane, and the relations among the vertices would remain the same. However, we would not expect to find a structure like the following:

\[(167) \quad \text{Structural form not expected to occur} \]

\[
\begin{array}{c}
\text{Mod} & \text{Asp}_{\text{middle}} \\
\text{D}_{\text{Referential}} & \text{D}_{\text{Referntial}} \\
V(\nu) & V \\
\text{N}_{\text{ext}} & \text{N}_{\text{int}}
\end{array}
\]

The prediction that a structure like (167) does not exist is due to the fact that it involves two-dimensional contrasts in any single dimension. For example, \(v = (V, S_b, k')\) and Asp = \((V, F_n, k)\) are contrastive in two dimensions: Sb-Fn and k-k'.

The legible representations in (163), (164), and (166), then, directly suggest a locality principle of syntactic relations. See (102), repeated here as (168). Therefore, a structure like (167), which directly characterizes the diagonal relations, is ruled out by the locality principle:
The Locality Principle of Syntactic Relations

A syntactic relation R between the node X and the node Y is established if X and Y stand in a strict local relation in the Merge-markers. That is, X and Y is a minimally different pair, e.g. X=(A, B, C) and Y=(A’, B, C).

It is interesting, yet not a coincidence, to note that each of the Merge-Markers discussed here generally corresponds to the derivational Chomskyean phases (Chomsky 2001, 2008). Chomsky defines phases as being ‘propositional’ and ‘convergent’. We may interpret Chomsky’s ideas as that each phase represents an independent domain in which all primitive syntactic relations are saturated. In the proposed analysis, we have further made explicit what these primitive syntactic relations are, and in what sense each Merge-markers represent a saturated grammatical unit. The proposed theory, however, departs from Chomsky’s minimalist approach in not assuming the derivations of phase are constructed in a bottom-up fashion. Instead, it is contended that the Merge-markers (or the Chomskyean derivational phases) are constructed in a simultaneous fashion, and the edge features that guide the growth of the syntactic structures are saturated all at once. The simultaneity thus predicts that Agreement (as well as Merge) is symmetric (since no derivational asymmetry is involved), as argued in Chapter 2.

In Section 2.2.3, it has been argued that the wh-construction in Chinese (as well as the wh-in situ in English multiple wh-constructions: Who thinks John bought what? vs. *Who thinks what John bought? ) causes a problem for the bottom-up derivational phase theories (Boskovic 2007, Pesetsky & Torrego 2007). To solve the problem, it is argued
that phases must be relativized with respect to the requirement of Full Interpretation (Aoun & Li 1993a, b, 2003, Brody 1995, 2003, 2005, Freidin & Vergnaud 2001, Simpson 2000). In order to achieve Full Interpretation, adopting the bi-directional interpretative Chain, but not the uni-directional derivational order, seems to have a wider empirical coverage. In the proposed theory, since the ‘phases’ or the Merge-markers are created simultaneously, the bi-directionality of Agreement is favored.

3.3 From Symmetry to Asymmetry

The Merge-markers are the symmetric representations of the ‘narrowest’ syntax, which is both commutative and associative. However, as observed in the last chapter, LF and PF are both asymmetric representations (due to external factors like time and our specific cognitive constraints). Following the assumptions in Prinzhorn & Vergnaud (2004) and Liao & Vergnaud (2010), it is argued that these asymmetries are derived products of generalized transformations in the sense of Chomsky (1965). This section presents a preliminary thought on the structural transformations from Merge-markers to phrase-markers. We limit ourselves to simple cases, leaving other complications to later chapters and future works.

3.3.1 More on Connectives

One of the fundamental relations is the connective pair \{k, k’\}, which is responsible for structural extension. The connective pair we have introduced in Section 3.2.3 is a first-ordered one, which extends the primitive (partial) Merge-markers of \{N, V\} \odot
There are, however, different types of connectives that connect different domains of Merge-markers. One type of higher-order connective links the Merge-markers and extends them to bigger phrases and sentence (while sentences are also connected by the more familiar logical connectives, such as and, or, if...then...), while the other type of connective introduces modifiers (or structural adjunctions). One major distinction between these types of connectives is the labels they introduce in the phrase structures. Conforming to X-bar theory, the former type of connective generally introduces structural embedding, that is, this type of connective introduces an extension of the label, while the latter type of connective introduces a reduplication of the label.

In early generative grammar (Chomsky 1964, 1965), it is hypothesized that surface structure are derived from Transformation-markers (T-markers) applying to ‘base’ Phrase-markers (P-markers). A T-marker is a structure that formally represents the transformational structure of the base P-markers and the transformations applying to them (See Chomsky 1965: Ch. 3). To illustrate, (169a) can be represented as follows (simplified from Chomsky 1965: 129):
(169) a. John persuaded Bill to be examined by a specialist.

b. Base P-markers:
   (i)  
   ![Diagram of P-marker structure (i)]
   
   (ii)  
   ![Diagram of P-marker structure (ii)]

c. T-markers (T = transformation rules)

   ![Diagram of T-marker structure]

The proposed theory takes the Merge-markers to be the base structures, which are connected by connective pairs. The connective pairs, then, can be understood as having similar functions as the T-markers: They introduce certain (generalized) transformation rules to the Merge-markers. As a unification of the various theories, let us follow the generalizations in the X-bar convention and reduce such transformational rules to
structural embedding and structural adjunction, leaving others to different components of
the grammar.

3.3.2 Deriving Phrase Structures

Let us return to the central hypotheses in this section (i.e., the Prinzhorn-Vergnaud
Conjectures):

(170) Prinzhorn-Vergnaud Conjectures
a. Narrow Syntax (NS) is a Cartesian product of the core syntactic coupled
domains (CD_n), and Merge applies to any two adjacent nodes in NS:
NS = CD_1 ⊗ CD_2 ⊗ CD_3

b. Given (a), Merge applies only to lexical items (formatives in the sense of
Chomsky 1965), which is realized as a node in NS.

c. Phrase-markers are constructed from the abstract structure of NS.

(170a, b) are explained by the Merge-markers introduced earlier, which are symmetric
structures in the sense that the grammatical relations remain invariant under
transformations. However, as demonstrated in Chapter 2, symmetry is not a signature
property of the LF or PF interfaces, and it is argued that the asymmetries are imposed
upon the symmetric M-markers (that is, they are representations that hold a
partial/lowered symmetry from the abstract symmetric syntax). In this section, we turn to
the point in (170c). I will take on the proposals in Prinzhorn & Vergnaud (2004 et seq.),
and present how asymmetric phrase structures can be constructed from the highly
symmetric M-markers.
Prinzhorn & Vergnaud (2004) correctly point out that phrase structures can actually be translated to a multi-linear ordered structure. Consider the standard representation in (171a):

\[
(171) \quad \begin{array}{c}
Z (Z = X \text{ or } Y) \\
X & \quad Y
\end{array}
\]

The structure contains three components: X, Y, and its projection label Z, where Z is always identified as X or as Y, and nothing else. The structure, therefore, can be alternatively represented in (172), which is formally equivalent to (171) (cf. also Boeckx 2008):

\[
(172) \quad \begin{array}{c}
a. \quad X \rightarrow Y \quad (\text{where } X \text{ and } Y \text{ merge and } Y \text{ projects}) \\
b. \quad X \leftarrow Y \quad (\text{where } X \text{ and } Y \text{ merge and } X \text{ projects})
\end{array}
\]

A standard X-bar structure, as in (173a), then, can also be represented in the given fashion, with the added brackets that reflect the ‘history’ of the derivation as in (173b).

We represent the ordering in the convention of (173c), where Head-Complement structure is generated earlier than the Spec-Head structure (the double arrow \(\gg\) represents the sequence of structural generations: \(G_1 \gg G_2\) means \(G_1\) is generated prior to \(G_2\)):
Two crucial observations about phrase structure are obtained here. (i) Labeling creates an asymmetric ordering that can be viewed as an external mechanism imposed upon the core operation of Merge, and (ii) the distinction between a specifier and a complement simply reflects an asymmetric direction setting on Merge (See also Brody 2000).

Suppose we replace the H-C relation and S-H relation with the core syntactic relations, that is, replace H-C with the \{Func, Subt\} relation and replace S-H with the \{N, V\} relation, then the P-markers can be constructed from the M-markers in a rather straightforward manner. One asymmetric direction is defined ‘on’ the fundamental relations, and the other asymmetry is defined ‘in’ the fundamental relations. Take for example, the Merge-markers in the C-T domain and in the v-V domain:
Let us further assume that in English, the relevant orderings of the primitive syntactic relations are \((N \rightarrow V), \text{Subt} \rightarrow \text{Func}\), and \((k \rightarrow k')\), and the relevant orderings among the application of the relations are \((\text{Subt, Func}) \gg (N,V) \gg (k,k')\) (where \((X,Y) = X \rightarrow Y\)).

The phrase structures that are constructed from the two M-markers are displayed as follow:\(^50\)

\(^{50}\) Note that in the P-markers, the orders between N and V become trivial.
(175) a. The C-T domain

b. First, applying \((\text{Subt} \rightarrow \text{Func})\) to (a)

c. Second, applying \((\text{N} \rightarrow \text{V})\) to (b)

d. Third, applying the connective \(\{k, k'\}\) to (c)

Suppose then, the \(\{k, k'\}\) is mapped to embedding structures (which is assumed to be the default case in English; Williams 2003). Then we derive the following representation (The empty set indicates that further embedding is possible):
If we apply the same operation to the v-V domain, we can derive a similar structure, with Mod replacing C and Asp replacing T:

The two P-markers can also be connected by a pair of higher-order connectives. Let us represent such connectives by \( \{P, P'\} \). Suppose this connective also translates itself to a structural embedding relation. Ultimately, a structure is derived in (177), which connects (175) and (176):
We arrive at a phrase structure that is not much different from standard structures; however, many structural properties are directly accounted for if it is assumed that phrase structures are actually constructed from the more abstract Merge-markers, where the core syntactic relations are established, and many structural computations are applied.\textsuperscript{51}

Prinzhorn & Vergnaud (2004) further assume that global ordering of the primitive syntactic relations may be responsible for macroparameters of linguistic variation (Baker 1996, Huang 2005). For example, suppose a language has the following order (N, V) >>

\textsuperscript{51} Note that the P-marker is a Calder-like structure (177). That is, it provides a blueprint for linearization at PF. This suggests that (177) can be mapped to more than one linear order, a parameter that is language-specific. I will, however, put aside the complications here, and refer readers to a parametric theory of merge and linearization (Fukui & Takano 1998, 2000, Saito & Fukui 1998).
(Subt, Func) >> (k, k’). The resulting phrase structures that are mapped from the Merge-markers can be illustrated as follows (using the Mod-Asp domain as example):

(178) Applying the ordering (N, V) >> (Subt, Func) >> (k, k’) to Mod-Asp domain

\[
\text{Mod} \quad \text{Mod} \quad \text{Asp} \\
\text{Mod} \quad V \quad \text{Asp} \quad V \\
D \quad \text{Mod} \quad V \quad N \quad D \quad \text{Asp} \quad V \quad N
\]

Such phrase structures seem compatible with languages with syntactic N-V incorporation, such as Mohawk:

(179) Wa’-ke-[nákt-a-hnínu]-’
Fact-1sS-bed-O-buy-Punctual
‘I bought the/a bed.’

Wiltschko (2002) argues that in Mohawk, not only V and N form a constituent, but D is also incorporated into a higher functional projection (e.g. an Agreement head). Such an analysis is expected by the theory proposed here. The differences between English and Mohawk, then, are only apparent. English would apply the (Subt, Func) relation first, which results in head selection (from N to D), while Mohawk applies the (N,V) relation first, which results in theta selection. Of course, we can expect that other types of phrase structures are possible if the orderings among the primitive syntactic relations are different (See next chapter for another example in the nominal domain), and this becomes
an empirical question that I am not able to fully pursue in this dissertation. I will leave this task for future research. If this is on the right track, however, it will confirm the idea that the sources of macroparameter simply lie in the mapping orderings from Merge-markers to Phrase-markers, and languages share the same Merge-markers as the underlying universal syntactic representations.

From a symmetry point of view, the transition from a highly symmetric Merge-marker to an asymmetric Phrase-marker can be regarded as a process of symmetry breaking. That is, each phrase structure is a unique pattern generated by some way of departure from the inherent symmetry. Although different types of phrase markers may look different on the surface, the phrase markers are related to one another by the same set of primitive syntactic relations. In this sense, a phrase marker can be regarded as a member of the symmetry group of a merge-marker.$^{52, 53}$

Another important consequence is on the notion of ‘Chain.’ It is not unnatural to think that the embedding structural mappings give rise to the chain relation (as assumed in the standard theory). However, as Merge-markers are multidimensional, so are LF chains.

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$^{52}$ I owe to Andrew Simpson and Tommi Leung for urging me to clarify on this point.

$^{53}$ The symmetry breaking from Merge-markers to Phrase markers recalls the example of the dropping pencil (see p. 6). Each dropping is asymmetric, and the (rotational) symmetry is restored when we consider all occurrences of dropping (all possible ones) globally.
This is not easily captured by the strict binary representation of the P-markers. However, the functional LF chains of (177) would look like this:\footnote{More precisely, each primitive chain is a result of Merge (indicating some syntactic relations between the merged items). Chain formation is subject to transitivity. For example, Merge \((X, Y)\) and Merge \((Y, Z)\) entail a chain \(X-Y-Z\). See Manzini (1995) and Leung (2007).}

\begin{equation}
(180)
\end{equation}

Since movement is guided by Chain (i.e. movement is a phonological consequence of the pre-defined Chain created by Merge), a version of the Structural Preservation Hypothesis (Emonds 1976) is successfully derived: for all substitution transformations, a head can only move to another head position (i.e., the functional V-chain above), and a spec can only moves to another spec position (i.e., the functional N-chain above). In the theory that adopts Merge-markers, every movement is viewed as a head-to-head relation constrained by the pre-defined Chains, and therefore, ‘being a Specifier’ is only a consequence of mapping the M-markers to a phrase structure, with an apparent PF effect that the overt movement of a Specifier often entails pied-piping of some maximal constituent structure.\footnote{It should also be noted that movement may be reduced to the question which occurrence/member of a chain is pronounced at PF (along the line of Brody’s work; see also Boeckx 2003).}
The Chain relations should also guide the LF interpretations, which are largely based on the structural c-command relations (Reinhart 1976). In fact, the proposed view may directly reflect an important effect of the c-command relation observed by Kayne (1994):

\[(181) \ [No \ one’s \ articles] \ever \ get \ published \ fast \ enough.\]

The grammaticality of (181) is problematic for the standard definition of c-command, where the Negative Polarity Item \ever\ is not structurally c-commanded by the negative quantifier \no. In view of this problem, Kayne proposes a revised definition of c-command that allows an adjunct/specifier to scope out of its domain:

\[(182) \ C\text{-}command \ domain \ of \ Y \ (the \ ‘scope-out’ \ effect)\]

Under the proposed theory, however, such a ‘scope-out’ effect is straightforwardly derived, since the quantifier/determiner \no\ is actually merged ‘outside’ the NP structure (as assumed in Sportiche 2005). The structure can be roughly represented as follows:\[56\]

\[56\] We take \get\ to be a passive light verb in English, and the noun phrase [one’s article] should have a more elaborated inner structure, which is largely irrelevant to our discussion here.
(183)  a. [No one’s articles] [ever get published].

b. 

\[ \text{ever}-\text{Mod} \quad \text{Asp} \]
\[ \text{no} \quad \text{one’s} \]
\[ \text{get} \quad \text{published} \]
\[ \text{N} \quad \text{article} \]

The negative quantifier no, instead of being generated with the NP, is merged with a verbal functional item that licenses the NPI adjunct ever, which we take to be a modifier of the habitual modal in the given sentence. Note that in this configuration, the negative determiner no is actually locally associated with the Mod, which is locally modified by the adverbial ever. The ‘c-command out’ effect can therefore be derived by the proposed model as a special Spec-head (N-V) relation.

Taking c-command relations to be restricted by the more primitive syntactic relations proposed here may also explain why the following binding relation is not licensed (if a Spec does c-command out of its own domain).57

57 We assume that the possessor John in [John’s mother] is associated with the determiner. See the next chapter for details.
If we take the approach towards binding in Reinhart & Reuland (1993), the application of reflexive binding is subject to theta-relations (that is, the bottom plane of the substantive N-V relation). The proposed mechanism is then a direct reflection of this criterion.
CHAPTER 4 ON MERGE-MARKERS AND NOMINAL STRUCTURES

This chapter presents and develops the analysis of DP under M-markers (in the sense defined in Chapter 3) originally proposed in Liao & Vergnaud (2010). Some of the technical executions of the analysis of DP structure will be focused on with the proposed theory of symmetric syntax. We shall begin by reviewing some long-standing puzzles in the standard theory regarding the analysis of DP (that is, the dual-DP and single-DP dilemma). These puzzles find their straightforward explanations once we adopt the proposed theory. It will be demonstrated that syntactic computations are in fact executed at a more abstract level (i.e., Merge-markers), and therefore, the problems brought about by assuming a single level of phrase structure can be eliminated.

4.1 Dilemma of Classifier and the DP analysis

4.1.1 One NP vs. Dual NPs

The syntactic structures of nominal expressions have always been subject to much debate. Since Abney (1987), however, it is generally assumed that nominal expressions are universally DP structures, in which a determiner takes a noun phrase as a complement, cf. (185a); and in a later development, a number phrase is also introduced into the structure, as in (185b).  

58 Some have proposed a parametric view of DP structure, and argued that a determiner might not project in languages like Chinese and Japanese languages, where bare nominal forms are productive (i.e., an overt article is often not required); see Chierchia (Chierchia 1998a, b) and Cheng & Sybesma (1999). However, in line with the language uniformity principle (Chomsky 1995, 2001, Vergnaud 1985), there is also abundant evidence against such a parametric view (Li 1999, Liao & Wang 2011, Simpson 2005, Tang 1990, Watanabe 2006, Zamparelli 2000, among others). Here I will side with the latter and assume the universal DP analysis.
Such structural analyses, however, involve one more layer in languages with (overt) classifiers. For example, in Chinese, a classifier is obligatory between a numeral and a noun:

\[(186)\]  
  a. san zhi gou  
    three CL dog  
    ‘three (individual) dogs’  
  b. yi ge ren  
    one CL person  
    ‘one (individual) person’

With respect to the structural position of classifiers, there have been two major competing proposals. The first line of research is to treat classifier and noun as two independent constituents (Fukui & Takano 2000, Huang 1982). This approach suggests that classifiers head an independent projection/constituent that is adjoined to the noun phrase (or they form a nominal small clause). On the other hand, a second approach maintains that a classifier is just another extended functional projection in the NP-system, like Numeral and Determiner (Borer 2005a, Li 1998, Tang 1990, Watanabe 2006, among others). The two different approaches can be illustrated below:
Let us briefly review the advantages and drawbacks of the two competing analyses. The dual-constituent analysis has the advantage of accounting for certain distributional facts. For example, it predicts that Determiner (or Demonstrative), Number, and Classifier all together form a single constituent. The proposal yields a welcome result since it predicts that N and CL have a similar syntactic status. As evidenced in Korean, both N and CL are able to take Case-marking:

(188) Case-marking of classifiers in Korean (Park 2008: 85)

a. ku-nun [chayk] [sey kwen-ul] ilkessta.
   He-Top book three CL-Acc read
   ‘He read (the) three books.’

b. ku-nun [chayk-ul] [sey kwen] ilkessta.
   He-Top book-Acc three CL read

c. ku-nun [chayk-ul] [sey kwen-ul] ilkessta.
   He-Top book-Acc three CL-Acc read

59 Note that Watanabe’s (2006) analysis differs from Borer’s and Li’s analyses in assuming that a classifier is the head of Number Phrase (#P) (equivalent to the CLP above), whose specifier is occupied by a numeral. That is, a numeral does not belong to an impendent nominal projection.
As seen in (188a-c), Case can be freely marked on the CL and/or on the N. The only exceptional pattern is when the Numeral-CL is preposed and in this case, another linking element –\textit{uy} is marked on the preposed CL. The fact therefore seems to support some type of dual-constituency analysis.

Another pattern that is not easily captured in the single-constituency analysis is the fact that a classifier can be assigned a theta-role from the main predicate. Consider the following facts in English (van Riemsdijk 1998), and corresponding examples in Chinese:

\begin{enumerate}
\item [(189)] a. John \textit{ate} a tray of \textit{pastries}. \hspace{1cm} [head = pastries]
\item b. John \textit{carried} a \textit{tray} of pastries. \hspace{1cm} [head = tray]
\item c. John \textit{turned over} a \textit{tray} of \textit{pastries}. \hspace{1cm} [head = tray or pastries]
\end{enumerate}

\begin{enumerate}
\item [(190)] a. John \textit{he-le} [san ping \textit{shui}]. \hspace{1cm} (theme = water)
   \quad John drank three bottle water
   \quad ‘John drank three bottles of water.’
\item b. John \textit{da-po} [san ping \textit{shui}]. \hspace{1cm} (theme = bottle)
   \quad John break three bottle water
   \quad ‘John broke three bottles of water.’
\end{enumerate}

Again, we see that both classifier and noun can be assigned a theta-role, which signals that classifier and noun indeed share similar syntactic properties. The facts also indicate
that a classifier should be treated as a substantive category (or as a semi-functional category, as suggested in van Riemsdijk’s work) since a functional category is not likely to be involved in the theta structures (Lebeaux 1988).60

Despite its empirical attractiveness, however, the dual-constituency analysis has difficulties capturing the strong selection between classifier and noun since it predicts that the classifier and the noun are heads of two independent constituents (that are neither adjacent to nor c-commanding each other), and these elements therefore should not be able to engage in selectional relations, given common assumption about head selection. This theoretical consideration, then, provides strong support instead for the single-constituency analysis, where the local head selection can be easily accounted for in structural representations. The classifier constructions, therefore, lead us to a conceptual paradox.

4.1.2 DP-Internal Remnant Movement: Kayne (2005)

Interestingly, the debate between the dual-constituency and the single-constituency analyses recalls a proposal made in Kayne (2005). Kayne observes that the following

60 One might argue that only measure/mass classifiers may receive a theta role, but a count classifier cannot. This is not empirically attested. Consider the singular agreement of the plural subject in English:

(i) Three NUMBER people is/are enough to carry the sofa.

The quirky agreement pattern is explained if it is assumed that plural agreement is sometimes sensitive to the theta structure, and the hidden subject of (i) is an unpronounced NUMBER, which carries a theta role of Amount/Quantity (Kayne 2005). As will be argued below, a count classifier in Chinese is the over realization of the unpronounced NUMBER in English.
sub-extraction examples bring problems to standard analyses, where the preposition of is considered an extended projection of the following noun, and extends the structure to a larger single DP-constituent:

(191)  

a. *Money*, John has [DP lots of t].

b. *Who* did you see [DP a picture of t]?

The problem arises since the DPs *[lots of money]* and *[a picture of who]* are larger constituents containing the extracted phrases (*money* and *who*), and therefore, the sub-extraction of *money* or *who* from the larger DP should be ungrammatical. One way to solve the problem is to assume a restructuring rule, such as the one introduced in Chomsky (1977), that reanalyzes the larger DP into to two smaller object phrases *[lots of money]* → *[lots of]*+[money]. The extraposed/restructured DP (*money* or *who*) is thus free to move. In Kayne’s proposal, however, the somewhat artificial readjustment rule can be dispensed with. The rule is replaced by the analysis that *of* is generated outside the DP. Kayne’s analysis outlined in (192) is therefore parallel to a split constituency analysis of DP structure:

(192)  

a. have [
sc [money] [lots]]

b. OFCase [VP have[sc [money] [lots]]]  \hspace{1cm} \text{(Merging } OF\text{)}

c. [money [OFCase [VP have [sc tmoney [lots]]]]]  \hspace{1cm} \text{(NP movement to Spec, } OFP\text{)}

d. of [money [OFCase [VP have [sc tmoney [lots]]]]]  \hspace{1cm} \text{(Merging } of\text{)}
e. [VP have [SC \text{tmoney} \text{[lots]]}] [of [money] [OF_{\text{Case tVP}}]] \\
\text{(remnant movement to Spec, ofP)}

f. 
\begin{center}
\begin{tikzpicture}
  \node (vp) {VP} ;
  \node (of) [right=of vp] {of} ;
  \node (have) [left=of of] {have \text{tmoney} \text{lots of}} ;
  \node (ofp) [below=of of] {OFP} ;
  \node (ofp) [below=of ofp] {OF} ;
  \node (tvp) [below=of ofp] {tVP} ;
  \path (have) edge (of)
  (of) edge (vp)
  (aq) edge (oof)
  (oof) edge (ofp)
  (oof) edge (ofp)
  (ofp) edge (tvp)
  (ofp) edge (tvp)
\end{tikzpicture}
\end{center}

The resulting structure is one with dual DP constituents (one headed by \textit{lots} and the other by \textit{money}) that are connected by the pair of connective (of, OF). Two points in Kayne (2005) need emphasis here: the Small Clause analysis and the pairing of connectives. Following Kayne’s analysis, it looks possible to solve the tension between the local selection and the dual constituents of CL and N if we assume that CL and N originally form a small clause, and the dual constituents are subsequently derived by remnant movements, as in (193):

(193) a. he san ping (de) shui \\
\text{drink three bottle}_{\text{CL}} \text{DE water} \\
\text{‘drink three bottles of water’}

b. [VP drink [SC \text{twater} [\text{bottle}_{\text{CL}}]]] [de [\text{water} [\text{DECase tVP}}]]

In this way, the contrast between the single-constituent and the dual-constituent analyses is neutralized. However, it remains that even if we adopt the small clause analysis (aside from concerns about the ill-defined nature of ‘small clauses’), many additional
stipulations are still needed about theta-role assignment and Case-assignment in order to solve the locality problem. We will return to this question in Section 4.2.

The other proposal concerns the syntax of the connectives. The current proposal about the fundamental relation \{k, k\'} is reminiscent of Kayne’s treatment of connective pairs.¹ In terms of the nominal domain, the same patterns recur in typologically different languages:

(194)  

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>lots of books</td>
<td>(English: Germanic)</td>
</tr>
<tr>
<td>b.</td>
<td>beaucoup de livres</td>
<td>(French: Romance)</td>
</tr>
<tr>
<td></td>
<td>‘lots of books’</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>san ben (de) shu</td>
<td>(Chinese: Sino-Tibetan)</td>
</tr>
<tr>
<td></td>
<td>three CL DE book</td>
<td></td>
</tr>
<tr>
<td></td>
<td>‘three books’</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>san bu^n e tse</td>
<td>(Taiwanese: Sino-Tibetan)</td>
</tr>
<tr>
<td></td>
<td>three CL E book</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>sey kwen-uy chayk</td>
<td>(Korean: Altaic)</td>
</tr>
<tr>
<td></td>
<td>three CL-UY book</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>san satsu-no hon</td>
<td>(Japanese: Altaic)</td>
</tr>
<tr>
<td></td>
<td>three CL-NO book</td>
<td></td>
</tr>
</tbody>
</table>

It looks unlikely to be a simple coincidence that linking elements are adopted in similar constructions across languages. Kayne’s analysis suggests that the function of connective

---

¹ It is an interesting question why many languages employ these (semantically empty) ‘linking elements’ in different domains. I have little to contribute here regarding to this puzzle. However, note that, like Agreement and expletives, it is these ‘empty’ elements that often lead to interesting findings in syntax.
is related to grammatical Case. However, the Case-related analysis does not hold well, at least in Chinese, since the same element *de* in Chinese also occurs in contexts where no ‘nominal’ or ‘noun-ish’ elements are involved, hence Case-irrelevant. Consider the data from Mandarin Chinese, where *de* links two verbal/predicative phrases:

(195) a. Zhangsan [AP hen kuaile] de [VP you-zhe]  
    ZS very happy DE swim-Prog.  
    ‘Zhangsan is swimming happily’

    ZS like fish same DE swim-Prog.  
    ‘Zhangsan is swimming like a fish.’

It therefore seems that these linking elements are applicable in more general contexts.


Kayne’s treatment of the linking pair (of, OF) also finds support in den Dikken’s (2006) work, who develops a similar theory on independent grounds. However, for den Dikken (2006), the connectives do not relate to Case theory, rather, den Dikken assumes that they are realizations of predicate holders, called Relators, which are always accompanied by a (possibly covert) shadow copy, called a Linker. Den Dikken then relates the ‘coupling’ effect of relator-linkers to the transformation of Predicate Inversion:

(196) Predication (a Relator ρP mediates between the argument and predicate)  
    [ρP Argument [ ρ=Relator Predicate]]
(197) Predicate Inversion (Relator raises to Linker λ and subsequently triggers predicate-raising)

\[ \text{Predicate } \lambda = \text{Linker} \rightarrow \text{Predicate} \]

Den Dikken assumes that a predication relation is always mediated by a grammatical Relator, which is a functional head in between an argument and a predicate. In a predicate inversion transformation, the Linker (the shadow copy of the Relator) attracts the head-raising of the Relator to the Linker, and therefore licenses the predicate raising (being somewhat irrelevant to the purpose of our discussion here, Den Dikken also assumes that the raised predicate always contains some empty element that needs to be licensed):

(198) a. [Brian [is(\(\rho\)) [Predicate the best candidate]]]

b. [[op the best candidate]_2 \ T(=\(\lambda\)) + is_1(=\(\rho\)) [Brian] t_1 t_2]

(199) a. a jewel of a village

b. [[F=SIMILAR a jewel]_2 of(=\(\lambda\)) + \(\rho\)_1 [a village [t_1 t_2]]]

Predicate Inversions can apply in verbal or nominal domains, reflected by different types of Relator-Linker pairs, which may be pronounced in various ways. In English, for example, the verbal linker is pronounced as be, as in (198), while of is the nominal counterpart, as in (199). The nominal linker de in Chinese is another example, illustrated in (200), where de is considered a Linker that attracts the raising of the empty Aux (see also Simpson 2002, who argues that the linker can be identified as a determiner):
Den Dikken’s analysis provides a novel insight to the problem. However, it still leaves some theory-internal puzzles. The greatest concern is on the restrictiveness of the Relator-Linker analysis. In a way, it is impossible to define (or falsify) what Relators are. Relator is a general term that is designed to cover the functional categories that mediate a predicate and its argument. It is sometimes difficult, however, to define precisely what the notion of ‘predicate’ is. For example, in terms of the term ‘predicate,’ in sentential domains, den Dikken (2006) only considers the Relator between subject and predicate, but not the object and a transitive predicate:

(201)  

a. [Subject [**Relator** Predicate]]

b. [Predicate [**Relator**? Object]]

There seems little theoretical reason to exclude the configuration in (201b) as a relation of predication. The question, then, is what the Relator is in (201b). If it can be identified as a determiner (a functional category between verb and NP object), then it is a puzzle why the determiner of the subject cannot be analyzed in the same fashion, as the Relator between subject NP and verb in (201a) is identified as a light verb. Suppose the Relator is
also a light verb in (201b) (a light verb between the verb and its object), then the theory of ‘predication’ needs a revision: a Relator, then, conjoins different verbal projections (in this sense, every argument is introduced by its own light verb; cf. also Lin 2001). A possible answer to this problem lies in a related question. Should the coordinator, and, be treated as a predicate, and the XP and YP in [XP and YP] treated as its argument? With respect to this question, the following analysis in den Dikken (2006: 17) may suggest a positive answer:

(202) a. nice and easy
   b. [AP nice [RP and (=Relator) easy]]

This indicates that the Relator-Linker analysis can be extended to many other configurations, where the connected elements are more than a typical argument and predicate in the sentential domain (from den Dikken 2006: Ch. 2):

(203) a. Susan danced beautifully.
   b. Susan [danced [RP –ly=Relator beautiful]]

(204) a. Imogen regards the president as a fool.
   b. Imogen regards [the president [RP as=Relator a fool]]

(205) a. That butterfly is big for a butterfly.
   b. That butterfly is [big [RP for=Relator a butterfly]]
Based on this, it is conjectured in den Dikken (2006: 17) that the Relator ‘might uniformly be the logical operator “∩”, with predication being semantically represented as set intersection.’ We shall elaborate on this conjecture and present a unified analysis (of Kayne’s and den Dikken’s approaches) under the Merge-marker analysis in the following section.

4.2 On the Dual-Constituent DP and Connectives

Despite different terminologies and some technical assumptions, the analyses proposed in Kayne (2005) and den Dikken (2006) can be reduced to a similar mechanism related to the proposal of connective pair \{k, k’\} introduced in the previous chapter.62

\[(206)\]
\[
\begin{align*}
\text{a. Kayne (2005):} & \quad \text{(of, OF)} \\
\text{b. den Dikken (2006):} & \quad \text{(Linker, Relator)}
\end{align*}
\]

We shall adopt the assumption that these elements are generalized connectives that can be realized differently with the domains connected. In effect, the remnant movement analysis and the dual-constituent analysis can be reanalyzed as a conjoined structure of two ‘base’ structures, or Merge-markers (by the connective pair, (of, OF)):

\[(207)\]
\[
\begin{align*}
\text{a. have lots of money} \\
\text{b. [have lots] of [have money] OF}
\end{align*}
\]

62 A similar effect is observed in Larson (2009), who refers the pair to ezafe and reversed-ezafe, based on the data of the linking elements in the Iranian languages (e.g., Farsi and Kurdish).
As usually assumed, in the pronounced structure, the lower instance of V undergoes deletion under identity: 63

(208)  [have lots] of [have money] OF

Applying the same analysis to the classifier and the noun, then, the classifier-noun structures can be re-analyzed as:

(209)  a. Lisi he-le san ping (de) shui
       Lisi drink-Asp three bottleCL DE water
       ‘Lisi drank three bottles of water.’

       b. [he san ping] (de) [he shui] (DE)
       drank three bottleCL DE drink water DE

What are conjoined by the connective pair ((de, DE) in Chinese) are not simply CL and N, but larger constituents.

One advantage of adopting this analysis is that Riemsdijk’s problem can be resolved.

Recall the problem in (189) and (28), repeated here as (210) and (211):

63 The analysis presented here assumes a copy-and-deletion approach to remnant movement, which is more compatible with the current minimalist assumption (Chomsky 1995). For a pioneer work of the same line, see Fanselow & Cavar (2002).
(210)  a. John ate a tray of pastries. [head = pastries]  
b. John carried a tray of pastries. [head = tray]  
c. John turned over a tray of pastries. [head = tray or pastries]  

(211)  a. John he-le [san ping shui]. (head = water)  
    John drank three bottle water  
    ‘John drank three bottles of water.’  
    b. John da-po [san ping shui]. (head = bottle)  
    John break three bottle water  
    ‘John broke three bottles of water.’  

Applying the analysis of dual-VP structure, the following structures can be derived:

(212)  a. [eat a tray=N1] of [eat pastries=N2] OF  
b. [carry a tray=N1] of [carry pastries=N2] OF  
c. [turn-over a tray=N1] of [turn-over pastries=N2] OF  

The structures directly capture the strict locality of theta-configurations (Williams 1994).  
It can be assumed verbs should freely assign theta-roles to their associated arguments,  
and at LF, the interpretations that are (semantically or pragmatically) deviant will be  
filtered out.  

The proposed analysis may also be responsible for the structure of verb-copying  
constructions in Chinese. Consider the following example, where the noun, water, can

64 For example, the head can be ambiguous between tray and pastry in (212) in a scenario where the pastry is  
put on a tray made of bread.
either remain in the position following the classifier, as in (213a), or it can be preposed along with the verb, as in (213b):

(213) a. Zhangsan he-le [san ping] (de) [shui]  
    Zhangsan drink-Asp three bottleCL DE water

    b. Zhangsan [he shui] [he-le san ping]  
    Zhangsan drink water drink-Asp three bottleCL  
    ‘(both a and b): Zhangsan drank three bottles of water.’

Under the proposed analysis, one can reduce the verb copying construction to an instance of predicate inversion transformation, where the pronunciation of the connectives, or the \{de, DE\} pair, varies according to the position of the predicate these elements are associated with:65

(214) a. [drink three bottles] de [[drink water] DE

    b. [drink water] DEi [drink three bottles] de

Compare the verb-copying construction in (214) with the predicate inversion structure in (215). Both transformations simply involve rearrangement of the connected domains:

(215) a. [v the man] be [ V Sherlock] BE. = The man is Sherlock.

    b. [V Sherlock] be [v the man] be. = Sherlock is the man.

---

65 Note that like other predicate inversion constructions, the preposed VP in the verb-copying construction can (but not necessarily) be mapped to the focused position in the information structure (Bresnan 1994).
4.3 Beyond Phrase Structure

4.3.1 Merge-Markers in the Nominal Domains

So far, the analyses reviewed earlier seem to suggest a version of the dual-constituent analysis. One problem remains, however, for the dual-constituent analysis presented in the previous section. That is, how do we account for the local selection between CL and N if they belong to independent VPs? The problem is directly resolved under the analysis of M-marker, where the two N’s are in fact local in the abstract symmetric structure, due to extension by \{k, k\}:

(216) A canonical M-marker

(217) The CL-N domain

To recapitulate, recall that an M-marker, represented in (216), is a domain where the primitive syntactic relations are satisfied: These include the \{N, V\}, the \{Subt, Func\},
and the \{k, k'\} relations. As mentioned in the previous chapter, the CL-N domain in (217) is one realization of such complete functional domains. In this sense, CL and N represent the two substantive nouns that are mediated by the relation \{k, k'\}. The abstract structural representation of the M-marker hence creates the locality between the two lexical nodes, which allows them to enter into a selectional relation. Since the relation \{k, k'\} is applied to the other two relations, one effect is that the structural extension also applies to the other domains, including both the substantive and functional verbal domains and the functional nominal domains. When the M-maker is transformed to a phrase structure (in the mechanisms introduced in Chapter 3), the dual-VP analysis is directly derived. Here, the connective pair that introduces the embedding transformation would be interpreted in PF as the linking elements (of, OF). The transformation from M-marker to phrase markers is shown as follows:

(218) a. [have lots] of [have money] OF
b. c. \(\{k, k'\} = \{\text{of, OF}\}\)

Another advantage of the current proposal that derives the phrase structure from the M-markers is that the contradictions between the single-constituent and the
dual-constituent analyses are neutralized. This treatment also captures, and further sharpens, the small clause analysis in Kayne (2005). The local selection between CL and N (between *lots* and *money*) is achieved through the connective relation in the abstract syntactic level, while the dual constituency on the surface structure is an apparent consequence of the asymmetric nature of the phrase structure (in alternation to the remnant movement analysis in Kayne 2005).

One can imagine that a different typology of language that generates the orders among the syntactic relations to P-markers in a different ordering may give rise to different phrase structures. For example, suppose a language where the connective relation is spelt out prior to the \{Func, Subt\} and, in turn, the \{N,V\} relations. This yields a phrase structure where CL and N function as a unit in the surface phrase structure, leaving the numeral and other functional categories outside, as shown in the structure below:

\[(219) \{k,k'\} >> \{Subt, Func\} >> \{N,V\}\]

![Phrase structure diagram](image)

Ejagham, a Bantu-Congo language, seems to be a language that adopts this type of P-marker transformation. In Ejagham, the numeral (which is the functional category that
is coupled with the CL in M-marker; $F_{N2}$ occurs outside the CL-N unit, which behaves like a nominal compound (Simpson 2005, Watters 1981) (NC= Noun Class):

(220) Classifier: N-mʊɛ / a-mʊɛ ‘any small, generally round object’
(From Watters 1981: 310; his (121a))

a. [N-mʊɛ i-cʊkud] yə-d
   NC-CL NC-orange NC-one
   ‘one orange seed’

b. [a-mʊɛ i-cʊkud] a-baɛ
   NC-CL NC-orange NC-two
   ‘two orange seeds’

(221) Classifier: N-sum/a-sum ‘classifier of any fruit or root which is long’
(From Watters 1981: 310; his (122b))

a. [N-sum ɔ-ɾəbɛ] yə-d
   NC-CL NC-bean NC-one
   ‘one bean pod’

b. [a-sum ɔ-ɾəbɛ] a-baɛ
   NC-CL NC-bean NC-two
   ‘two bean pods’

Note that although the numeral (a functional category that is coupled with the classifier) occurs outside the CL-N sequence, the noun classes (or Gender) of the numerals agree (or concord) with the classifiers (rather than with the nouns). This can be observed from the examples above: The noun classes of the numerals shift with the classifiers (with respect to gender marking and plurality), while the noun classes of the main nouns remain the same. Again, this fact lends support to our view that syntactic computation may be
carried out in a more abstract level, the M-markers, where numeral and CL are nevertheless local pairs that enter an agreement (concord) relation (yet in surface phrase structure, they are separated by transformations).

Turning back to (218b), one important question concerns the functional categories that are coupled with the substantive N’s (including the noun and the classifier). We have assumed that the functional item that is coupled with the classifier is a numeral, while the other functional item that is coupled with the (non-classifier) substantive N has not been discussed. The next section therefore focuses on the functional items and their interactions in the M-markers. It will be shown that employing M-markers in the syntactic analyses not only sheds some light on the classifier/counting constructions, but also on the syntax-semantic mappings of mass-count distinctions and plural markings cross-linguistically.

4.3.2 Functional Categories in the Nominal Domain

4.3.2.1 The Compositional Nature of Mass-Count and Plurality

Let us focus on the nominal dimension of M-markers in (222). It is crucial for the current analysis to find out what the contents of the functional items are. To begin with, the functional items in the nominal domains must be able to explain (at least) the following three semantic (LF) properties in (223):
(222) The CL-N domain

(223) a. Mass-Count Distinction
    
    b. Semantic/Morphological Plurality
    
    c. Quantifiers

To this end, a hypothesis made in Higginbotham (1994) is critical to our analysis.
Higginbotham (1994) observes that every mass quantifier can always find a count
counterpart, but not vise versa:

(224) COUNT      MASS
    a. many N’s      much N
    b. some N’s      some N
    c. (a) few N’s   (a) little N
    d. two N’s       n.a.

The paradigm suggests that count nouns and mass nouns underlyingly share some
fundamental features. Reflecting Higginbotham’s observation, we shall argue for a
compositional analysis of the mass/count and plurality in (225) below, in contrast to the
standard taxonomy in (226):
I propose that the mass-count distinction can be further decomposed to the combinations of [unit] and A*: The functional item [unit] reflects a semantic criterion of atomicity, or some notion of integrity (in the sense of Moltmann 1998), while the A* operator (standing for a set formation operator: AND) reflects the grouping of the atoms, or cumulativity (the basic semantics will be discussed in the following subsection). The proposal here is that plurality is combined from singularity and mass. Simply speaking, a plural noun is understood as a set formed by atoms, so that it is cumulative and atomic.

The analysis is directly backed up by the fact that plurality shares features with both singular terms and mass nouns. A plural and a singular term are both countable, in the sense that they can be counted by a numeral, and are hence atomic. A plural noun, at the same time, shares with a mass noun the property of being cumulative (Landman 1995):

---

66 One candidate of the bottom right combination (Ø+Ø) is lexical roots, which are unspecified for mass/count. However, it can be assumed that grammar will rule this out at the LF interface, due to Full Interpretation (Chomsky 1995).
4.3.2.2 More on the Semantics of [unit] and A*

Link (1983) proposes a semantic formulation for the mass/count distinction in terms of semi-lattice structures, which are illustrated below (1998a, b, Doetjes 1996):

(228) a. singular
   \{a,b,c\}

   b. plural\textsuperscript{67}
   \{a,b,c\}, \{a,b\}, \{b,c\}, \{a,c\}

   c. mass (x\textsuperscript{+} represents an item with vague boundary)
   \{a\textsuperscript{+},b\textsuperscript{+},c\textsuperscript{+},\ldots\}, \{a\textsuperscript{+},b\textsuperscript{+}\}, \{b\textsuperscript{+},c\textsuperscript{+}\}, \{a\textsuperscript{+},c\textsuperscript{+}\} \ldots \textit{(portions of material parts)}

Semantic singular terms are understood as the atoms in the semilattice structure, while plural terms are understood as the non-atomic parts, which consist of two or more atoms per set. Mass terms are identified as inherently plural, but their atoms are vague (represented here as x\textsuperscript{+}), in the sense that the recursion of the part-of relation is unbounded (i.e. the sizes of atoms are vague/undefined; cf. Chierchia 2010). Specifically, the semilattice framework can be reduced to two crucial components: atomicity vs.

\textsuperscript{67} From the entailment of negative sentences (John saw no students → John didn’t see a student), Chierchia (2010) concludes that the extensions of a plural noun should include singular objects. We shall ignore this difference since it bears no direct relation to our analysis.
cumulativity. The former defines an atomic level of a semi-lattice, while the latter gives rise to different groupings ordered by the part-of relation.

As shown in the last section, we propose that a (grammatical) functional item [unit] corresponds to the semantic notion of atomicity (or integrity). The functional item [unit] merges with N, and the result is a count structure, as in (229a):

(229)  a. syntax of count nouns  b. syntax of mass nouns

\[
\begin{array}{c}
F_{\text{[unit]}} \\
\mid \\
N_2 \\
\end{array} \quad \begin{array}{c}
F_\emptyset \\
\mid \\
N_2 \\
\end{array}
\]

The binary structure reflects a coupling between a substantive root and a (grammatical) functional item, which can be attributed to the \{Substantive, Functional\} relation, it is interpreted at LF as the main noun. Likewise, when a substantive root is coupled with a grammatical functional item, e.g., a Numeral, it is interpreted at LF as a classifier. The two domains, when connected by the \{k, k’\} relation, represent a minimal nominal syntactic structure:

(230)  Coupling in the CL-N domains

\[
\begin{array}{c}
\text{Num}_A^* \\
\mid \\
N_1 \\
\mid \\
N_2 \\
\end{array} \quad \begin{array}{c}
F_{\text{[unit]}} \\
\end{array}
\]

\[
\begin{array}{c}
\text{Num}_A^* \\
\mid \\
N_1 \\
\mid \\
N_2 \\
\end{array} \quad \begin{array}{c}
F_\emptyset \\
\end{array}
\]
The binary structure should also derive an aspect of Kayne’s conjecture about the design of UG in (231), which may ultimately be subject to the economy condition of the computational system (Kayne 2007: 835). This idea is interpreted here as a direct consequence of the coupling of the \{Func, Subt\} relation:

\[(231)\] UG imposes a maximum of one interpretable syntactic feature per lexical item.

Let us turn to the plurality in the structure, which we take to be associated with both the functional item [unit] and the A* operator. Here, we shall consider the difference between semantic plurality and morphological plural markings. Semantic plurality includes not only plural nouns like *cats*, but also mass nouns like *water* and *furniture*, in the sense that both categories of nouns give rise to cumulativity (X and X -> X; see Chierchia 1998a, 1998b, 2010; Link 1983). On the other hand, morphological plural only contains the nouns that carry (covert/overt) plural markings, which are subject to linguistic variations. Let us focus on semantic plurality first. It has been noted that mass and plural behave alike in many contexts (e.g. Chierchia 1998a, 1998b treats mass as a lexicalized plural term). For example, they are compatible with collective predicates, and they have the same interpretations in stage-level and individual-level predicates (Carlson 1977). Much like cumulativity, Harris (1982) notes that the connective operator *AND* distinguishes plural and mass, on the one side, from singular terms, on the other:
(232)  a. (Wherever I looked,) I saw lava and lava.
       → I saw lava.
       b. I saw a cat and a cat.  → I saw (two) cats.
       c. I saw a boy and a boy.  ≠ I saw a boy

We shall adopt Harris’ idea by assuming an operator A* for the logical connective AND, and quantifiers can be deduced from such an operator. Singular terms do not contain an A* operator anywhere in the structures, while plural and mass contain A*, but the sources of the A* operator may vary in the structures: For plural nouns, the A* operator comes from the recursion of the Numerals (e.g., two = one AND one), and for mass nouns, the A* comes from the ‘mass’ classifier, or a silent AMOUNT (Kayne 2005). In this way, the difference between singular, plural and mass terms are a compositional one:

(233)  The proposed taxonomy

<table>
<thead>
<tr>
<th></th>
<th>A*</th>
<th>Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>[unit]</td>
<td>plural</td>
<td>singular</td>
</tr>
<tr>
<td>Ø</td>
<td>mass</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Note that the proposed combinatory analysis may also provide a new perspective on the long-standing paradox of the so-called plural mass nouns (McCawley 1979a):

(234)  Some plural mass nouns in English (from Ojeda 2005)

   clothes, chattel(s), effects, stocks, victuals, vivers, sweetmeats, molasses, oats,
   hops, weeds, brains, bowels, cinders, curds, embers, grounds, guts, dregs, hards,
   lees, proceeds, remains, vails, contents, belongings, (paper) hangings, leavings,
sharings, sweepings, winnings, ashes, chemicals, vegetables, greens, eatables, 

drinkables, sweets, sours, bitters, cordials, movables, valuables, necessaries, dues, 
assets, goods, wages, measles, mumps, hysterics, shingles, shivers, rickets, chills, 
throes, vives, blues, creeps, dumps, jumps, sulks, sullens.

Plural mass nouns are not typologically rare, and have been noted in many other 
and Tsoulas (2006) in Greek, and Wiltschko (2008) in Halkomelem (a Salish language), 
among others:

(235) Bantu (Ojeda 2005) (PL = Noun Class 6)

<table>
<thead>
<tr>
<th>a. PLURAL</th>
<th>ma-kolo</th>
<th>ma-tama</th>
<th>ma-ndoki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-leg</td>
<td>6-cheek</td>
<td>6-rifle</td>
</tr>
<tr>
<td></td>
<td>‘legs’</td>
<td>‘cheeks’</td>
<td>‘rifles’</td>
</tr>
<tr>
<td>b. MASS</td>
<td>ma-i</td>
<td>ma-kila</td>
<td>ma-bele</td>
</tr>
<tr>
<td></td>
<td>6-water</td>
<td>6-blood</td>
<td>6-soil</td>
</tr>
<tr>
<td></td>
<td>‘water’</td>
<td>‘blood’</td>
<td>‘soil’</td>
</tr>
</tbody>
</table>

(236) Greek (Alexiadou 2010 and Tsoulas 2006)

epesan nera sto kefali mu
fell-3Pl water-Pl on head my
‘Water fell on my head.’

(237) Halkomelem Salish (Wiltschko 2008)

a. tsel kw’êts-l-exw te/ye th’exth’ éxet
  1Sing.Subj see-Trans-3Obj Det/Det-Pl gravel.Pl
  ‘I saw a lot of gravel.’
b. tsel kw’éts-l-exw te/ye shweláthetel
1Sing.Subj see-Trans-3Obj Det/Det-Pl fog.Pl
‘I’ve seen a lot of fog.’

Under the standard taxonomy, where plural and mass nouns fall into separate natural classes, the existence of mass plural nouns should be in principle ruled out. Under the proposed analysis, however, the combinatory nature of plurality offers a clue to this problem. I hypothesize that morphological plural marking is subject to parametric variation across languages. In languages that allow plural mass nouns, I suggest that the plural marking is actually a morphological realization of the $A^*$ operator, which resides in the mass structure:  

$\emptyset_{\text{Num}} \quad \emptyset_{[\text{unit}]}$

\[ \text{AMOUNT} \cdot A^* \quad \text{water} \rightarrow \text{PL(-s)} \]

On the other hand, count plural marking (–s and its allomorphs) in English can be formulated as a structural configuration of $A^*$ and [unit] (in this sense, the morphological plural marking is a property of Spell-out and PF, in the same vein as structural Case):

\[ \text{two} \cdot A^* \quad [\text{unit}] \rightarrow \text{PL(-s)} \]

\[ \text{NUMBER} \quad \text{cat} \]

\footnote{Following Kayne (2005), I assume that covert AMOUNT and NUMBER (Kayne 2005) occupy the classifier position in non-classifier languages. We shall return to this point later.}
The A*-operator here comes from the numeral *two* (or any numeral that is more than 2 and plural quantifiers like *many* and *few*). As in Harris (1982) (recall (232)), I assume that quantifiers and numerals can be derived from the AND/A* operator (i.e. *two* = one AND one).

The analysis presented here may also help refine the proposals in Wiltschko (2008) and Alexiadou (2010) regarding plural mass nouns. In particular, Wiltschko (2008) suggests that the plural marker can be a head in some languages (which will function like a classifier), or it can be adjoined to different nominal categories (N, n, #, and D) in other languages, as a modifier. However, this analysis does not capture the close association between mass and plural nouns. To a certain extent, it separates semantic plurality from morphological plurality. An alternative analysis pursued here is that plurality universally comes from the logical A* operator, and it is the syntax-morphology of the A* operator that is subject to the surface parameterization.

### 4.4 Syntax of Classifiers: Parallelism in the Nominal Structure

In this section, three types of classifier constructions will be examined. The three types of classifiers include number/shape classifiers, vague classifiers, and measure classifiers. We shall compare the classifier constructions in Chinese with the nominal constructions in English. It will be shown that the assumption of unpronounced structures, in the same
vein as Kayne (2005), can lead us to a unified analysis with respect to the syntax of counting and quantification, limiting the parameters between English and Chinese to surface detectable properties, which is hence more compatible with the Language Uniformity Principle (Chomsky 1995, 2001).

4.4.1 Count Classifiers: Number vs. Shape Classifiers

One can generally classify count classifiers in Chinese into two sub-classes: shape classifiers and number classifiers. The distinction can be roughly seen through adjectival modification. The following list illustrates some examples of number and shape classifiers:

69 Originating from Jean-Roger Vergnaud’s hypothesis about language parameterization (especially with respect to the Case theory), one of the strong minimalist theses is the Language Uniformity Principle: ‘Assume [the internal structures of] languages to be uniform, with variety restricted to easily detectable properties of [surface] utterances.’ (Chomsky 2001:2)

70 Cheng and Sybesma (1999, 2005) propose that classifiers can be distinguished into count and mass classifiers through the tests of de-insertion and adjective modifications. The first test, however, is not without judgmental variations among native speakers. The second test is often challenged as well (Kobuchi-Philip 2007). We shall not adopt the first criterion. The second criterion, as we argue here, has to do with whether a given classifier provides shape information or not (most mass classifiers are only a subset of such classifiers).
Two types of count classifiers

<table>
<thead>
<tr>
<th>a. shape CL</th>
<th>b. number CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>zhang (for sheets, papers, etc.), ben (for books), zhi/gen (for sticks, pens, etc.), tiao (for snakes, necklace, etc.), zhi (for dogs, cats, cows, etc.), kuai (for a load or a chunk of objects), etc.</td>
<td>ge (default), wei (for honorific professions), men (for academic subjects), etc.</td>
</tr>
</tbody>
</table>

(i) yi da zhang zhi one big CL paper ‘a big sheet of paper’
(ii) yi xiao ben shu one small CL book ‘a small book’
(iii) yi xiao zhi bi one small CL pen ‘a small pen’

(i) yi (*da) ge xiaoyuan one big CL campus ‘a (big) campus’
(ii) yi (*xiao) wei/ge laoshi one small CL teacher ‘a (small/young) teacher’
(iii) yi (*da) men/ge xuewen one big CL knowledge ‘a (big) branch of knowledge’

The shape classifiers allow a modifier like big and small, as in (240a), while the number classifiers do not. Close scrutiny, however, suggests that the adjectival modifications of the classifiers are in fact sensitive to their lexical semantics (i.e. the primitive concepts associated with classifiers). Number classifiers often come from honorific forms that simply do not provide any reference to shape in their lexical meanings (as a noun). Therefore, attributing the availability of adjectival modifications to the syntax proper does not seem adequate (cf. Cheng & Sybesma 1998, 2005). Furthermore, it is not the case that number classifiers resist any modifications, an intensifier like zheng ‘whole’ can modify both number and shape classifiers (Tang 2005):
We suggest that the relation between shape and number classifiers be formulated as an implication rule encoded in grammar from shape to number. This amounts to saying that the shape and number information in the cognitive-linguistic domain form an intersection, and the shape CL is a subset of the number CL. This should derive from the fact that the reference to shape functions as one of the most natural criteria for counting (Grinevald 2000, Moltmann 1998, Svenonius 2008). The implication rule from shape to number may gain empirical support from many other languages. We discuss two pieces of evidence here. Schwarzschild (2009) observes that several predicates in English always (preferably) apply to singular participant events (to the atomic parts), which are referred to as Stubborn Distributive Predicates:71

(242)  a. The boxes are large. → Each box is large.
       b. The boxes are round. → Each box is round.

(243)  a. ?The wine is big.
       b. ?The snow is round.
       c. ?The cocaine is long.

71 For the same observation as in Schwarzschild (2009), see Moltmann (1998), who explicitly attributes the distributivity to the part-structure sensitive nature of some predicates.
Schwarzschild (2009), however, does not offer an explanation for why these predicates behave in such a way. Nevertheless, under the implication rule from shape to number, the ‘stubbornness’ of these predicates can be accounted for:

(244) The boxes are large$_{[\text{shape}]}$ → $[\text{number}]$.

In fact, in the Southern Min dialect (also referred to as Hokkien), some of the adjectival predicates of shape necessarily involve classifiers and singularity, as in (245) (although in Mandarin, these classifiers are optional, as in (246)):

(245) a. Hit gi enbit gai dua (jit)/*neng gi that-one CL pencil Aux. big one/two CL ‘That pencil is long/big.’

   b. Hit jia gao gai dua (jit)/*neng jia. that-one CL dog Aux big one/two CL ‘That dog is big.’

(246) Zhe zhi qianbi hen da (yi zhi)/*liang zhi. this CL pencil very big one CL/ two CL ‘This pencil is very long/big.’

We can conclude that, although hidden in different surface patterns, languages seem to encode this universal implication rule (from shape to number) in one way or another.

Turning to the syntactic structure of number classifiers, let us consider the structure in (230), repeated here as (247):
When the classifier is a shape classifier, the structure remains the same, and the
difference is restricted to the feature of CL (where its [number] feature is entailed from
[shape]). This accounts for why adjectival modification is only permissible with shape
classifiers. One important aspect of this structure is the selectional/checking properties of
the numerals. The numeral plays two roles in our system: it does not only define the
corresponding noun as a classifier, but it also specifies the quantity of [unit]. As a pivot, it
associates a count classifier to the count structure. I suggest that [unit] has an unvalued
/uninterpretable formal feature, which is checked/valued by the numeral. We therefore
predict, correctly, that a counting numeral, selected by a count classifier, is obligatory in
the structure, and must accompany the count structure (i.e. with [unit]).\(^{72}\) We also predict
that some classifiers, which do not select a counting numeral (such as the numeral \(yi\)
‘one/a’ in \(yi\) xie / \(yi\) dian ‘some’ in Chinese) would show different selectional properties.
This also seems to be a correct result. We shall come back to these vague counting
classifiers in Section 4.4.3.

\(^{72}\) In some dialects of Chinese and many Southeast Asian languages, bare CL-N sequences can be found. This phenomenon is not a counterexample to our analysis, however. Simpson et al. (2010) argue convincingly that cross-linguistically CL-N constructions (whether interpreted as definite or indefinite) necessarily involve an unpronounced ONE (being a default numeral).
In some cases, it seems that the unpronounced lexical item [unit] is overtly realized. Chao (1968) notes that the a group of ‘strict count’ nouns in Mandarin form a compound with the classifier. Notably, these N-CL compounds are strictly count, and they resist a mass interpretation:

(248) a. hua-duo  
   flower-CL  ‘flowers’

b. ma-pi  
   horse-CL  ‘horses’

c. chuan-zhi  
   ship-CL  ‘ships’

d. che-liang  
   car-CL  ‘cars’

e. shui-di  
   water-drop  ‘drops of water’

f. bu-pi  
   cloth-CL  ‘pieces of cloth’

This morphological compounding is not syntactically productive, however. One cannot form a strict count noun by freely compounding a noun with its classifier:

(249) a. *gou-zhi  
   dog-CL  ‘dogs’

b. *ren-wei  
   person-CL  ‘people’

c. *jiu-di  
   wine-drop  ‘drops of wine’

d. *guo-li  
   fruit-CL  ‘fruits’

Furthermore, strict count nouns can also be counted with an additional classifier phrase, and they prefer to be plural (and vague), while judgments vary in the singular cases:

(250) a. ji  
   some  
   flower-CL  ‘some flowers’

duo  
   good  
   many  
   car-CL  ‘a good many cars’

b. hao  
   good  
   many  
   tai/liang  
   che-liang  ‘a good many cars’
A similar example can be found in Dutch, where a class of strict count nouns is also observed in the contexts of diminutive suffixes. Wiltschko (2006) and De Belder (2008) notice that in Dutch and German, diminutive suffixes (in addition to plural markers) always give rise to plural interpretations (the original observation is attributed to Henk van Riemsdijk in Wiltschko 2006):

(252) a. veel zout   b. veel zout-je-s  
much salt       many salt-Dim-PL
‘much salt’    ‘many salt crakers’

(253) a. veel brood  c. veel brood-je-s  
much bread      many bread-Dim-PL
‘much bread’    ‘many rolls’
The paradigm suggests that the diminutive suffixes may also occupy the functional item [unit] in the proposed theory. It defines the unit for counting and necessarily generates a count structure.

4.4.2 NUMBER and AMOUNT: Unpronounced Nouns in English

Diverging from the standard assumption, Kayne (2005, 2007) argues that a numeral or a quantificational modifier does not directly take the head noun of a nominal expression as its complement (or its direct modifiee). Instead, it is suggested that there is a covert unpronounced noun located between the numeral and the head noun. Therefore, (254a) should in fact be analyzed as (254b):

(254) a. two cats
    b. two NUMBER cat-s

Empirical evidence for the proposal comes from expressions like *a few students*, and *a little money* (from Kayne 2005, 2007):

(255) a. a few NUMBER student-s
    b. a little AMOUNT money

Note that these phrases are actually syntactically anomalous, *few* appears to be a modifier of *students*, but the indefinite article *a*, nevertheless, requires a singular noun. Kayne’s
solution is to assume hidden unpronounced nouns: NUMBER between a few and students (for count structures) and AMOUNT between a little and money (for mass structures).

The proposal also provides a straightforward solution to another inconsistent pattern in (256), where few and famous are both adjectives:

(256)  a. Few are very intelligent.

        b. *Famous are very intelligent.

The pattern is explained if a silent NUMBER is taken into account, since it is quite odd to claim that famous is a modifier of NUMBER:

(257)  a. Few **NUMBER** are very intelligent.

        b. Famous **NUMBER** are very intelligent.

In a footnote, Kayne (2005: 147, 17n) suggests that the unpronounced number can be treated in a classifier-like fashion. Building on this suggestion, let us assume that the covert NUMBER (NUM) occupies the classifier position in English numeral constructions, parallel to the classifier constructions in (247):

(258)  a. two student-s

        b. two_{A^*} [unit] (A^*[unit] = PL -s)

        |   |   |   |
        |   |   |   |
        NUM_{(=CL)} student
On the other hand, in a mass structure, where [unit] is unavailable (represented here by $[\emptyset \text{unit}]$), a counting numeral is not licensed, but a quantifier like *much* or *some*, can appear in the structure which we take to be a modifier of the silent noun AMOUNT:

(259) a. much money
    
    b. much ——— $F_{[\emptyset \text{unit}]}$
        |
        |
        AMOUNT ——— money

4.4.3 Vague Classifiers: *a few* and *a little* vs. *xie* and *dian*

Turning back to *a few* and *a little* in English, let us refer to the expressions that do not convey an exact quantity as Vague Quantity Constructions (including things like *many/much, some, several*, among others). Assume that *a few students* and *a little water* have the structures below:

(260) a. a few students
    
    b. ONE/a ——— [unit] (A*+[unit] = PL -s)
        |
        |
        NUM ——— student
        |
        few-A*
(261)  

<table>
<thead>
<tr>
<th>a. a little water</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. ONE/a \quad --- \quad F_{\text{unit}}</td>
</tr>
<tr>
<td>\quad AMOUNT.A^* \quad --- \quad money</td>
</tr>
<tr>
<td>\quad \quad \quad little</td>
</tr>
</tbody>
</table>

I take *few* and *little* as modifiers of NUMBER and AMOUNT, respectively. I assume that the numeral is occupied by a default numeral ONE, pronounced as *one* or *a* (the reduced form) in English. Comparing (258), (260) and (261), it is crucial to identify the sources of A* in these constructions. The A* operator comes from the plural counting numeral in (258), from the plural modifier *few* in (260), and from the classifier AMOUNT in (261). The complimentary distributions of A* operators suggest an important property of the A* operator. It is a quantificational property extended from the lexical node to the whole classifier domain (reminiscent of Quantifier Raising). The complimentary distributions also explain why the following expressions are illicit:

(262)  

| a. *two few students  \quad (intended: two groups of few students) |
| b. *two little water  \quad (intended: two amounts of waters) |

Under the current analysis, the reason is that two A* operators overlap in one CL-N domain:
Let us turn to the vague classifier constructions in Chinese. Similar to the English *a few* and *a little*, Chinese has *yi xie* and *yi dian*. *Yi* is the numeral ‘one’ in Chinese, *xie* means ‘fewness’ and *dian* means ‘spot’ or ‘little amount.’ However, unlike English, where *a few* selects strictly for count nouns, and *a little* for mass, *yi xie* may give rise to either count or mass readings, while *yi dian* typically selects only mass nouns (for most speakers):

(264) a. Ta du-guo *yi xie* shu
    he read-Asp one *XIE* book
    i. ‘He read some books.’          [count]
    ii. ‘He received some education.’  [mass]

b. Ta du-guo *yi dian* shu
    he read-Asp one *DIAN* book
    i. %*‘He read some books.’        [count]
    ii. ‘He received some education.’  [mass]

(265) a. Zhangsan chi-le *yi xie* pingguo.
    Zhangsan eat-Asp one *XIE* apple
    i. ‘Zhangsan ate some apples.’     [count]
    ii. ‘Zhangsan ate some apple (parts).’  [mass]

b. Zhangsan chi-le *yi dian* pingguo.
    Zhangsan eat-Asp one *DIAN* apple
    i. %*‘Zhangsan ate some apples.’     [count]
    ii. ‘Zhangsan ate some apple (parts)’ [mass]

In the literature, it is usually suggested that *yi xie* and *yi dian* might be analyzed as a single morphological unit (i.e., they are a bi-syllabic quantifier of some type). Therefore, *yi xie* and *yi dian* are treated syntactically on a par with other bi-syllabic quantifiers, such
as yi-qie ‘all’ and yi-ban ‘half’. However, in view of the following two facts, such a view cannot be maintained. I suggest instead that xie and dian should be treated as syntactic classifiers, and yi as a typical numeral. The first piece of evidence that suggests that xie and dian are not a single morphological unit comes from the test of classifier reduplications. Observe the following examples:

(266) a. Zhangsan shuo-chu yi jian-jian shiqing
    Zhangsan say-out one CL-Red thing
    ‘Zhangsan discloses many things (one after another).’

    b. Zhangsan chi-le yi ke-ke pingguo.
    Zhangsan eat-Asp one CL-Red apple
    ‘Zhangsan ate many apples (one after another).’

(267) a. Zhangsan xiang zhidao yi-qie(*-qie) shiqing
    Zhangsan want know one-cut-cut thing
    ‘Zhangsan wants to know everything.’

    b. Lisi zhi shuo-chu yi-ban(*-ban) shishi.
    Lisi only say-out one-half-half fact
    ‘Lisi only reported half of the fact.’

(268) a. Zhangsan xiang zhidao yi xie(-xie) shiqing
    Zhangsan want know one XIE-Red thing
    ‘Zhangsan wants to know some things.’

    b. Lisi zhi shuo-chu yi dian(-dian) shishi.
    Lisi only say-out one DIAN-Red fact
    ‘Lisi only reported a partial fact.’

Classifier reduplication is productive in typical Num-CL structure, as evidenced in (266), and the rule is sensitive to the syntactic structure. For a bi-syllabic quantifier that happens to use one in the numeral position, classifier reduplication is not applicable, as in (267).
The fact that classifier reduplication can apply to yi xie and yi dian therefore suggests that xie and dian should be treated as classifiers syntactically.

Let us turn to the numeral yi. In Mandarin Chinese, the numeral yi ‘one’ (and only yi) can undergo one-omission in the post-verbal position:

(269) a. Zhangsan zuo-le (yi) fen zaocan.
    Zhangsan make-Asp one CL breakfast
    ‘Zhangsan fixed a breakfast.’

    b. Lisi zhu-le (yi) bei kafei.
    Lisi cook-Asp one cup coffee
    ‘Lisi made a cup of coffee.’

Turning to yi in yi xie and yi dian, the numeral yi in these examples may also undergo one-omission. Contrastively, the lexical compounds yi-qie and yi-ban are not subject to this test, and one-omissions turn out to be ungrammatical. Observe the contrast between (270) and (271):

(270) a. Zhangsan chi-le (yi) xie shuijiao. [yi omission okay]
    Zhangsan eat-Asp one XIE dumpling
    ‘Zhangsan had some dumplings.’

    b. Lisi he-le (yi) dian kafei. [yi omission okay]
    Lisi drink-Asp one DIAN coffee
    ‘Lisi drank some coffee.’
This piece of evidence suggests that *yi* before *xie* and *dian* be treated as a numeral (restricted to *one*).

The above paradigms then argue for a syntactic analysis that treats *yi xie* and *yi dian* as typical numeral classifier constructions. However, while *xie* and *dian* are classifiers, they differ from other classifiers in not allowing specific counting. Instead, they only facilitate a vague sense of counting, and they display sensitivity to mass/count distinctions. The properties of these vague classifiers are reminiscent of *a few* and *a little* in English. In fact, we can come up with a universal representation of vague classifiers (or vague quantifiers) by analogizing Chinese *xie* and *dian* as overt morphologically counterparts of *few-NUMBER* and/or *little-AMOUNT* in English. Therefore, the syntax of *yi xie* and *yi dian* can be analyzed in the following fashions:

---

73 The fact that *xie* and *dian* are classifiers should pose problems to the popular view that the semantics of classifiers is simply to facilitate counting in grammar.
The differences of vague classifiers/quantifiers in Chinese and English, then, are kept minimally to the selectional properties (with respect to the relation \{k, k’\}). Specifically, while *(few)* \textit{NUMBER} and *(little)* \textit{AMOUNT} in English select a count and mass structure, respectively, in Chinese, \textit{XIE} optionally, while \textit{DIAN} strongly, selects for the mass structure. The differences between Chinese and English nominal expressions, then, are structurally unified, which eventually echoes our view of language uniformity. The parameterized differences between the two languages are morphological properties (or pronunciation patterns).

One particular note here is that the default numeral \textit{ONE} (or a reduced \textit{a}) does not seem to have a strong selection for the \[\text{unit}\], or the count structure. Instead, it may also occur in mass contexts (such as \textit{a little} in English and \textit{yi dian} in Chinese), where \textit{AMOUNT} is
coupled with ONE. The loose selectional properties of the numeral ONE can be
evidenced by the fact that singular count nouns, but not plural ones, are rather flexible in
having a mass interpretation. Consider the following examples involving the distributive
quantifier *dou* in Chinese:

(274) a. Shui dou shi hong-se de
water all Aux red-color DE
‘The whole water is red.’

b. Zhe liang tai che dou shi hong-se de.
this two CL car all Aux red-color DE
‘These two cars are both red (but not necessarily every part).’

c. Zhe yi (zheng) tai che dou shi hong-se de.
this one whole CL car all Aux red-color DE
(i) ‘The whole car is red (in every parts, including the windows, wheels, etc.).’
(ii) ‘The car is always red.’
(iii) ‘The car is red (but not necessarily every part).’

The exhaustive/distributive quantifier *dou* requires a mass or plural argument, and resists
a singular argument (since a singular argument resists distributivity). When *dou* takes a
singular argument, such as *this car* in (274c), however, either the quantified argument of
*dou* is a hidden plural events (*always*), as in (274cii), or the singular argument is in fact
interpreted like a mass term, which cancels the atomic [unit]. This is indicated by the
interpretation (*the whole N → every part of N*) in (274ci), where the singular noun no
longer denotes an atomic singular object by itself, but rather a collection of its sub-parts
(Moltmann 1998). The semantic interpretation of the given singular object, then, becomes
a non-countable mass interpretation, like *furniture* in English. Such flexibility is, however,
not extended to plural nouns, where the atomic [unit] is obligatory. Therefore, when the exhaustive quantifier *dou* is used, the property of being red is distributed only to the atomic individual in the plural set (namely, each car), but not necessarily to their subparts, and the interpretation remains a count one.\(^ {74} \)

### 4.4.4 Measure Classifiers

Measure words are often used in the pseudo-partitive constructions, where the *of*-complement NP of the measure word can only be mass or plural terms, as shown in (275a) and (275b). Additionally, the plural agreement on the measure word is obligatory, as in (275c):

\[(275) \begin{align*}
\text{a. a cup [of chocolate]} & \quad \text{[mass]/*[singular]} \\
\text{b. a cup [of chocolates]} & \quad \text{[plural]} \\
\text{c. two cups of chocolate}
\end{align*}\]

Chinese does not display plural morphology in the corresponding cases. However, the following phrase is still ambiguous:\(^ {75} \)

\[(276) \begin{align*}
\text{yi bei qiaokeli} & \\
\text{one cup\textsubscript{CL} chocolate} & \\
\text{a. ‘a cup of chocolate’} & \quad \text{[mass]} \\
\text{b. ‘a cup of chocolates’} & \quad \text{[plural]}
\end{align*}\]

\(^ {74} \) Syntactically, the property of *whole* in English, or *zheng* in Chinese, can be accounted for if we assume that they are in fact modifiers of the silent head AMOUNT. The analysis lends further support to Kayne (2005).

\(^ {75} \) The ambiguity also recalls the language uniformity principle (Chomsky 2001:2), and a reasonable analysis is that Chinese employs a covert plural morphology that is not PF-interpreted (at least for non-human objects; see Li 1999 for the discussion of the plural marking –*men* in Chinese).
The ambiguity shows that the same mass/plural distinction is observed in Chinese measure classifiers, in spite of the lack of overt morphological cues. The plurality of (276b) can be revealed by predicates that are sensitive to count structure (Moltmann 1998), such as the verb *compare*, as shown in (277). While the mass reading is not compatible with count-sensitive predicate, as indicated by the unavailability of (277a), the plural reading is admissible to this type of predicate, as in (277b):

\[(277)\quad \text{Zhangsan zixi-de bijiao-le zhe yi bei qiaokeli,} \\
\text{(faxian mei ke dou bu yiyang da) discover every CL all not same big}\]

\[a. \quad \# \text{‘Zhangsan compared this cup of chocolate.’} \]
\[b. \text{‘Zhangsan compared this cup of chocolates, (and he found that every chocolate is different in sizes.’} \]

If one assumes the standard analysis of [this one cup/CL chocolate] = [D Num CL N], where plurality is due to part of the functional structure, such as the Number Phrase, the contrast in (277) is unaccounted for without further stipulations.

In fact, in the canonical pseudopartitive structure: [N₁ of N₂], one can even modify N₂ with another quantifier:

\[(278)\quad \text{a. a cup of many chocolates}\]
\[\text{b. a bowl of many eggs}\]
In Chinese, as well, the second N can be modified by an overt quantifier (Chao 1968):

(279) 

a. yi bei henduo de qiaokeli
one cup many DE chocolate
‘a cup of many chocolates’

b. yi wan shu ke de dan
one bowl several CL DE egg
‘a bowl of several eggs’

Reflecting the rather independent status of the second N, let us assume that the pseudopartitive constructions actually consist of two nominal domains, which are connected by a higher-ordered connective \{K, K’\} (where in English, they are realized as \{of, OF’\}). The structure of the two connected nominal domains can be visualized as in (280), where the bold-faced lines represent a higher-ordered connective pair that ‘merges’ the two nominal domains:

(280) 

a. two cups of (many) chocolates

b. liang bei qiaokeli
two cup chocolate
‘two cups of chocolates’

c. 

\[
\begin{array}{c}
\text{two-A*} \quad \text{[unit]} \\
\text{NUMBER} \quad \text{cup} \\
\text{A*} \quad \text{[unit]} \\
\text{NUMBER} \quad \text{chocolate}
\end{array}
\]

Due to this partitive connective, a selection of the A* operator holds between the two connected nominal domains. This explains why only mass or plural readings can appear
in the pseudopartitive constructions. The above structure illustrates how the plural reading comes from the structure (the A* operator of the covert numeral #), whereas the structure in (281c) below illustrates the source of the mass reading, where the A* operator of the AMOUNT is selected instead:

(281) a. two cups of chocolate
   b. liang bei qiaokeli
two cup chocolate
   ‘two cups of chocolate’
   c. two-A* [unit] Ø [Ø unit]
      |       |               |
      NUMBER cup AMOUNT-A* chocolate

The selectional property of the A* operator may also come from other syntactic predicates. One illustrative instance is between a collective verb and its argument(s). For example, (280) and (281) both consist of two A* operators. This accounts for the sources of ambiguity in the following example (modified from Link 1983):

(282) John reshuffled two decks of cards.
   a. ‘John separately reshuffled two decks of cards.’
   b. ‘John reshuffled (a single deck of) cards that consists of two decks in number’

This particular example, like the one in (280), has two A* operators from \textit{two} and an unpronounced \textit{MANY}. \textit{Reshuffle} being a verb (like \textit{count}) that selects the A* operator as
its argument, the meaning in (282a) is available when the first A* operator (of two) is selected as its main argument, while the meaning in (282b) comes from the fact that the A* of the unpronounced MANY is selected as the main argument.

An intriguing puzzle may further reveal the phrase structural properties of measure classifiers. Observe the following contrast:

(283)  

(a) a cup of (many) chocolates/cookies  
(b) a cup of (*much) chocolate/wine

The surprising puzzle is that the count quantifier many may appear as a modifier of the plural nouns, but the mass quantifier much cannot appear in the pseudo-partitive constructions. To the best of my knowledge, such a contrast has never been well accounted for in the literature.

Under the proposed analysis, however, one way to capture such a contrast is to assume a parameterization of the mapping of the connectives to the phrase structures. Specifically, we can hypothesize that a syntactic mechanism, Fusion, may apply to the mapping rules from the symmetric structures to the phrase structures. When Fusion applies to the structure in (281c), repeated as follows, two adjacent projections will be mapped to the same node in the phrase structures, reminiscent of ‘head-adjunction’ in the standard theory:
Applying Fusion to the resulting structure bleeds the mass modifier of much, since the fused elements, AMOUNT, already functions as a modifier of the [unit]+cup. Fusion may not apply, however, in the plural pseudopartitive constructions (i.e. a cup of MANY NUMBER chocolates). This constraint in English might be due to the fact that Num is occupied by a (possibly covert) well-functioning Numeral when the following NP is a plural one.

The parameters of applying Fusion run into further complications in view of the data in Chinese. In Chinese, both mass and plural behave alike with respect to the additional modifiers of the main noun. Therefore, the following phrase is ambiguous:
The paradigm suggests that Fusion may not apply in Chinese in both mass and plural pseudopartitive constructions. However, a further complication can be brought into the discussion when we consider the occurrence of *de* in Chinese. Note that in examples like (285), the linking connective *de* is obligatory, while typically it is optional elsewhere:

(285) yi bei hen-duo de qiaokeli
one cupCL many/much DE chocolate
a. ‘a cup of many chocolates’
b. ‘a large cup of chocolate’

Although the syntactic status of *de* is still controversial, one significant clue to its status is that *de* is obligatory when it signals the modifier status of the associated elements (Li 2008). Observe the following example (cf. Schwarzschild 2006):

(286) a. Lisi chi-le hen-duo (de) qiaokeli
    Lisi eat-Asp many/much DE chocolate
    ‘Lisi ate many/much chocolate(s)’
b. Lisi chi-le yi bei hen-duo *(de) qiaokeli
    Lisi eat-Asp one cupCL many/much DE chocolate
    ‘Lisi ate a cup of many chocolates/a large cup of chocolate.’

(287) a. shi ke (de) pingguo
    ten CL DE apple
    ‘ten apples’
b. yi xiang shi ke *(de) pingguo
    one boxCL ten CL DE apple
    ‘a box of ten apples’

(288) san gongsheng (de) shui
    three milliliter DE water
a. ‘three milliliters of water’     (de optional: pseudopartitive)
b. ‘three-milliliter water’       (de obligatory: appositive modifier)
When *de* is obligatory in the surface form, the appositive measuring phrases in (288b) and (289), are always syntactic modifiers. Let us go back to the pseudopartitive constructions in (286b) and (287b). If the same reasoning goes through, this signals that the numeral-classifiers and quantificational adjectives in these examples might also be syntactic modifiers. Reflecting this observation, then, we might say that Fusion also applies in Chinese, but it applies to a different domain:

\[(290)\]

\[
\begin{array}{c|c|c}
\text{two-A}^* & \text{cup} & \text{chocolate=N}_2 \\
\text{NUMBER} & \text{AMOUNT-A}^* & \text{Ø} \\
\hline
\end{array}
\]

Fusion

The application of Fusion might be due to a skeletal effect (a representational phrase structural skeleton in the sense of Williams 2003). Assume that the surface skeleton of a Chinese NP is [Num-CL-N]. The structural competition between the silent AMOUNT and the measure classifier may have caused the former element to be mapped to a syntactic modifier, and hence triggering Fusion between AMOUNT and N₂.

In the configuration (290) above, the dual status of the ‘classifier’ also recalls the adjunction analysis of mass classifiers (Cheng & Sybesma 1998):
The proposed structure in Cheng & Sybemas attempts to capture the dual syntactic status of classifiers by employing small clause and head adjunction analyses. The mixed analysis is reconstrued in the proposed analysis as a chain relation between AMOUNT and wan ‘bowl’ (the former fused with the noun), and the substantive role of the classifier comes from the fact that the surface ‘classifier’ is analyzed in our framework as a noun coupled with the functional item Numeral in another nominal domain.

4.5 Conclusion

This chapter presents a novel theory of the nominal constructions in English and Chinese. It is shown that symmetric syntax that employs the mechanisms of parallel merge can capture several important properties of the nominal constructions, some of which are problematic for standard analyses. For example, Riemsdijk’s problem that both classifier and noun are able to receive a theta role is now tackled by the assumption that both classifier and noun are parallel substantive roots (in the theta domain), and it is their associated functional category that eventually defines the semantic roles of the classifier.
and noun. We have also shown that classifier and noun are independently associated with a functional category, Numeral and [unit], respectively. In semantics, the combination of Numeral (or the A* operator) and [unit] provides us a new way of looking at the mass-count distinction. This proposal then shed light on the plural mass noun problem noted in the literature.
CHAPTER 5  ON TWO TYPES OF INDEFINITES AND PARALLEL MERGE

This chapter develops the theory originally proposed in Liao (2009) and presents a theory of indefinite NPs that provides support for parallel merge in the proposed symmetric syntax. It will be argued that the nominal functional item, a determiner, is directly merged with the verbal functional item, with the result that the verbal-nominal correspondence in the interpretation of the indefinite NPs is directly accounted for.

The chapter is organized as follows. Section 2 reviews previous proposals of Li’s (1998) and Tsai’s (1999, 2001). A unified syntactic analysis of indefinites is proposed in Section 3, and it is shown how this can account for different readings of indefinites. Section 4 proposes a dynamic syntax-semantics mapping mechanism related to syntactic parallel merge.

5.1  Introduction: Quantity vs. Existential indefinites

Consider the following English sentence, which is ambiguous between (292a) and (292b):

(292) Three people cannot play this game.

   a. ‘This game is not designed to be played by three players.’
   
   b. ‘There are three people that are forbidden to play this game.’
The ambiguity is usually attributed to the LF scopal interactions between the indefinite NP (three people) and the negative modal auxiliary verb (cannot). Therefore, if three people takes lower scope under the modal auxiliary, we obtain the quantity reading in (292a), while if three people takes higher scope over the modal auxiliary, we have the existential reading in (292b).

The fact that English does not display surface syntactic transformations in different readings more or less increases the difficulty in studying the properties of bare numeral indefinites (e.g. three people, a student, and five animals, etc.). Interestingly enough, Chinese displays transparent scope markings when a numeral indefinite argument appears in a preverbal position (e.g. subject or topic positions). Observe the examples in (293):\(^7\)

(293) a. San ge ren bu-neng wan zhe ge youxi.
   Three CL person Neg-can play this CL game
   ‘This game is not designed to be played by three players.’

   b. *(You) san ge ren bu-neng wan zhe ge youxi.
      have three CL person Neg-can play this CL game
      ‘Three people are forbidden to play this game.’

The Chinese bare numeral subject in (293a) does not yield ambiguity, and it has to be interpreted as having a lower scope than the negative modal auxiliary verb bu-neng ‘can-not’. Hence, only the quantity reading is available (see Huang 1982). On the other

\(^7\) While most speakers find it ungrammatical, some native speakers seem to accept the sentence like (293b). In this chapter, we shall limit ourselves to the former speaker group (namely, people who do not accept an existential indefinite subject without a you marker).
hand, when the bare numeral subject obtains a higher scope existential reading, a surface scope marker *you* (which literally means *have or exist*) is obligatory, as shown in (293b).

As for indefinite objects, a transparent scope marking strategy is still employed. When an indefinite object has a higher scope reading, not only is a *you*-marker obligatory, but it also triggers object fronting, or topicalization, as shown in (294a). When the *you* marker is not present, the in-situ object can only obtain a lower scope reading, as in (294b):

(294) a. *(You) san ge xuesheng, mei wei laoshi dou jiao-guo e_i have three CL student every CL teacher all teach-Asp ‘There are three students such that every teacher has taught them before.’

   b. Mei wei laoshi dou jiao-guo san ge xuesheng every CL teacher all teach-Asp three CL student ‘Every teacher has taught (at least) three students.’

Regarding the *you*-marker in the subject indefinites, Cheng (1991), Li (1998), and Tsai (1999, 2001), among others, propose the *you*-marker rule: existential subject indefinites in Chinese need to be licensed by the existential scope marker *you*. Nevertheless, as also observed in Tsai (1999, 2001), there are exceptions to the *you*-marker rule since some constructions do allow an indefinite subject without the *you* marker, and in these constructions, both the subject and the object indefinites necessarily have quantity readings (note that with *you*-marker, however, subjects and topicalized objects still have an existential reading in these constructions):
(295) Environments where a subject you-marker need not occur (modified from Tsai 2001: 146):

a. V-de/bu-V constructions
san ge ren chi-de-wan wu wan fan
three CL people eat-can-finish five bowl rice
‘(Generally speaking), three people can finish five bowls of rice’

b. flip-flop constructions (the canonical order of object and subject is reversed)
san zhang chuang shui shi ge ren
three CL bed sleep ten CL people
‘Ten people share three beds (as a rule).’

c. modal constructions
san ge xuesheng keyi/yingai jiao shi fen zuoye
three CL student can/should hand.in ten CL assignment
‘Three students should hand in ten assignments (as an order)’

d. enough-constructions
san tai che gou zuo shi ge ren
three CL car enough sit 10 CL people
‘Three cars are/is enough to carry ten people.’

e. conditional/counterfactual constructions
ruguo san ge ren jiao shi fen zuoye, wu ge ren ne?
if three CL people hand.in ten CL assignment five CL people Q
‘If three people hand in ten assignments, how about five people?’

f. (generic) characterizing sentences
San zhi yazi you liu zhi chibang
three CL duck have six CL wing
‘Three ducks have six wings.’

To summarize the data, we form the following generalizations:
(296) a. With respect to subject indefinites, (i) such elements have quantity readings in the environments in (295); (ii) they have existential readings with the you-marker in any environment.

b. With respect to object indefinites, (i) when in situ, such elements have quantity readings in the environments in (295), and (ii) when in situ, they have existential readings in the environments other than (295), and (iii) when fronted to the topic position with the obligatory you-marker, they have existential readings

At this point, we may ask the following questions. (i) Why do the environments in (295) do not require the you-marker in the preverbal subject/topic positions, and why do these environments force the quantity readings of indefinite subject/object (while other environments generally yield the existential readings)? (ii) How do we formulate the correspondence between the readings of the indefinite arguments and their syntactic environments? These related questions will guide the central lines of inquiry in this chapter.

To answer the first question, we find that all of the environments in (295) typically contain some kind of generic/root modal auxiliary and a null (neutral) aspect, while the syntactic contexts that allow existential readings generally contain an aspectual marker (for the in-situ object) and the you marker (for the subject and the fronted object). This interaction between aspect/modal and indefinites indicates that the interpretations of
indefinite NPs actually bear on their verbal functional environments (as observed in Tsai 2001). To formulate this nominal-verbal correspondence, we argue that the proposed parallel merge in the symmetric syntax provides a straightforward account to the nominal-verbal parallelism. Parallel merge can be schematized as in (296), in which the functional nominal item (a determiner) is parallel-merged with another functional item in the verbal domain:

(297) The Mod-Asp domain (= The v-V domain)

Employing the structural mapping rules introduced in Chapter 3, the symmetric Merge-markers can be unpacked to the (more familiar) phrase structures below, in which the subject and object domains are in parallel to each other:

---

77 As mentioned in earlier chapter, Sportiche (2005), based on certain asymmetries of LF reconstruction, also comes to a similar conclusion that D and N are introduced into the structure in a ‘split’ way.
I suggest that the effects of quantifications can be accounted for in terms of feature agreement (Chomsky 2001, 2008). We assume that the indefinites arguments are associated with an indefinite determiner that is inherently unvalued with respect to its quantificational feature. In a simple case, the unvalued (but interpretable) quantificational feature i[_QF] on the subject D probes the valued feature i[QF] of the Modal head in the subject domain, and its [QF] is in turn valued (recall the feature agreement in Chapter 2). The same mechanism applies to the quantificational feature on object D, which probes (and is then valued by) the i[QF] of the Aspectual head (some complications will be dealt
with later). Accordingly, parallel merge extends the referentiality of an argument NP to its corresponding verbal domains. With overt aspectual markings and the *you* marker, Chinese allows us to observe the quantificational valuations in a rather transparent way.

One of the advantages of adopting the proposed mechanism is that the quantificational forces can be attributed to the lexical features of aspectual and modal elements. Therefore, this approach avoids a violation of the inclusiveness condition (Chomsky 1995), which the traditional mapping hypothesis fails to do (since it conditions the structural quantifications upon certain maximal projections). Another advantage of the proposed analysis is a unified syntax of the bare numeral indefinites in Chinese. I also argue that the *you* marker should be analyzed as a verbal element (i.e. a predicate), and the apparent indefinite subject introduced by *you* is actually an internal argument that is also subject to the parallel merge. This proposed analysis therefore concludes that all bare numeral indefinites share the same syntax.

### 5.2 Two Previous Approaches

This section critically reviews the analyses in Li (1998) and Tsai (1999, 2001). The *with-in* analysis in Li (1998) analyzes the problems under discussion by adjusting the internal structures of nominal expressions: Quantity indefinites are projected as NumP, while existential indefinites as DP. On the other hand, the *with-out* analysis in Tsai (1999, 2001) approaches the question by looking into the licensing environments of different types of indefinites. Although several aspects of their insights can be preserved, we show that some of their assumptions might induce undesired theoretical consequences. A
unified approach that combines Li’s and Tsai’s insights can be sought in the dual-DP analysis in Zamparelli (2000), which this chapter bases its analysis on. We also look into the environments proposed in Tsai (1999, 2001), listed in (295). I argue that the environments are related to certain aspectual and modal elements, and the interactions between them.

5.2.1 DP vs. NumP: Li’s (1998)

Li correctly points out that the distinctions between the two types of indefinites can be clearly drawn with the fact that quantity indefinites induce no existential presuppositions (i.e. no actual reference, but only quantity information), while existential indefinites do.

As a consequence, even without any specific three people or five bowls in mind, a speaker can still say a sentence like (295a). Nonetheless, when the you-marker appears, the existential readings for the indefinite subjects emerge again (but the object indefinites in these examples remain quantity-denoting):

\[(299) \text{ a. (cf. (295a))} \]
\[
\text{You san ge ren} \quad \text{chi-de-wan wu wan fan} \\
\text{have three CL people eat-can-finish five bowl rice} \\
\text{‘There are three people who can finish five bowls of rice’}
\]

\[\text{b. (cf. (295b))} \]
\[
\text{You san tai che (tongchang) zuo shi ge ren} \\
\text{have three CL car usually sit ten CL people} \\
\text{‘There were three cars such that (each of) them usually carry ten people.’}
\]
Unlike in (295), when a speaker utters the sentences in (299), it is always the case that some three people and some three cars are presupposed (i.e. they exist in the actual situation). A useful diagnosis is available, utilizing existential presupposition. Consider the following examples, which contrast existential and quantity indefinites in the subject position:

(300) a. **You san ge ren** lai le, #(keshi mei you san ge ren) have three CL person come Perfect but not have three CL person ‘Three people have come, #(but there are no three people here).’

b. **San ge ren** chi-de-wan, (keshi mei you san ge ren) three CL person eat-can-finish but not have three CL person ‘Three people can finish it, (but there are no three people here).’

Due to the existential presupposition of existential indefinites, falsifying the existence of the event participants yields a contradiction in (300a). On the other hand, falsifying the existence of a quantity indefinite that does not have an existential presupposition, as in (300b), does not in any way degrade the sentence.

As for the syntactic treatment of the two types of indefinites, Li adopts the hypothesis that referentiality is directly correlated with D(eterminer), and claims that a straightforward way of capturing the difference is to assume that they have different syntactic structures. Li proposes that quantity indefinites simply do not project to DP, but

---

78 The existential presupposition is equivalent to the ‘actuality entailment’ in Bhatt (1999) and Hacquard (2006, 2009). In fact, both authors attribute the actuality entailment to the semantics of Aspect and Modality, e.g. Hacquard (2006, 2009) suggests that the actuality entailment comes from the perfective aspect while the non-actual entailment comes from the imperfective aspects and/or root modality. Essentially, the proposed analysis here is trying to develop a syntactic mechanism to capture such an effect.
occur as simple Number Phrases (NumP) in the derivation, as shown in (301a). In addition, since existential indefinites are referential expressions, they are projected as DP, shown in (301b):

(301) a. Quantity(-denoting) Indefinites

\[ \text{NumP san [CLP ge [NP xuesheng]]]} \text{ chi shi wan fan.} \]

\( \text{three CL student eat ten bowl rice} \)

‘(Any) three students eat ten bowls of rice.’

b. Existential (individual-denoting) Indefinites

\[ \text{you [DP D [NumP san [CLP ge [NP xuesheng]]]]} \text{ chi-le shi wan fan.} \]

\( \text{have three CL student eat-Asp ten bowl rice} \)

‘(Certain) three students ate ten bowls of rice.’

Li’s analysis, though straightforward, may need further elaborations. Li argues that a NumP is licensed when the linguistic context is quantity-denoting, while DP is projected when the linguistic context is not quantity-denoting. What is meant by

‘quantity-denoting’ context is an expression like (some amount) is enough to or be able to finish (an amount), and the ‘quantity contexts’ from the environments in (295). However, it is not always clear what constitutes a quantity context, and how this notion may affect the derivational procedure of a determiner. Therefore, it is important is to identify the structural cues that may define the quantity contexts. Furthermore, consider the selectional restriction of a transitive verb. If Li’s analysis is to be maintained, a transitive verb would freely select either a NumP or a DP as its complement. In such cases, however, subcategorization could no longer be local (in contrast with the standard assumption, e.g., ECM verbs vs. non-ECM verbs), but would rather be contingent on something outside the local domain. If such an approach is to be maintained, one might
need to develop an alternative theory of selection. There also seems to be a tricky redundancy in the analysis. If the parameter for interpreting an indefinite is set on the (pragmatic) contexts, it may seem redundant to set another structural parameter on the syntax of indefinites per se. Instead, an analysis that aims to eliminate such a redundancy will be pursued here.

One of the most challenging tasks here is to spell out specifically what constitutes the ‘natural class’ of the linguistic environments in (295) that license quantity readings. As will be elaborated in Section 5.4, I propose that different readings of indefinites are actually contingent on the aspectual/modal elements and their interactions. To this end, it will be argued that Li’s insight can be maintained by departing from the standard DP analysis (where D and NP are merged as a unit), and assuming DP is always a derived structure (recall Sportiche 2005 in Chapter 3). Let us assume that D is merged outside NP, and is directly merged with the Aspectual/modal elements (which define its quantificational property or referentiality). In this way, we can maintain that all indefinites are structurally DP (see also Simpson 2005), and that the referentiality of D is dependent on the verbal elements that the D is merged with. The proposed parallel merge, as we shall see in the Section 3, is a syntactic mechanism that pursues this line of research.
5.2.2 Extended Mapping Hypothesis: Tsai (1999, 2001)

The analysis in Tsai (1999, 2001) is an effort to characterize the licensing environments of indefinite expressions in Chinese. As in Heim (1982), Tsai treats an indefinite expression as a restricted variable that needs a contextual quantification (through a general syntax-semantics mapping mechanism). Revising Diesing (1992), Tsai develops an extended mapping mechanism in derivational terms:

(302)  Extended Mapping Hypothesis: (from Tsai 2001: 132)

a. Mapping applies cyclically, and vacuous quantification is checked derivationally.

b. Materials from a syntactic predicate are mapped into the nuclear scope of a mapping cycle.

c. Materials from XP immediately dominating the subject chain of a syntactic predicate are mapped outside the nuclear scope of a mapping cycle. A subject chain is an A-chain with its tail in a subject position.

d. Existential closure applies to the nuclear scope of a mapping cycle.

Let us consider the case of you-NP. The reason why you must occur in non-quantity indefinites is in order to avoid vacuous quantification.\(^79\) Tsai assumes that V-to-I movement does not apply in Chinese due to the lack of any agreement morphology (we shall also argue against this head-movement approach later). Therefore, unlike English in

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\(^79\) The term ‘vacuous quantification’ is understood here in two ways: (i) an operator has no variables to bind, and/or (ii) a variable is not bound by an operator.
(303a), the nuclear scope in Chinese is not extended to IP. As shown in (303b), the result is vacuous quantification, where the subject is not licensed by the existential closure of V. The vacuous quantification is rescued by the appearance of *you*, on the other hand, as shown in (303c):^{80}

(303)  a. English-type language (V-to-I movement applies at LF) (modified from Tsai 2001: 139)

```
 IP ----> mapping cycle
       |  ...
       |     I’ (∃x) ----> nuclear scope
       |        V_{+I}   VP
       |             |     Subj(x)   t_1
       |             |  V (∃x) ----> nuclear scope
```

b. Chinese-type language (V-to-I movement does not apply)

```
 IP ----> mapping cycle
       |  ...
       |     I’
       |        I ----> VP
       |             |     Subj(x) V (∃x) ----> nuclear scope
```

^{80} A double-arrowed dotted line is used here to represent the operator-variable binding relation.
c. Licensing the subject by *you*

\[
\text{IP} \rightarrow \text{mapping cycle}
\]
\[
\ldots \quad \text{ModP}
\]
\[
you_x \\
\quad \rightarrow \text{VP}
\]
\[
\rightarrow \text{Subj}(x) \\
\rightarrow \text{V} \rightarrow \text{nuclear scope}
\]

This explains why indefinite subjects in Chinese need the *you* marker. As for quantity indefinites, Tsai observes that the environments that allow quantity expressions, as shown in (295), are all related to modal forces. These modal verbs trigger V-to-Modal movement and consequently extend the mapping cycle to ModP. As a result, the lower copy of the subject can be licensed by the existential closure of the nuclear scope:

(304)  \[
\text{ModP} \rightarrow \text{mapping cycle}
\]
\[
\ldots \quad \text{Mod'} \rightarrow \text{nuclear scope}
\]
\[
\rightarrow \text{V}_{1+\text{Mod}(\exists x)} \quad \text{VP}
\]
\[
\rightarrow \text{Subj}(x) \quad t_1
\]
Tsai’s proposal successfully accounts for the parametric differences between English and Chinese. Nevertheless, there are non-trivial problems in Tsai’s analysis, too. First, V-to-I movement is assumed to be a crucial parameter that accounts for the differences between English and Chinese. However, it is unclear how and why head movements carry any semantic effects (e.g. a quantificational force). The formal relation postulated in Tsai between head movements and mapping cycles is rather arbitrary. If we follow the original proposal in Pollock (1989), the parameter of head movement only concerns when a head movements applies: e.g. V-to-I movement applies in English at LF, while it applies in French in narrow syntax. The head movement (from V to I) is for the verb to encode tense information, which should be regarded as a universal requirement.

Another issue concerns a technical aspect. Tsai (2001: 148) gives the following logical form for the sentence in (305a):

(305) a. Wu ge ren chi-de-wan shi wan fan.
   five CL people eat-can-finish ten bowl rice
   ‘Five people can finish ten bowls of rice.’

   b. ◊GENS [s is a situation] ∃x,y (x is a group of five people in s & y is a group of ten bowls of rice in s & x finishes y in s)

(305b) can be partially rejected as a correct logical form for (305a). In (305b), both subject and object NPs receive existential closure from the V-raising to Modal. In plain English, (305b) can be translated as ‘it is possible that for any situations, there are (possibly different) five people and ten bowls of rice in those situations and those five people always finish those ten bowls of rice in those situations.’ Tsai argues that the
possibility modal and the generic operator can account for the free-choice *any*

interpretation. It is not clear how this is achieved. Using this logical form amounts to
saying that (305) and (306) are equivalent:

(306) keneng mei-ci dou you wu ge ren chi-wan shi wan fan
possibly every-time all have five CL people eat-finish ten CL rice
‘It is possible that there are always five people who finish ten bowls of rice
together.’

(306) can be falsified if for all situations, there do not exist five people (e.g. only four
people), and they finish ten bowls of rice together. However, the same condition does not
falsify the intuition we have in (305a), which is simply an evaluation made by the speaker.
The point is that in (305a), the existence of five people and ten bowls of rice is not
presupposed (i.e. no actuality entailments). Therefore, if there are only four people in
every situation, (305a) can still be true (no matter whether ten bowls of rice are finished
or not). On the other hand, I suggest that (305a) should involve a conditional meaning
brought about by the generic modal (as assumed in Heim 1982 and Heyer 1990, among
many others). It has the logical form: ‘For all situations, if there are five people and ten
bowls of rice, then they can finish them.’ This logical form will be elaborated in the next
section and in section 4. Notably, a conditional sentence is falsified only when the
left-hand part is true, but the right-hand part is false. To make the sentence true, therefore,
it is not necessary that there indeed are five people or ten bowls of rice in the present
situation. Crucially, as long as there are five people and there are ten bowls of rice in a
given situation, then it is true that they can finish them. We therefore capture the lack of existential presupposition and the free choice effect of the quantity indefinites.

Our last remark is on the mapping approach in general, concerning the source of the existential closure. It is generally assumed that an existential closure could be given by the structural configuration itself, associated with a certain level of representation. If we adopt the Minimalist thesis as presented in Chomsky (1995) and the subsequent works, it is unclear how these LF mechanisms are encoded in syntax, given syntax only concerns merging two distinct units. Suppose existential closures are related to the structure itself, then they are byproducts of mergers. However, since not every instance of merger result in an existential closure in the structure, these mergers must be special. Such a conclusion is conceptually difficult. For theoretical reason, we shall assume the Inclusiveness Condition, entertained in Chomsky (1995:225) as a core assumption of the Minimalist thesis. To eliminate a violation of such a condition, it is crucial that we attribute existential closures (and related quantificational forces) to appropriate lexical items. As we shall see in the next subsection, the sources of these quantifications are from the (overt/covert) lexical items associated with the aspectual and modal elements, rather than from the structures. The aspectual markings in Chinese allow us to achieve this task quite straightforwardly.
5.2.3 Towards a Unified Approach: Zamparelli (2000)

It might be helpful at this point to review a syntax-semantics interface theory of the English indefinites that echoes the observations in Chinese. It is generally claimed that numeral expressions in English like *three students* can be understood as either referential or predicative in typical argument positions (Milsark 1974, Zamparelli 2000):

(307) John needs to see **three students**.

If the indefinite *three students* in (307) is taken to be referential, the sentence is paraphrased as ‘there were three specific students such that John needed to see them’ (i.e. a specific interpretation of *three students*). This reading corresponds to an existential reading. On the other hand, if the indefinite is predicative, the sentence is paraphrased as ‘John needs to see (any) three students.’ The latter therefore corresponds to the quantity reading. The different readings are very reminiscent of the existential/quantity distinctions in Chinese. A theory that provides a convincing account of the English facts is Zamparelli (2000). Interestingly, his analysis recalls both of Li’s and Tsai’s analyses, and may serve as a unification of the two approaches. Similar to the approach that Li (1998) adopts, a straightforward analysis is to claim that the referential and predicative indefinites have different syntactic structures. Following Carlson (1977), Zamparelli proposes the following structures:

(308) \[
\begin{array}{c}
\text{\text{StrongDP S D} } \downarrow \\
\text{\text{PredicativeDP PD} } \downarrow \\
\text{\text{NP N]]}}
\end{array}
\]

\[
\begin{array}{c}
\text{\text{referential/quantificational}} \\
\text{\text{type } e/ \text{type } (\langle e, t \rangle, \langle (e, t), t \rangle)}
\end{array}
\]

\[
\begin{array}{c}
\text{\text{predicative}} \\
\text{\text{type } \langle e, t \rangle}
\end{array}
\]
English numerals like *three* may occupy the head position of a strong determiner phrase or that of a weak/predicative determiner phrase, resulting in referential or predicative interpretations, respectively. We can identify the StrongDP as a full DP and PredDP as NumP in Li’s theory. Semantically, a strong numeral carries its own quantificational force, and it may undergo QR to obtain a wide scope. A weak DP, on the other hand, does not carry a quantifier of its own, and remains as a variable that requires an existential closure from its context. This then brings us to the question how the null strong D position in a predicative indefinite phrase is licensed in the structure. Reflecting Tsai’s analysis, then, Zamparelli (2000) assumes that predicative indefinites obtain a proper quantification from the structure through the mapping mechanism as in Diesing (1992). The Zamparellian approach therefore represents a first step towards a unified theory of Li’s and Tsai’s approaches (although it is still subject to the same problems in Tsai’s approach due to the mapping hypothesis). As we shall see in Section 3, the proposed parallel merge takes on the Zamparellian approach, and further refines it by treating PredD (Num) as modifier of N, and merging the strong (quantificational) determiner directly into the verbal domains (Aspect and Modal).

### 5.2.4 Sources of the Existential Presupposition

Before going into the syntactic analysis of Chinese indefinites, I take it to be a first priority to construct a general condition for predicting the two readings. First, in all of the environments observed in Tsai (2001), listed in (295), we notice that the verbs generally carry a non-dynamic aspect, which is not overtly realized in Chinese. Significantly, the
overtly realized verbal aspectual morphemes are all dynamic ones (Klein 1994, Klein, Li & Hendriks 2000, Smith 1991). In all of these cases, a subject you marker is obligatory, and no quantity readings are available:

(309) a. Perfective -le
*(You) san ge ren chi-wan-le shi wan fan.  
have three CL people eat-finish-Perf. ten CL rice
‘Three people finished eating ten bowls of rice.’

b. Progressive/Durative zai-/zhe
*(You) san ge xuesheng xie-zhe shi fen zuoye.  
have three CL student write-Prog. ten CL assignment
‘Three students are writing ten assignments.’

c. Experiential –guo
*(You) san ge xuesheng shang ci jiao-guo shi fen zuoye  
have three CL student last time turn.in-Exp. ten CL assignment
‘Three students have the experience of turning in ten assignments last time.’

In addition, the null aspect in Chinese brings about a habitual/generic modal meaning.

Observe the contrast between (310a) and (310b) (from Lin 2004):

(310) a. Gou chi-ø rou  
dog eat肉
‘Dogs (habitually) eat meat.’

b. Gou chi-le rou  
dog eat-Perf.肉
‘The dog ate some/the meat.’
Here, we find a strict selectional restriction between the null aspect and the lower modal auxiliaries (Modal auxiliaries lower than Tense Phrase in Cinque 1999), such as the Abilitative modal and the Deontic modal). Overt dynamic aspectual markers are prohibited in these contexts. This requirement of null aspect and/or lower-modal exhaustively constitutes the core properties of the quantity-licensing environments in (295):

(311)  a. Zhangsan keyi chi(*-le/*-zhe/*-guo) niu-rou.
Zhangsan can eat –Perf/Prog/Exp cow-meat
‘Zhangsan can eat beef.’ [deontic]

b. Zhe ge xiangzi gou zhuang(*-le/*-zhe/*-guo) shi ben shu.
this CL box enough contain –Perf/Prog/Exp ten CL book
‘This box is enough to carry ten books.’ [abilitative]

c. Gou you(*-le/*-zhe/*-guo) yiba
dog have(-Perf/Prog/Exp) tail
‘Dogs have tails.’ [generic]

Given the contrast in (310), we shall adopt the analysis in Lin (2004), who argues that dynamic aspects in Chinese are associated with existential closure, and the null aspect with the generic operator. As a refinement, let us further assume that the generic operator actually resides in the lower modal, which necessarily co-occurs with a null aspect in Chinese. The interpretative variables of the indefinites are therefore subject to minimal binding requirement (Aoun & Li 1993b), schematized in (312):
as

b. Modal[Gen]i ... Asp[Ø] ... vb

The variable of the indefinite is bound by the Modal only if Aspect fails to establish a proper binding relation. This structural analysis therefore derives the same cyclic effect of Tsai’s Extended Mapping Hypothesis without involving extended mapping cycles and head movements.

5.3 Syntax of Indefinites in Chinese

5.3.1 Parallel Merge

The observation that the referentiality of an argument is anchored to the verbal domain echoes the idea of parallel merge developed in Vergnaud and Zubizarreta (2001), upon which the proposed theory is based. In the proposed theory, the parallelism is further extended from the verbal and nominal domains to the functional and substantive domains, and the extended connective domain. To recapitulate, the parallelisms come from the composition of the three fundamental relations, \{N, V\}, \{S(ubstantive), F(unctional)\}, and \{k, k’\}. As represented in (313), the Mod-Asp domain (or the v-V domain) represents one of the base symmetric structures (after applying Lexical Insertion):
(313) The Mod-Asp domain (= The v-V domain)

\[
\begin{align*}
(V,F,k') &= \text{Mod} \\
(N,F,k') &= \text{D} \\
(V,S,k') &= V(v) \\
(N,S,k') &= N_{\text{subject}} \\
(V,F,k) &= \text{Asp} \\
(N,F,k) &= \text{D} \\
(V,S,k) &= V \\
(N,S,k) &= N_{\text{object}}
\end{align*}
\]

The structure can be translated with canonical phrase structures in the following way, where the symmetric relations are asymmetrically represented:

(314) \( XP = \text{AspP or ModP} \)

\[
\begin{align*}
D[+N, F] & \quad \Rightarrow X' \\
X[+V, F] & \quad \Rightarrow YP = vP \text{ or } VP \\
N[+N, S] & \quad \Rightarrow Y[+V, S]
\end{align*}
\]

The effect of parallel merge is directly carried over to its semantics. Therefore, when a ‘defective’ null D that fails to denote a reference is merged into the verbal domain, its quantificational property is subsequently taken over by its closest verbal element (through feature agreement). On the other hand, if D is strong, then the ‘verbal’ effect is blocked no matter whether parallel merge applies or not.\(^{81}\) The parallel merge in the

\(^{81}\) For theoretical unification, I assume that parallel merge also takes place when D is strong. See Sportiche (2005) for independent motivations (from A-movement reconstruction) for such a proposal.
subject and the object domains are illustrated in (315a) and (315b), respectively.

Structurally, the analysis is assumed of locating arguments in the specifier positions, as in Bowers 1993, Hale & Keyser 1997, Larson 1998, and Lin 2001. I also assume that the Aspectual phrase is located in between the subject light verb and the main verb, as proposed in Megerdoomian 2008:90 and Tenny 2000:326):

(315) a. Parallel merge in the subject (Modal) domain

Let us assume that the quantificational properties of D and those of Aspect and Modal are realized through feature specifications, represented by [QF], for ‘quantificational feature’. The null determiner of the bare numeral indefinites carries an unvalued (but interpretable)
quantificational feature, represented as i[QF] (employing the terminology in Pesetsky & Torrego 2007; See Chapter 2). For the object D in (315b), the closest possible valued feature (i.e. i[QF]) is in Aspect, which carries an existential QF (as argued in Section 2.4): i[QF:∃]. Given the Spec-head checking (the most local agreement), a dynamic aspect carrying an existential feature i[QF:∃] therefore values the i[QF] on the D in its specifier position, and gives rise to the existential interpretation of the object D at LF.82 As in (315a) the same mechanism applies to the subject D, whose quantificational force comes from the lower Modal (related to genericity or a universal quantification). Therefore, when the i[QF] of the Modal is valued, the subject D can be valued with the same i[QF] (In Section 3.2, we discuss the complication where Aspect fails to value the object D. In this case, the object D is also valued by Modal).

In the proposed mechanism, the quantificational force is inherent in the features of the functional items (Aspect and Modal heads). Through feature agreement, this allows us to capture the quantificational operator-variable binding without violating the Inclusiveness Condition (Chomsky 1995:225): “Another natural condition is that outputs consist of nothing beyond properties of items of the lexicon (lexical features).” The parallel merge thus represents a theoretical improvement over the traditional mapping hypothesis (while keeping most of its insights).83

82 The proposed scope-checking mechanism has its root in the proposals in Beghelli (1997) and Beghelli & Stowell (1997).

83 Note that the parallel merge is theoretically possible only if the theory of bare phrase structure is adopted (Chomsky 1995: 243). Therefore, the theory of parallel merge can be viewed as a minimalist method of analyzing the LF operator-variable binding. Note that a similar view is already proposed in Tsai (1999) with
5.3.2 Deriving the Quantity Readings

Let us consider the case where subject and object both have quantity readings. Recall the environments that allow quantity readings generally involve a null aspectual marker and a lower modal auxiliary. Suppose the null aspect does not carry a quantificational feature. The object D fails to receive a value from Asp, and therefore the object D (still active) seeks the next closest head with a [QF], which is Modal. Meanwhile, the subject D is directly merged with Modal, checking its Q feature with Modal. As a result, the subject and object Ds are both valued by the [QF] in Modal (through checking and agreement, respectively). Following Hiraiwa (2005), I assume a strong version of multiple feature agreement/checking is possible. Essentially, we obtain a similar result of unselective binding (See also Zeijlstra 2004 for a similar approach in accounting for the negative concord):

(316) \([\text{ModalP} D_1 \text{ Modal} [\text{san ge ren } [\text{AspP} D_2 \text{ Asp } [\text{VP chi [wu wan fan]}]]]

\[\text{[QF]} [\text{Gen}] \text{ three CL person [QF]} [\text{ø}] \text{ eat five bowl rice}\]

‘Three people eat five bowls of rice.’

Consider (316), I assume that the null aspect in this sentence does not carry a quantificational feature that can value/bind the feature/variable of the object D_2.

respect to \textit{wh}-in situ in Chinese. Tsai argues that D is directly merged withSpec, CP in Chinese; therefore, \textit{wh}-movement is not necessary (due to the Merge-preempt-Move principle). In the proposed theory, such a proposal is quite expected, since D is paired with a C in the C-T domain. Tsai’s theory can then be reconstructed as a Chain condition between the determiner in the higher domain and the determiner in the lower domain.
Therefore, being still active, the unvalued \[ \_QF \] on D\textsubscript{2} looks upward to the higher phase for valuation, which is the valued generic feature i[QF:Gen] (or [Gen]) in Modal. D\textsubscript{2} is then valued with [Gen].\textsuperscript{84} The unvalued \[ \_QF \] on D\textsubscript{1} is also valued with [Gen] since it is in [Spec, Mod], the most local agreement domain of the Modal head. In the logical form, the [Gen] feature on D will be interpreted as a TYPE operator. In addition, given that the deontic/generic modal is a hidden conditional sentence with universal quantification of situations, the corresponding logical form of (316) is as follows:\textsuperscript{85}

\[
(317) \forall_{s,x,y} [(\text{three-people}^\text{type}(x) \& \text{five-bowl-rice}^\text{type}(y)) \rightarrow [x \text{ eat } y] \text{ in } s]
\]

The syntax-semantics mapping is transparent here: the quantificational features assigned to each argument are represented through the unselective binding mechanism at LF. The generic force is represented through a TYPE operator,\textsuperscript{86} which is equivalent to saying that x belongs to the type constructed by \textit{three-people} and y to the type \textit{five-bowl-rice} (i.e. any groups of three people and five bowls of rice). This should also generate the desired obligatory group readings for the quantity indefinites.

One of the consequences that the referentiality of an argument is ‘absorbed’ by the modal is that they would behave as arguments of the modal. This seems to be the case. Consider

---

\textsuperscript{84} An alternative way of achieving feature valuation is to assume that the unvalued \[ \_QF \] of Aspect is also valued by Modal, and the object D in turn checks its feature with Asp.

\textsuperscript{85} We adopt what has been assumed in the literature on Generic Modals that the generic operator is translated as a universal quantification over possible situations/worlds (Kratzer 1981).

\textsuperscript{86} By type, we are referring to the type-token distinctions here (Vergnaud & Zubizarreta 1992), rather than the type in type-theoretic semantics.
the quantity implication associated with Modal. While the existential indefinites do not bear the implication, the quantity indefinites directly reflect the modal implication:

(318) **You san ge ren chi-de-wan wu wan fan.** [existential reading] 
\[
\text{have three CL person eat-can-finish five bowl rice}
\]
  a. ‘There are three people who can finish five bowls of rice.’
  b. ‘There are four people who can finish four bowls of rice.’

(319) **San ge ren chi-de-wan wu wan fan.** [quantity reading] 
\[
\text{three CL person eat-can-finish five bowl rice}
\]
  a. ‘Any three people can finish any five bowls of rice.’
  b. ‘Any four people can finish any four bowls of rice.’
  c. ‘More than three people can finish less then five bowls of rice.’
  d. \(\text{can}_{\text{abilitative}}\): (upward, downward)

The existential reading in (318a) does not imply (318b). On the other hand, the quantity reading (319a) does imply (319b), and is equivalent to (319c). We represent the implication of the abilitative modal \(\text{can}\) as in (319d), which means the quantity implication of subject is upward (more than), and that of object is downward (less than).

The quantity implication is dependent on the modal in use. (320a) illustrates another case, where an imperative rule-like modal is used, which carries an ‘exact’ quantity implication, as in (320b):

(320) *As a command from the Lieutenant,* 
\[
\text{San ge shibing dai wu ba qiang}
\]
  a. ‘(Exactly) three soldiers carry (exactly) five guns.’
  b. Imperative: (exact, exact)
Let us turn to the ungrammaticality of (321), where the quantity subject cannot receive a proper quantification.87

(321) a.*[^ModalP  San  ge  ren  [AspP  chi-wan-le  wu  wan  fan.]]
three  CL  person    eat-finish-Perf.  five  CL  rice
‘(intended:) (any) three people ate and finished some five bowls of rice.’

five-bowl-rice]]

Sentence (321) does not contain a modal element that can support D1 a [QF]. The ungrammaticality further shows that the [QF] of Aspect is restricted to the object domain in Chinese (therefore incapable of saving the subject from vacuous quantification). Not satisfying the full interpretation condition, the sentence crashes at LF since the variable three people is not properly bound, and is hence an illegible LF item.

5.3.3 Deriving the Existential Readings

As we move on to the existential readings, a potential problem may occur. If we follow the former approaches in treating the subject indefinite you marker as a Modal element that provides the existential closure, two potential problems may occur. First, we would wrongly allow the reading in (322b) since you will unselectively bind the subject indefinite, as well as the object indefinite:

87 For some speakers, bare numeral NPs can also have a definite reading in Chinese, subject to the familiarity and maximality conditions (Lyons 1999). In that case, we argue there is a covert definite article in the structure (same with the definite reading of bare nouns in Chinese). Since the D is filled with a definite value, no vacuous quantification will be obtained.
(322) You san ge xuesheng xie shi fen zuoye.
    have three CL student write ten CL assignment
  a. ‘There are three students such that they typically write ten assignments.’
  b. *‘There are three students such that they typically finish some ten assignments.’

In a neutral context, however, (322b) is not a salient reading since the speaker does not presuppose the existence of any ten assignments. The sentence simply attributes the judgment that the speaker made to a certain three students. However, since the null aspect does not provide an existential closure to the object, it becomes a problem for both the unselective binding approach and the mapping hypothesis why (322b) cannot be obtained.

In view of the problem, I would like to suggest that you and the subject are in fact introduced in independent domains. Therefore, the [QF] of object D is valued by Aspect, while the interpretable unvalued i[QF] of subject D is valued by the quantificational feature associated with you:  

---

88 As shown in the last note, the definite readings of bare numeral NPs are subject to familiarity and maximality conditions. The indefinite reading of ten assignments in (322b) is not subject to the same condition. Given the variations of speakers’ judgments, I ignore the definite readings of bare numerals in this chapter.

89 I assume the ZP contains an empty subject pro, which is typical in various Chinese constructions, adopting Huang’s (1988) analysis.
Putting aside the categorical status of XP, YP, and ZP for now, this structure seems to be a favorable move, considering the scope interactions and other properties between the you subject (YP) domain and the ZP. Consider the negation scopes in the following minimal pair:

(324) a. san ge ren bu-keneng tai-de-qi shi xiang shu
    three CL person not-possible move-can-up ten box_{CL} book
    ‘It is impossible that three people can carry ten boxes of books.’
    ([not possible] > [three people carry ten boxes of books])

    b. You san ge ren bu-keneng tai-de-qi shi xiang shu
    have three CL person not-possible move-can-up ten box_{CL} book
    ‘There are three people such that it is impossible they can carry ten boxes of books.’
    ([three people] > [not possible] > [carry ten boxes of books])

The modal negation in (324a) negates the whole proposition, showing that the modal negation can take scope over the whole sentential domain (a CP), including the subject; however, in (324b) the scope of the modal negation is only limited to the YP, excluding the you-subject part. This scope relation is transparent if we assume the structure as in (323). Therefore, a negation in the main predicate can at most take ZP in its scope, but
not YP. In *you* constructions, YP and ZP can even take their own epistemic modal adverbials, as in (325), yet this is not possible in the sentence with only one CP domain, as in (326):

(325) \[ CP_{\text{Keneng}} \text{you liang ge qiangshou} [CP_{\text{dagai}} \text{zhi-shao kai-le liang qiang}] \]

possibly have two CL shooter probably at-least fire-Asp two shot
‘There possibly were two shooters who probably fired at least two shots.’

(326) *[CP Keneng Zhangsan dagai chi-le san wan fan].

possibly Zhangsan probably eat-Asp three bowl\textsubscript{CL} rice
‘(intended:) It is possible that Zhangsan probably ate three bowls of rice.’

These facts show that YP and ZP in (323) should be treated as separate propositional domains. Let us assume that YP and ZP are both ModP (or CP), and they together form a larger ModP (that is connected by a higher-ordered connective pair K-K’):\(^{90}\)

(327)

\[ \text{ModP} \quad \text{K} \quad \text{ModP} \quad \text{K'} \]

\[ \text{D you Num/NP} \quad \text{Pro… AspP} \]

By virtue of the connectives (as discussed in the nominal constructions in the last chapter), the structure also allows a version of predicate inversion, in which the two ModPs are inverted (with an overt *de*, again, as the linking element):

\(^{90}\) This analysis is reminiscent of the analysis of *there*-construction in Williams (1994, 2006), where *there* is treated as a subject of the nominal predicate. See also Li (1996) for a similar ‘cleft’ analysis.
(328) a. You san ge ren mai-le wu shu hua.
   have three CL person buy-Asp five bouquet flower
   ‘There are three people who bought five bouquets of flowers’

   b. [mai-le wu shu hua ] de [you san ge ren].
      buy-Asp five bouquet flower DE have three CL person

With this structure in mind, the existential reading of the you-subject is independent of
the bare numeral object. Recall the problematic sentence in (322), repeated here as (329).
(329b) shows how the structure rules out the non-salient reading in (322b). Instead of
being bound by the existential closure, the bare numeral object (i.e. ten assignments) is
bound by the Modal in the rightward clause:

(329) a. [You san ge xuesheng] [Pro Mod abol xie shi fen zuoye].
   have three CL student write ten CL assignment
   ‘There are three students such that they typically write ten assignments.’

   b. [[AspP D1:[QF] Asp[∃] … three-student] [ModP Pro [Gen]…[AspP D2:[QF]
      Asp[∅] … ten-assignments]]]

Let us consider a similar scenario. In a sentence where subject and object indefinites are
both interpreted as existential, their quantificational features are valued by the aspectual
heads in their own domains:

(330) a. [You san ge xuesheng] [ModP Pro [AspP jiao-le shi fen zuoye]].
   have three CL student turn.in-Asp ten CL assignment
   ‘There are three students such that they turned in ten assignments.’
One question concerns why you can provide an existential closure for its argument. A plausible analysis is to claim that you is a proto-form of a dynamic predicate with a temporal-locative argument, which can be overt or covert in Chinese, as in (331). The existential closure (and the specificity of the existential subject) is therefore associated to the temporal/locative argument, which prohibits a generic operator (Chierchia 1995), hence the unavailability of a quantity reading for the indefinite argument:91

(331) (Jiao-shi-li/zuotian) you san ge xuesheng shou-le shang
class-room-PostP/Yesterday have three CL students get-Asp hurt
‘In the classroom/Yesterday, there were three students that got hurt.’

Crucially, we have shown that all bare numeral NPs in Chinese are interpreted by parallel merge and the so-called quantity indefinites are in fact results of unselective binding by the modal elements. The interpretations and sources of quantification are summarized as follows:

(332)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Object</th>
<th>Source of QF</th>
<th>Ex.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Quantity</td>
<td>Quantity</td>
<td>Modal (unselective binding)</td>
<td>(316)</td>
</tr>
<tr>
<td>b. Quantity</td>
<td>Existential</td>
<td>N.A. (vacuous quantification)</td>
<td>(321)</td>
</tr>
<tr>
<td>c. Existential</td>
<td>Quantity</td>
<td>You (for subj.) / Modal (for obj.)</td>
<td>(329)</td>
</tr>
<tr>
<td>d. Existential</td>
<td>Existential</td>
<td>You (for subj.) / Asp (for obj.)</td>
<td>(330)</td>
</tr>
</tbody>
</table>

91 When unpronounced, the temporal/locative argument should be treated on a par with a silent PLACE argument (Kayne 2005, Leu 2008).
An exceptional case is found in the counterfactual conditional construction, as in (333):

(333) Ruguo san ge xuesheng jiao (’le) wu fen zuoye, wu ge ne?
if three CL student turn-Perf. five CL assignment five CL Q
‘If three students turned in five assignments, how about five students?’

The sentence does not bring about a presupposition of either *three students* or *five assignments*, given it is a counterfactual sentence. This seems to be a counterexample to the proposed mechanism. Namely, the aspectual marker does not contribute to an existential reading of the object (and the sentences do not need a *you* marker). I would like to suggest that this problem can be treated on a par with the problems of donkey sentences, in which unselective binding provides a possible solution.

It has been proposed that (counterfactual) conditional sentences contain a universal quantifier-like necessity modal in Heim (1982) and Baker and Travis (1997), etc. Just like the overt modal verbs, this covert modal should provide a proper quantification for the subject in (333). As in the donkey sentences, existential quantifiers behave like open variables that are absorbed by the modal quantification:

(334) a. If a farmer owns a donkey, he beats it.
    b. $\forall s[\exists x,y[x\text{ is farmer and }y\text{ is donkey}] \rightarrow [x\text{ beat }y]]$

The equivalence in (334b) illustrates the Lewis-style unselective binding (Heim 1982, Lewis 1975). The force of the existential closure is cancelled, or absorbed by the
universal quantification in the conditional sentences. We treat the problem in (333) as a similar case, only that the existential closure is provided by the aspectual marker. The absorption/cancellation of the existential force of the aspectual marker in this case may also explain native speakers’ intuitions why in such cases, the aspectual marker is optional (unlike in the declarative sentences).

5.4 A Note on Syntax-Semantics Mappings

Chung & Ladusaw (2004) have recently argued for a non-unified theory of the semantics of indefinites, based on linguistic data from Maori and Chamorro. Particularly, Chung & Ladusaw argue that there are two ways of interpreting indefinites at the LF interface: When a VP and an indefinite NP are combined; two modes of composition may be evoked.92 One is the Specify mode, which involves choice functions (Reinhart 1997, 2006, Winter 2001, 2005) (this mode of interpretation does not concern us much in this paper). The other is a novel mechanism called Restrict, which, I suggest, can be understood as a generalized version of Predicate Modification (Heim & Kratzer 1998) if we adopt the theory of light verbs (where each verb/light verb is a one-place predicate; see below). That is, two (unsaturated) predicates are conjoined by a logical conjunction, and the NP predicate is saturated at a later stage in the derivation. Chung & Ladusaw assume that the predicative NP combined with V through Restrict is saturated by a default existential closure at the event level (the same mechanism as the Davidsonian event

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92 Chung & Ladusaw (2004) assume that Functional Application (i.e. direct type-calculation) applies when a V is combined with a referential DP.
argument). (335b) illustrates how Restrict works. The predicative NP *dog*, instead of directly saturating the predicate *feed*, becomes a restriction of the feeding event. (335c) is the final logical representation, in which the event argument and the object argument are both saturated by the default event-level existential closure (modified form Chung & Ladusaw 2004:5):

(335) a. John fed a dog.

b. $\lambda x \lambda y \lambda e [feed'(x)(y)(e)](dog')$                (by Restrict)

$\rightarrow \lambda x \lambda y \lambda e [feed'(x)(y)(e) & dog'(y)]$

c. $\exists e \exists y \ [ \ \begin{array}{c} \hline \text{restriction} \ \\
\text{scope} \end{array} \ ]$

We would like to relate the semantic Restrict mode to the syntactic D-F merge here, and stipulate a dynamic syntax-semantics mapping mechanism that is defined on derivational terms. Employing D-F merge, we may further modify and sharpen Chung & Ladusaw’s theory by defining the event-level(s). Specifically, I suggest that the event-levels refer to two independent, yet associated levels: a lower existential event level is associated with dynamic Aspects (and its restriction contains the object argument), while a higher event level is associated with generic modal elements (and its restriction may contain both arguments).
As mentioned in our preceding discussion, the proposed parallel structures adopt the light verb theory that the subject (or the external argument) is introduced not by the verb itself, but by a light verb, and therefore each verbal predicate introduces only one argument (see Bowers 1993, Kratzer 1996, Larson 1988, Lin 2001). For us, this is why the subject is not included in the restriction domain of Aspect (unlike Chung & Ladusaw’s original proposal, where the external argument is an argument of the verb, and a single event level is assumed). Taking on this direction, we may further treat Aspect and Modal as a higher ordered two-place predicate: The determiners and vP/VP being the two arguments.

Reflecting the proposal in Chung & Ladusaw (2004), I propose the following syntax-semantics mapping rules:

(336) a. V/v and NP are combined by Restrict.

b. Asp/Mod is a two-place predicate that takes D and VP/vP as its arguments.

c. The determiners that enter agreement with Asp/Mod are mapped to the restriction (along with the NPs that are associated with the D’s), and the rest is mapped to the scope.

Consider the structure in (337), which involves the lower object domain (AspP). The mappings are quite transparent here. Aspect takes D and VP as its two arguments, mapping D_y and its associated NP_y to the restriction, and VP to the scope:
(337) a. \[\text{AspP kanjian-lesan zhi mao}\]  
see-Perf three CL cat  
‘saw three cats’

b.  
\[ \text{AspP} \]
\[ \text{D}_y \]
\[ \text{Asp} \]
\[ \text{VP} = [\text{V} \text{NP}_y] \]

c.  
\[\text{Asp} (D_y)(\text{VP}) = \text{Asp}_{le} (D_y)(\text{see three cats}) = \exists e. \exists y. [\text{three-cat’}(y) & \text{see’}(y)(e)]\]

Extending to the Modal phrase, we shall consider the case where subject and object both have quantity readings. Complications aside, I propose that the logical form of (338) looks like (338c):\(^93\)

(338) a. \[\text{San ge ren yang san zhi mao.}\]  
three CL person raise three CL cat  
‘Three people keep three cats (as a rule).’

b.  
\[\text{ModP} \]
\[\text{D}_x \]
\[\text{Mod} \]
\[\text{Mod} \]
\[\text{vP} \]
\[\text{NP}_x \]
\[\text{v} \]
\[\text{v} \]
\[\text{AspP} \]
\[\text{D}_y \text{Asp} \]
\[\text{[VP V} \text{NP}_y]\]

c.  
\[\text{Mod} (D_x)(\text{vP}) = \text{GEN}(e, x, y).[[\text{three-man’}(x) & \text{three-cat’}(y)] & \text{raise’}(x)(y)(e)]\]
\[\forall e’ \subseteq e. \forall (x, y). [[\text{three-man’}(x) & \text{three-cat’}(y)] \rightarrow \text{raise’}(x)(y)(e’)]\]

\(^93\) The semantic notations used here may look sketchy. I shall leave this task, however, to the future work.
The Modal head now takes Dv and vP as its two arguments (we assume that the lower event and the upper event are conjoined together by Event Identification; see Kratzer 1996). The generic modal introduces a generic operator, which binds the event argument and the determiners that enter checking/agreement relations with the Modal head. The generic operator may in turn be translated to a conditional tripartite structure (cf. Kratzer 1981), as shown in the last line in (338c), which roughly translates into plain English as “for all sub-events \( E' \) that is a subset of event \( E \), and for all \( x \) and \( y \), if \( x \) consists of three people and \( y \) consists of three cats, then \( x \) raises \( y \) in \( E' \).” A correct LF representation is therefore successful derived.
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