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Glossary of Abbreviations

1	first person
ACC	accusative
Asp	aspect
CL	classifier
DC	dative construction
DOC	double object construction
DP	determiner phrase
FUT	future
NI	noun incorporation
NUM	numeral
PASS	passive
PERF	perfect
PL	plural
PNI	pseudo noun incorporation
POSS	possessive
PPI	pseudo preposition incorporation
SG	singular
TAM	tense and aspect marker

Chapter 1 Introduction

1 Research questions

Historically, Mandarin Chinese has been considered a language that does not have morphology (Hoosain, 1992; Jensen, 1990; Sapir, 1921; Xu, 1997). According to Rygaloff (1973), this understanding is largely due to the fact that Mandarin is a monosyllabic language where most of the words are composed of one syllable. However, recent research has suggested that though the generalization may hold true for ancient Chinese, this idea does not apply to modern Mandarin (C. N. Li & Thompson, 1981; Lü, 1979; Lu, 1957). Figure 1 presents a summary of Zhou's (2004) analysis of the words collected in *The Contemporary Chinese Dictionary.* As can be seen below, of the 58,481 words collected in the dictionary, most of them consist of multiple syllables, and only 8,795 are monosyllabic words.

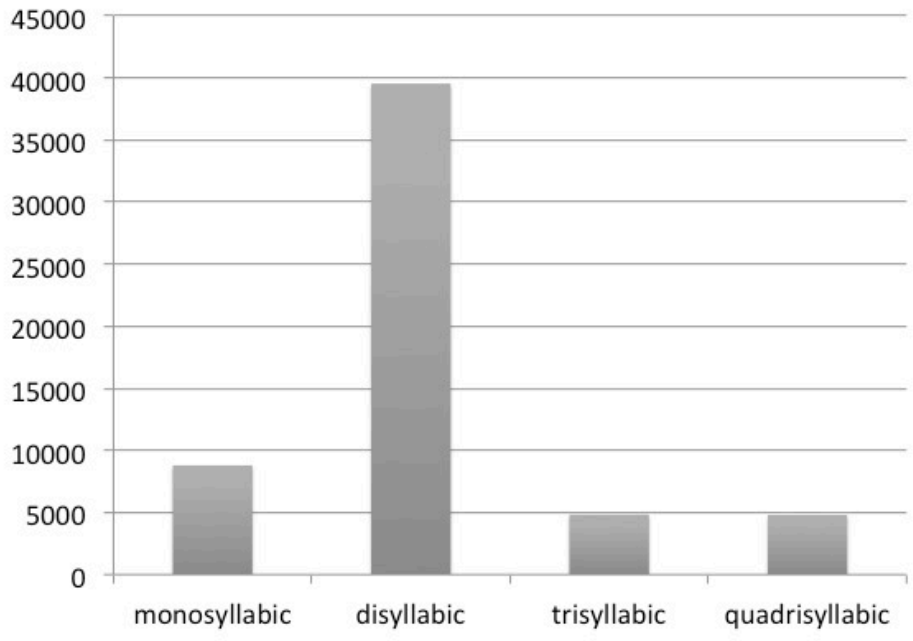


Figure 1 Raw number of words in *The Contemporary Chinese Dictionary* (Zhou, 2004).

Study of the morphology of Chinese has gained increasing momentum in the past twenty years (Dai, 1992; Duanmu, 2000; Packard, 2000). Though lacking inflectional morphology, Mandarin Chinese is a language rich in compounding (Y. R. Chao, 1968; Dai, 1992; X. Zhang, 2001). Thus, the current study focuses on compounding in Mandarin. Specifically, it investigates verbal compounding in Mandarin (represented by (1a), (1b), (4a), and (5a)), and there are three elements that motivate the present research.

The first motivation for the present study is the phonological effects observed in compounds such as *shui-xi* (water-wash, 'clean with water') and *gai-shan* (correct-perfect, 'improve'). In (1), there are two verbal compounds, two nominal compounds, and two adjectival compounds. As can be seen from these examples, while both the nominal and adjectival compounds permit the addition of one more syllable to form a larger compound, the two verbal compounds (1a) and (1b) are subject to Foot Binarity (FTBIN), a constraint requiring two syllables. Adding a syllable to either of their components leads to ungrammaticality. This contrast in phonological features raises the question of why structures such as **xin-zang-suan* (heart-count-calculate) and **gai-zheng-shan* (correct-perfect) are ill formed and the structures such as *nan-ban-qiu* (south-half-ball, 'southern hemisphere') and *er-fang-dong* (second-house-owner, 'principle tenant') are well formed. Namely, this thesis seeks to provide a viable explanation as to what causes the foot binarity effect in verbal compounds in Mandarin and how they are constructed.

(1) a. *xin-suan* (heart-calculate, 'do mental calculation')

* xin-zang-suan (heart-organ-calculate)

* xin-ji-suan (heart-count-calculate)

b. gai-shan (correct-perfect, 'improve')

* gai-zheng-shan (correct-correct-perfect)

* gai-wan-shan (correct-perfect-perfect)

c. ban-qiu (half-ball, 'hemisphere')

nan-ban-qiu (south-half-ball, 'southern hemisphere')

d. fang-dong (house-owner, 'landlord')

er-fang-dong (second-house-owner, 'principle tenant')

e. re-nao-de (hot-noisy-adjective marker, 'bustling')

re-re-nao-nao-de (hot-hot-noisy-noisy-adjective marker, 'bustling')

f. hong-se-de (red-colour-adjective marker, 'red')

ju-hong-se-de (orange-red-colour-adjective marker, 'orange')

Before presenting the second reason for the study, the insertion of the tense and aspect marker *le* (PAST/PERF) as exemplified in (2), is briefly introduced for a necessary understanding of compounding diagnostics in Mandarin (a detailed discussion is provided in Chapter 2).

(2) a. ge-chang le zu-guo
song-sing TAM motherland
'sang a song to praise the motherland'

b. *ge-le-chang zu-guo
song-TAM-sing motherland

(3) a. gai-shan le sheng-huo
correct-perfect TAM life
'improved living conditions'

b. * gai-le-shan sheng-huo
correct-TAM-perfect life

As a tense and aspect marker, *le* is expected to appear at the end of a verb. Inserting it between a verb's constituents results in an ungrammatical structure. Therefore, in (2a) and (3a), the verbal compounds *ge-chang* (song-sing, 'sing') and *gai-shan* (correct-perfect, 'improve') only allow the aspectual marker *le* to be placed in a position outside of and following the compound. Inserting *le* in between the constituents of the compound results in ungrammaticality (see (2b) and (3b)).

This leads to the second motivation for the current research. As will be addressed in Chapters 4 and 5, two constructions in Mandarin—post-verbal prepositional phrases and double object constructions—share similarities with the verbal compounds like (1a) and (1b). First, these constructions do not allow the insertion of *le* between certain constituents. Second, like verbal compounds, they are also subject to FTBIN. Sentence (4a) illustrates the distribution of *le*.

Sentence (4a) is an example of a prepositional phrase *xiang dong-fang* ('to the east') functioning as a post-verbal complement. Sentences (4b) and (4c) indicate that the verb *shi* ('sail') and the preposition *xiang* ('to') form an integral construction $[VP]_V$ that prevents the insertion of *le*.

(4) a. lun-chuan shi xiang dong-fang.
ship sail to east
'The ship sailed to the east.'

b. lun-chuan shi xiang le dong-fang.
ship sail to TAM east
'The ship sailed to the east.'

c. *lun-chuan shi le xiang dong-fang.
ship sail TAM to east

Such an effect can also be found in double object constructions (DOCs) like (5a). Sentence (5a) is a marked DOC structure[1], as the goal marker *gei* (to/give) is present in the sentence. The ditransitive verb *song* ('send') and the goal marker *gei* ('to') in (5a) form a compound [V *gei*]$_V$, because *le* is only permitted to appear after the whole compound; inserting it between the two constituents results in an illegitimate structure (see (5b) and (5c)).

(5) a. wo song gei ta yi ben shu.
I send to/give him NUM CL book
'I gave him a book.'

b. wo song gei le ta yi ben shu.
I send to/give TAM him NUM CL book
'I gave him a book.'

c. * wo song le gei ta yi ben shu.
I send TAM to/give him NUM CL book

Meanwhile, it is noteworthy that another similarity shared by the three structures is that they are all constrained by FTBIN. Take the [VP]$_V$ structure *shi-xiang* (sail-to, 'sail to') as an example. The addition of an extra syllable to either constituent of this structure generates an illegitimate structure (see (6b) and (6c)).

(6) a. shi-xiang (sail-to, 'sail to')

lun-chuan shi-xiang dong-fang.
ship sail-to east
'The ship sailed to the east.'

[1] There are three types of double object constructions, DOCs with *gei* (give) itself as the predicate, marked DOCs and unmarked DOCs (see chapter 5).

b. *xing-shi-xiang (walk-sail-to)

*lun-chuan xing-shi-xiang dong-fang.
ship sail-to east

c. *shi-chao-xiang (sail-towards-to)

*lun-chuan shi- chao-xiang dong-fang.
ship sail- towards-to east

The similarities between the verbal compounds in (1) and constructions *shi-xiang* (sail-to, 'sail to') and *song*-gei (send-to/give, 'give') in (4a) and (5a) indicate that the latter have the same properties as the former and are therefore verbal compounds too. This raises the question of whether the three structures are derived through the same operations.

The third motivation for the study is the order of the constituents in the verbal compounds. While the verbal element in some verbal compounds precedes the other element (i.e., with the structure $[VX^2]_V$), it can also take final position in some compounds (i.e., with the structure $[XV]_V$). For example, in the following verbal compounds *gai-shan* (correct-perfect, 'improve'), *zhuang-xiang* (pack-box, 'to pack something'), *shui-xi* (water-wash, 'clean with water'), and *ge-chang* (song-sing, 'sing'), the first two are formed with the structure $[VX]_V$ and the latter two are formed with the structure $[XV]_V$. The coexistence of two linear orders in Mandarin verbal compounding raises the question of what factors determine the constituent order in these compounds. Is linearization established in the syntax, or is it determined after syntax?

[2] The symbol X refers to the syntactic category of the other constituent of the verbal compound.

To summarize, based on the observations above, this research sets out to explore the nature of compounding in Mandarin and aims to provide answers to the following questions:

1. Why do the verbal compounds exhibit the foot binarity effect and how are they constructed?

2. Why do the post-verbal preposition and the double object constructions exhibit the same prosodic behaviour as verbal compounds? Are they constructed in the same way?

3. What factors determine the constituent order in verbal compounding? Is it established syntactically or post-syntactically?

2 Goals of the research

This study focuses on verbal compounds in Mandarin. In the following chapters, I will explore the nature of this compounding type and propose answers to the questions raised in section 1.

The main purpose of this study is to discover what the properties of a verbal compound such as (1a), (1b), (4a) and (5a) are and to provide an explanation of the formation processes of these compounding types. Specifically, this study aims to achieve the following goals:

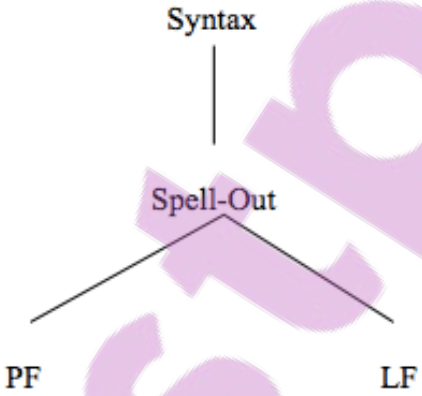
- to present a thorough analysis of Mandarin verbal compounds;
- to identify the relationship between the derivational process of these compounds and their phonological realization; and
- to reveal the factors that determine the linearization of these compounds.

In order to achieve these goals, in the following chapters, a detailed description of the phonological and syntactic properties of the various verbal compounding types will be provided. It will be demonstrated how the proposed analysis for Mandarin compounding accounts for these properties.

3 Theoretical orientation

The central assumption of this thesis is that compounds are derived at the interface of syntax, semantics, and phonology. This assumption is consistent with the inverted Y-model proposed by the Minimalist Program (MP) (Chomsky, 1993, 1995). In MP, grammar consists of three modules: narrow syntax, phonological form (PF), and logical form (LF). MP assumes an inverted Y-model of grammar. In this model, syntax occurs first; and the output of syntactic derivations is sent to PF and LF at Spell-Out.

(7) The inverted-Y model within MP (Chomsky, 1993, 1995).



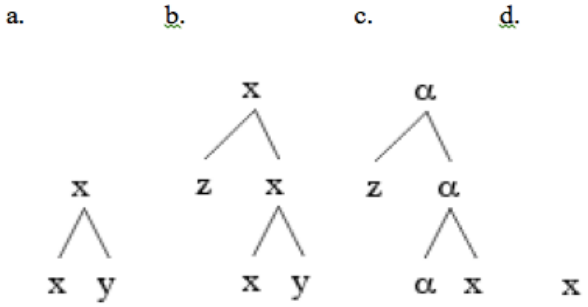
3.1 Argument Structure

This thesis develops an analysis of $[VN]_V/[NV]_V$ compounding in Mandarin on the basis of argument structure. The notion of argument structure has been accounted for with various approaches either from the lexicalist or the syntactic camps (Levin, 2013). This thesis employs Hale and Keyser's (1993, 2002, 2005)

theory of argument structure to account for the derivational processes relating to $[VN]_V/[NV]_V$ compounding in Mandarin.

Hale and Keyser's (1993, p. 68) fundamental philosophy about argument structure is that "there are no thematic roles"[3]. Instead, they assume that there are only structural relations determined by the categories (e.g., a verb, a preposition, etc.) and their projections. The thematic role of a constituent is interpreted from its syntactic position in the structure. Therefore, argument structure is defined by Hale and Keyser (2005, p. 11) as the "syntactic configuration projected by a lexical item". By defining argument structure in this way, Hale and Keyser (2002) assume that there are only two fundamental syntactic relations in argument structure: head-complement and specifier-head relations. According to Hale and Keyser (2002, p. 13), the two relations result in four types of structures:

(8) Structural types of lexical argument structure



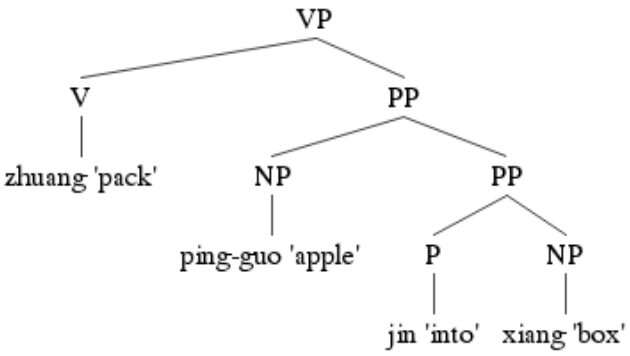
In (8), the letter *x* stands for a lexical head, *y* symbolizes a complement, and *z* represents a specifier. In languages such as English, (8a) and (8d) are the structures of verbs and nouns respectively; while (8b) and (8c) can be the structures of prepositions and adjectives. Thus, the head *x* in the four structures refers to V, P, A, N, respectively. In (8a), the head V takes a complement *y* but

[3] Hale and Keyser (1993, 2002, 2005) are not the only researchers that are in favour of this minimalist approach to argument structure. Dowty (1991), for example, argues that there are only two basic semantic roles in argument structure—a proto Agent and a proto Patient.

does not project a specifier. In (8b), the head P not only takes a complement *y* but also projects a specifier *z*. In (8c), the head A does not take a complement but projects a specifier α. The head A is hence the complement of α. Taking α as the head of the new structure, it may project a specifier z. In (8d), the head N takes neither a complement nor a specifier.

The four structural configurations can function as a complement or a specifier of each other. For example, the structural configuration for the expression *zhuang ping-guo jin xiang* (pack-apple-into-box, 'pack the apples into the box') consists of an (8b)-type structure in the complement position of the (8a)-type, as shown by (9).

(9) Structural configuration of the VP *zhuang ping-guo jin xiang* (pack-apple-into-box, 'pack the apples into the box')



It is proposed in Chapters 3, 4, and 5 that the syntactic configuration for each type of verbal compound formed through incorporation is based on the four structural types introduced in (8).

3.2 Incorporation—head movement or phrasal movement?

The central assumption of this thesis is that the $[VX]_{V/}[XV]_V$ constructions in Mandarin are derived through incorporation. A very concise definition of incorporation is provided by Matthews (2007): "A regular process by which

lexical units which are syntactically complements of verbs can also be realized as elements within the verb itself."

Although many researchers have adopted this idea in the analyses of similar structures in languages other than Mandarin, there remains a conspicuous lack of consensus on whether the verbal structures like (10a) are derived in the syntax from a source similar to (10b) (i.e., the syntactic approach), or whether they are formed in the lexicon through ordinary root merger (i.e., the lexicalist approach).

(10) a. ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
'He is packing the apples.'

b. ta zai zhuang ping-guo jin xiang.
he TAM pack apple into box
'He is packing the apples into the box.'

The lexicalist approach, initiated by Chomsky's (1970) *Remarks on Nominalizations*, proposes that morphology and syntax are two distinct grammatical components. Word formation under this approach is considered to take place completely in the lexicon. Therefore, in the lexicalist analysis, a complex verb formed through incorporation is the result of compounding a word (a noun, a verb, an adjective, or an adverb) with a verb in the lexicon, then the complex verb can be inserted into a verbal node in the syntax (A.-M. Di Sciullo & Williams, 1987; Mithun, 1984; Rosen, 1989).

The syntactic approach, advocated by Baker (1988, 1995, 1996, 2009; 2005), Hale and Keyser (1993, 2002, 2005), Massam (2001), and a number of analyses within the framework of Distributed Morphology[4] (Halle & Marantz, 1993; Marantz,

[4] See Haugen (2009), Harley (2011b), Mateu (2010, 2012), and Barrie and Mathieu (2012, 2016) for detailed discussion.

1997, 2001), hold that instances like (10a) are derived through a movement process in the syntax from structures that are similar to (10b).

This thesis adopts the syntactic approach to the $[VX]_{V/}[XV]_{V}$ constructions in Mandarin. Researchers within the syntactic camp agree that incorporation occurs in the syntax, but there is substantial debate on whether it is the headword X of the verb's complement or the phrase XP that moves to the verb forming a complex predicate. The proponents of head movement assume that incorporation is a syntactic process through which the head X (noun, verb, preposition, etc.) of a verb's complement moves out of its original phrase and adjoins to the governing V (Baker, 1988, 1995, 1996, 2009; Baker et al., 2005; Hale & Keyser, 1993, 2002, 2005)[5]. In contrast to the head-movement point of view, some theorists propose that incorporation involves phrasal movement[6] because the element that incorporates is a phrase XP rather than a head X (Clemens, 2014; Massam, 2001). That is to say, the key difference between the two approaches is the size of the incorporated element (Barrie & Mathieu, 2016). Following the convention of the literature (see Massam, 2001), I term the syntactic process that involves head movement as incorporation and the incorporation that involves phrasal movement as pseudo incorporation.

[5] Hale and Keyser (2002) employ the term conflation to refer to the head movement process where the head V is phonologically null and hence the movement involves one single head root N moving into the empty V. I take Hale and Keyser's (2002) conflation as a special type of incorporation, as they themselves admit that the two notions are closely related and may prove to be the same thing.

[6] See Barrie and Mathieu (2012, 2016) for a different approach to incorporation within the framework of Distributed Morphology. In their analysis, incorporation is realized solely by phrasal movement rather than by head movement. This is because in Distributed Morphology the input to the syntax is provided by morphemes rather than words. With this point as one of their fundament components, every single word is produced in a derived environment where a root merges with a category-determining functional head such as v^0, n^0, and so on. So in Barrie and Mathieu's analysis, the incorporated structure is not an X (e.g., N, V, A, and so on), but nP, vP, aP, DP, etc., which are larger than a bare root. Therefore, they argue that incorporation is achieved solely by phrasal movement; head movement is not needed.

Both approaches within the syntactic camp have provided evidence to show the applicability of their theories in certain languages. It turns out that in some languages, it is the lexical category X that moves into the verb to form a complex predicate; while in some languages, the incorporated element is a phrase XP.

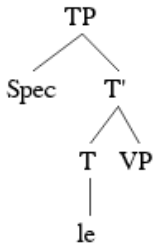
The $[VX]_V/[XV]_V$ constructions in Mandarin are of theoretical interest because both types of movement are involved in their derivations. The compounding structures formed through head movement and their parallel phrase structures formed through phrasal movement are discussed in Chapters 3 to 5. It is demonstrated that $[VX]_V/[XV]_V$ compounds are derived through head movement (i.e., incorporation) while a fundamentally different set of $[VX]_V$ structures are derived through phrasal movement (i.e., pseudo incorporation).

3.3 Tense and aspect

In English, tense and aspect are marked by fixed syntactic patterns, such as [V-ed] for simple past, [have/has + V-ed] for present perfect, and so on. The marking of tense and aspect in Mandarin is closely related to the morpheme *le*. The morpheme can appear in two different positions: the post-verbal postion or the clausal-final position, which are termed as verbal *le* and sentential *le* respectively. There exists disagreement in the literature on whether verbal *le* and sentential *le* are actually the same morpheme. On the one hand, Rohsenow (1977), Li (1989), and Shi (1988), among others, argue that there is only one *le*, which appears in different syntactic positions with different interpretations. On the other hand, Chao (1968), Li and Thompson (1981), Sybesma (1999), and Soh and Gao (2006, 2007) argue that verbal *le* and sentential *le* are two distinct morphemes with different meanings. The present study agrees with the second proposal, as one of the best diagnostics for there being two distince *le*s is the double *le* sentences, in which verbal *le* and sentential *le* co-occur in the same sentence (Soh & Gao, 2006).

Mandarin used to be categorized as a language without tense (Gao, 1986; Li Wang, 1985), but recent research indicates that verbal *le* has a past-tense interpretation and behaves like a past-tense marker (Guo, 2015; J.-w. Lin, 2000). Chen (2002) and Wu (2004) suggests that the form [V *le*] has the function of placing an event in past time and is therefore interpreted as a simple past. This thesis adopts this proposal by assuming that the form [V *le*] represents the simple past. The syntactic configuration of the simple past in Mandarin is illustrated in (11):

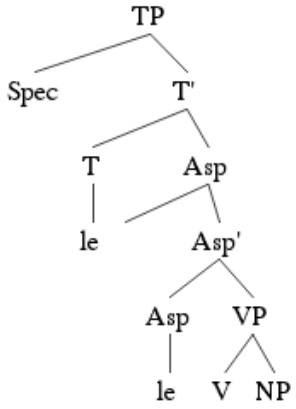
(11) Simple past in Mandarin



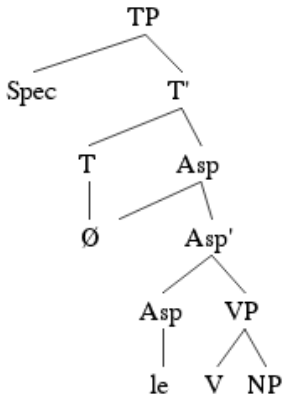
Despite of the disagreement on the treatment of verbal *le* and sentential *le* in the literature, both approaches agree that sentential *le* is a perfect marker, in the sense that the morpheme interprets the predicate as an activity occurring in the past (which maybe or maybe not ongoing) that still has relevance at the time of reference (J. Lin, 2004; Soh, 2009). This thesis follows the literature by assuming that [V NP *le*] is the form of the perfect aspect. As for the sentences containg both verbal *le* and sentential *le*, Soh and Gao (2006) suggest that the predicate of an double *le* sentence has an interpretation of perfect as well, although not all clause structures of the perfect aspect can take both *le*s. There is no clear evidence why only certain sentences take double *le*s to express the perfect aspect, but since tense and aspect are not the focus of the present study, the reasons won't be discussed in detail here. It is simpley assumed in the thesis that [V *le* NP *le*] is the full form of the perfect aspect while [V NP *le*] is the short form of the perfect aspect. Under

Cinque's (1999) assumption of the hierarchical ordering of free standing verb-associated functional elements Tense—Aspect, it is assumed in this thesis that verbal *le* ranks higher than sentential *le* in the syntact configuration of a clause structure, as shown in (12). When the short form [V NP *le*] is taken, the phonological null element Ø is employed, as shown in (13):

(12) Syntactic configuration of a clause structure in Mandarin



(13) Syntactic configuration of the short form [V NP *le*]



In Chapters 3 to 5, it is demonstrated that the simple past form [V *le*] is derived through head movement and the perfect form [V NP *le*] is derived through phrasal movement.

3.4 Motivation for movement

Chomsky (2001a; 2005, p. 7) proposes that internal merge or move may be motivated by "information-theoretic" conditions, such as discourse-related informational properties. In line with Chomsky's proposal, syntactic movement is information-structure based (Kučerová, 2007). Specifically, syntactic movement is assumed to be a focus process (Aboh, 2004; Ghomeshi, Jackendoff, Rosen, & Russell, 2004). This assumption has been verified in many languages. For example, it is reported that *wh*-movement in languages such as Gungbe, Kitharaka, and Bulgarian are trigged by focus (Aboh, 2004; Dukova-Zheleva, 2010; Muriungi, 2005) and that the raising of a verb's object to the sentence-initial position in mixed order languages is motivated by focus (Holmberg, 2000). In this thesis, it is assumed that this focus process is constrained by two principles proposed by Gundel (1988): the Given Before New Principle and the First Thing First Principle. It is discussed in Chapters 3 to 5 how the NPs bearing new and/or important information are moved to focus positions in accordance with the two principles.

Besides the information-structure based proposal, Massam (2001) proposes that certain types of syntactic movement check the D-feature of T, which requires the predicate verb or phrase to move to T as a determiner of the T marker. It is shown in Chapters 3 to 5 that genuine incorporation checks the D-feature of T by forming a sentence in the simple past while pseudo incorporation checks the D-feature of T by forming a sentence in the present perfect.

3.5 Phonological form

This thesis will demonstrate that a binary foot effect holds in Mandarin verbal compounds. This result is presented within the framework of Optimality Theory (OT) (A. Prince & Smolensky, 2008). Optimality Theory assumes that an input

form is paired with a set of output candidates, from which a system of ranked constraints selects an optimal output. Chapters 2 to 5 demonstrate how a Mandarin verbal compound with a binary foot is achieved through constraint evaluation.

3.6 Word order

There is substantial debate in the literature on whether the structure derived in the syntax contains the information of linearization. Some researchers assume that morpheme order is arranged in the narrow syntax and that phonology (PF), which occurs after syntax, does not have an effect. To researchers holding this view, morphological structure contains not only hierarchical information but also the information relating to linearization. This is a traditional approach to the ordering issue and this view has been defended in a number of works (see Baker, 1985, 1988; Harley, 2011a; Hill, 2005; Stowell, 1981). Against the traditional view, the other group of researchers assume that the syntax only derives a structure with hierarchical information and linearization is determined at PF (see Embick, 2010; Inkelas & Zec, 1990; A. Prince & Smolensky, 2008; Wolf, 2008).

This thesis takes the first approach by assuming that linearization is determined by syntactic manipulation. The implication of this assumption is that the morphological structure derived in the syntax is sent to PF with a fixed linear order. Although OT constraints select the optimal output through evaluation, the evaluation does not affect word order. It is demonstrated in Chapters 3 to 5 that word order of the various verbal compounds formed through incorporation is determined in the syntax. It is shown that these compounds are systematically compatible with their syntactic counterparts in word order. That is to say, in Mandarin, verbal compounds formed through head movement violate the Mirror Principle (Baker, 1985).

4 Structure of the thesis

The thesis consists of seven chapters and it is organized as follows.

Chapter 2 examines the compound formation processes in Mandarin. There are two goals to be achieved in this chapter: (a) to introduce notions and facts that will be discussed in the following chapters, and (b) to examine how an analysis of formation processes helps to categorize compounds in Mandarin. This chapter is composed of five sections. Section 2 looks at the definition of compounding. Section 3 provides an introduction to the diagnostics for determining wordhood in Mandarin. Section 4 firstly introduces how compounds are classified in the literature, and then proposes a novel classification by examining the compound formation processes. Section 5 concludes the chapter.

In Chapter 3, two types of incorporation in Mandarin are examined: (a) noun incorporation (NI), which produces compounding structures $[VN]_V$ and $[NV]_V$ and (b) pseudo noun incorporation (PNI) which generates breakable $[VN]_V$ constructions. Because both the compounding structures formed through NI and the breakable $[VN]_V$ structures formed through PNI surface as $[V+N]_V$[7], they exhibit some similarities in form. In order to distinguish the two from each other, section 2 provides a brief account of $[V+N]_V$ constructions in Mandarin and summarizes their general properties. It is clarified in this section that breakable $[VN]_V$ constructions are de facto phrase structures. With the characteristics of NI and PNI summarized at the beginning, section 3 reveals that the properties of $[VN]_V$/$[NV]_V$ compounds and breakable $[VN]_V$ constructions conform to the characteristics of NI and PNI, respectively. It is therefore proposed that the two types of structures are the products of the two different syntactic processes.

[7] Word order is not reflected in this structure.

Section 4 explores the formation process and the phonological properties of $[VN]_V$ compounds. It shows that $[VN]_V$ compounds are NI constructions derived through head movement and that, as word structures, they exhibit a strong binary foot effect, which is the product of head movement. Section 5 proposes a phrasal movement account for the formation of breakable $[VN]_N$ constructions in Mandarin. Section 6 discusses the formation of $[NV]_V$ compounds in Mandarin. Section 7 discusses the linearization of these constructions with the conclusion that the $[VN]_V$/$[NV]_V$ compounds are compatible to their syntactic counterparts in word order, and are therefore a violation of the Mirror Principle. Section 8 concludes the chapter.

Chapter 4 focuses on two similar processes: (a) preposition incorporation (PI), which generates a $[VP]_V$ compound and (b) pseudo preposition incorporation (PPI), which generates a verbal phrase. This chapter consists of seven sections. Following the introduction section, section 2 discusses the classification criteria for prepositions in Mandarin. It concludes that prepositions in post-verbal PP (preposition phrase) complements are, in general, monosyllabic; and only a small portion of prepositions in Mandarin can appear in this position. Section 3 examines the behavior of post-verbal PPs. It demonstrates that a post-verbal PP, being functionally identical to the NP discussed in Chapter 3, may also undergo head movement or phrasal movement, during which either the head P incorporates into V forming a verbal compound, or the phrase PP incorporates into V forming a VP. Additionally, this section examines the structures where V takes two complements: a direct object complement NP_1 and a PP complement ($[P + NP_2]$). It reveals that the two NPs are constrained by the definiteness condition when taking certain positions in the sentences. Section 4 explores the derivation of PI and PPI constructions and the motivation for their derivation. Section 5 examines the property of the theme object NP_1. It is proposed that NP_1, when taken as a

topic, may occupy different positions in a sentence; and such a movement is a process of topicalization. In section 6, the prosodic properties of PI are discussed. Section 7 provides further discussion of the notion tonal foot. Section 8 concludes the chapter.

Chapter 5 focuses on double object constructions (DOCs). It is hoped that a thorough analysis of these structures can reveal the properties of another type of verbal compound in Mandarin—$[VV]_V$ compounds derived through verb incorporation. This chapter is organized as follows. In order to get a full generalization of double object constructions in Mandarin, a literature review is carried out in section 2, based on which genuine DOCs and pseudo DOCs are distinguished from each other. A grammatical definition of Mandarin DOCs is provided at the end of the section. In accordance with the classification in section 2, section 3 examines the properties of genuine DOCs in Mandarin, based on which a summary of possible DOC structures is provided and the research questions of the chapter are raised. Due to the number of possible structural types of DOCs, diachronic evidence is checked in section 4 so as to uncover the order of appearance of these structures. Based on the diachronic evidence, the derivational processes of various DOC structures are examined and the formation of $[V\ gei]_V$ compounds is discussed. Section 5 examines the prosodic properties of $[V\ gei]_V$ compounds. This section demonstrates that different strategies are adopted so as to satisfy the FTBIN constraint. Section 6 concludes the chapter.

Chapter 6 summarizes the most important assumptions and findings of this study and suggests possible directions for future research.

Chapter 2 Compounds in Mandarin

1 Introduction

This chapter examines the compound formation processes in Mandarin. There are two goals to be achieved in this chapter: (a) to introduce notions and facts that will be discussed in the following chapters, and (b) to examine how an analysis of formation processes helps to compounds in Mandarin. This chapter is composed of five sections. Section 2 looks at the definition of compounding. Section 3 provides an introduction to the diagnostics for determining wordhood in Mandarin. Section 4 firstly introduces how compounds are classified in the literature, and then proposes a novel classification by examining the compound formation processes. Section 5 concludes the chapter.

2 Definition of compounding

Morphology is messy in nature (Hooper, 1979). Evidence for this comes from the arguments on the definition of compounding. It is well accepted in the field of morphological study that to provide a universally applicable definition of compounding is not an easy task (Lieber & Štekauer, 2009). To some scholars, a compound is composed of two or more free morphemes, which are words themselves when used separately (Bauer, 2001; Bloomfield, 1933; Fabb, 1998). To others, bound morphemes can be constituents of compounds as well (Gerdts, 1998; Mithun, 1997, 1999).

The majority of multisyllabic words in Mandarin would not count as compounds if the first definition is adopted, since in most complex words in Mandarin, at least one of the constituents is a bound morpheme (Packard, 2000). Therefore, while some morphologists follow Bloomfield and define a compound in Mandarin as consisting of two or more free morphemes (e.g., Dai, 1992), some propose that a

compound in Mandarin contains at least one bound morpheme (Y. R. Chao, 1968), and others propose that they can be composed of two or more morphemes that are either bound or free, with the former as the majority (X. Dong, 2004; Liao, 2014). This thesis follows Dong (2004) and Liao (2014) and adopts this broad definition of compounds.

3 Diagnostics for wordhood

This sections examines the diagnostics for wordhood. Various criteria including the grammatical, semantic, and prosodic diagnostics have been put forward in the literature. This section focuses on the criteria relevant to the present study. They are insertion (section 3.1) and modification (section 3.2).

3.1 Insertion

In Chapter 1, the tense and aspect marker *le* (‘-ed’) was employed as a diagnostic for wordhood. If a construction does not allow the insertion of *le* (‘-ed’) in between its constituents, it is then regarded as a word; otherwise, it is treated as a phrase. This criterion for distinguishing compounds from phrases is based on the Lexical Integrity Hypothesis (Booij, 2005a; Chomsky, 1970; A.-M. Di Sciullo & Williams, 1987; C. T. J. Huang, 1984; Lapointe, 1980; Lieber & Scalise, 2006; Selkirk, 1982; Spencer, 2005). According to this hypothesis, a word possesses the property of “syntactic atomicity” (Di Sciullo & Williams, 1987, p. 52). One aspect of the atomicity feature is that a word does not allow any type of insertion. As shown in (1a), inserting the tense and aspect marker *le* between the two constituents of the verbal compound *pao-zou* (run-walk, ‘run away’) results in an illegitimate expression. Instead, *le* can only be added to the end of the compound, illustrated by (1b).

(1) a. *pao-le-zou (run-TAM-walk)

b. pao-zou-le (run-walk-TAM, 'ran away')

One diagnostic for nominal compounds is the insertion of *de*. The morpheme *de* is a phrasal marker, which can be inserted into a phrasal structure (Gu & Shen, 2001; D. Shi, 2002, 2003). The insertion of *de* into a nominal compound would result in ungrammaticality. For example, the structure of attributive compounds with noun output is $[M\ N]_N$, in which M stands for the modifier of the head N (e.g., *bai-cai* (white-vegetable, 'cabbage')). A parallel phrase structure can be identified: $[M\ N]_{NP}$ (e.g., *hao-cai* (good-vegetable, 'vegetables with good quality')). To distinguish the compound *bai-cai* (white-vegetable, 'cabbage') from the phrase *hao-cai* (good-vegetable, 'vegetables with good quality'), the modifier marker *de* needs to be employed. As illustrated by (2) and (3), the insertion of *de* into the compound *bai-cai* (white-vegetable, 'cabbage') results in an ungrammatical structure, while inserting it into the nominal phrase *hao-cai*[8] (good-vegetable, 'vegetable with good quality') still produces an acceptable expression, and the meaning stays the same as well.

(2) a. bai-cai (white-vegetable, 'cabbage')

b. *bai-de-cai (white-de-vegetable)

(3) a. hao-cai (good-vegetable, 'vegetable with good quality')

b. hao-de-cai (good-de-vegetable, 'vegetable with good quality')

[8] The expression will be a compound if understood as 'delicious dish'.

3.2 Modification

Another prediction of the Lexical Integrity Hypothesis is that a word does not permit the modification of its constituents, whereas a phrase does (Lieber & Scalise, 2006). For example, in the verbal phrase *kai-guan* (open/turn on-close/turn off, 'to open/turn on and close/turn off'), adverbs can be inserted to modify *kai* ('open/turn on') and *guan* ('close/turn off'), respectively. As can be seen in (4), two adverbs *qing-qing-de* ('softly') and *zhong-zhong-de* ('heavily') can be inserted before the two morphemes, respectively. The adverb *qing-qing-de* ('softly') is used to modify the verb *kai* ('open/turn on') by adding the way in which the door opens (i.e., the door opened softly). The adverb *zhong-zhong-de* ('heavily') is used to modify the verb *guan* ('close/turn off') by adding the way in which the door closes (i.e., the door closed heavily). However, as a compound, the noun *kai-guan* (open/turn on-close/turn off, 'switch') does not permit any modification of its constituents. In (5), the adjective *hao* ('good') can only precede the compound to modify the expression as a whole. Neither of its constituents can be independently modified by the adjective.

(4) men qing-qing-de kai le zhong-zhong-de guan le.
door softly open TAM heavily close TAM
'The door opened softly but closed heavily.'

(5) ta mai le yi-ge hao kai-guan.
he buy TAM NUM-CL good switch
'He bought a good switch.'

4 Types of compound formation processes

4.1 Previous classification of compounds

In the history of morphological study, three mainstream approaches have been proposed for the classification of compounds. They are (a) headedness, (b) syntactic category of compounds, and (c) semantic relations between constituents.

Of these approaches, the first is to classify compounds with respect to headedness, that is, whether there is a head in the compound. For many, including Bauer (2003), Bloomfield (1933), Booij (2005b), Chao (1968), Fabb (1998), Haspelmath (2002), Scalise and Bisetto (2009), Spencer (1991), and Zwicky (1985), *kai-guan* (open/turn on-close/turn off, 'switch'), with the structure $[V\ V]_{N,}$ is an exocentric compound because the expression lacks a head; whereas *bai-cai* (white-vegetable, 'cabbage'), with the structure $[A\ N]_N$, is an endocentric compound, in which the nominal element N functions as the head. There are not many exocentric compounds in Mandarin. For instance, Ceccagno and Basciano (2007) carries out a corpus study of Mandarin compounds and classify them into three types: coordinate, attributive, and subordinate[9]. Their study indicates that the percentage of exocentric compounds in each of the three types are 15.8%, 20.7%, and 19%, respectively. That is to say, more than 80% compounds in Mandarin are headed. Ceccagno and Basciano's research further indicates that there exist three different patterns of headedness in Mandarin compounds: left-headed, right-headed, and two-headed.

In addition to headedness, compounds can also be categorized according to their syntactic category. For example, compounds in Mandarin are classified into nominal compounds, verbal compounds, and so on (S. Huang, 1998; Packard,

[9] Their classification of the Mandarin compounds will be introduced later in this section.

2000). A problematic situation this criterion may result in is that compounds of different internal structures may fall into the same category (Scalise & Bisetto, 2009). For example, while *hei-ban* (black-board, 'blackboard') and *tuan-gou* (group-buy, 'collective buying') are both nominal compounds, the two have different structures, with the former being $[A\ N]_N$ and the latter being $[N\ V]_N$.

The third approach is to categorize compounds in accordance with the semantic relations between the constituents. Based on this criterion, compound categories such as attributive, appositive, dvandva, appositional, and so on, are proposed (Bauer, 1983, 2009; A. M. Di Sciullo, 2005; Lieber, 2004; Scalise & Bisetto, 2009; Spencer, 1991). In Mandarin, compounds are usually classified into three types—subordinate, attributive, and coordinate (Bisetto & Scalise, 2005; Ceccagno & Basciano, 2007; Ceccagno & Scalise, 2006). Subordinate compounds refer to those in which the constituents are in a head-argument relation. Attributive compounds refer to those in which the constituents are in a modifier-head relation. Coordinate compounds are those in which the constituents are in a relation of synonymy, antonymy, or hyponomy.

Of the three types, coordinate compounds are distinctly different from the other two in the sense that: (a) there is a "logical coordination between the constituents" (Ceccagno & Basciano, 2007, p. 212), and (b) the constituents usually have the same syntactic category. For example, in the coordinate compound *mao-dun* (spear-shield, 'contradiction'), both *mao* ('spear') and *dun* ('shield') are nouns. The compound as a whole thus takes the structure $[N\ N]_N$. What is problematic with this semantic classification of Mandarin compounds is that the distinctions between subordinate and attributive compounds are not clear-cut (Bisetto & Scalise, 2005). For example, the word *kou-suan* (mouth-calculate, 'do mental calculation'), which is classified as an attributive compound in the literature (e.g., Ceccagno & Scalise, 2006), also exhibits the property of a subordinate compound.

In other words, the modifier *kou* (‘mouth’) is an argument (instrument) of the head *suan* (‘calculate’).

4.2 A new perspective

In view of the problems identified in the previous section and the situation that most research on Mandarin compounds to date is restricted to disyllabic compounds (e.g., Ceccagno & Basciano, 2007; Ceccagno & Scalise, 2006; Dai, 1992; Packard, 2000; X. Zhang, 2001), a new classification of compounds is deemed necessary. Although in Chapter 1, it was introduced that multi-syllabic words in Mandarin are mostly disyllabic, there are still some consisting of more than two syllables. Excluding words with more than two syllables from research may run the risk of failing to reveal the essential properties of compounds. Therefore, this thesis proposes a new way of classifying compounds, which aims to not only provide a solution to the identified problems but also cover compounds of different lengths.

This new approach is to categorize compounds according to their formation processes. The rationale behind this approach is that compounds with the same surface structure (e.g., *cai-tang* (vegetable-soup, ‘vegetable soup’) and *fu-qi* (husband-wife, ‘husband and wife’)), as well as compounds whose constituents are semantically related (e.g., *kou-suan* (mouth-calculate, ‘do mental calculation’) and *kuang-ben* (crazy-run, ‘run wildly’)), may be produced in different ways. Therefore, once the formation processes of the compounds are determined, the differences between these compounds can be determined as well.

Compounds in Mandarin are classified into three types in this thesis: (a) compounds that are formed through reduplication, (b) compounds that are formed through merge, and (c) compounds that are formed through head movement.

4.2.1 Compounds formed through reduplication

4.2.1.1 Reduplication

In Mandarin, compounds formed through reduplication are mostly, but not entirely, confined to coordinate compounds. Of the various theories, this thesis applies Inkelas and Zoll's (2005) framework of reduplication to compounding.

According to Inkelas and Zoll's (2005), reduplication is a semantic-driven compounding process. Such an approach is different from most theories of reduplication, which hold that the motivation for reduplication is phonology (Marantz, 1982; McCarthy & Prince, 1993, 1996). While the phonological-driven account of reduplication is expected to produce a structure in which the base and the reduplicant are phonologically identical, the structure produced in line with Inkelas and Zoll's (2005) theory does not need to present such a property. Instead, the constituents in the structure should semantically agree (partially or fully) or disagree with each other. In other words, constituents in the structures formed through reduplication may show different degrees of semantic similarity. Structures, in which the constituents are both phonologically and semantically identical (termed by Inkelas and Zoll as pure reduplication), are "simply one point along the cline of semantic similarity" (p. 62). Most of the time, what reduplication produces is a compound whose constituents are in a relation of synonymy, antonymy, or hyponomy. In Inkelas and Zoll's (2005, p. 65) words,

> Clearly there is a cline of semantic similarity on which total identity is an end point. As attested by the fact that descriptive grammarians standardly use the term "reduplication" for the kinds of constructions we have been looking at, reduplication includes cases in which the essential relation between the two daughters is one of semantic identity, similarity, or opposition.

The three semantic relations mentioned just now are consistent with the semantic relations identified in coordinate compounds. If the constituents in a compound are synonymous, the compound (known as a synonym construction) is assumed to be produced through "partial reduplication" (p. 64). If the constituents in a compound are antonymous, the compound is formed through "juxtaposition of opposites" (p. 64). If in a compound one constituent is the hyponym of the other, they are in a "semantic inclusion" relationship (p. 62). This is also a kind of partial reduplication. Except for the two end points— pure reduplication and juxtaposition of opposites, all the other types of compounds along the cline of semantic similarity are produced through partial reduplication. Sometimes pure reduplication may change to partial if it targets only a part (e.g., a certain syllable) of the copied constituent (i.e., base). This kind of reduplication has been found in Acehnese (Inkelas & Zoll, 2005, p. 64):

(6) singöh ('tomorrow')

singöh-ngöh ('sometime indefinite in the future')

(7) bubê ('size')

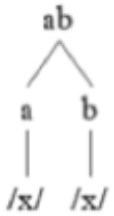
bubê-bê ('as big as')

Similar types of reduplication also exist in Mandarin. However, unlike Acehnese, syllable reduplication in Mandarin does not apply to true compounds. Instead, it applies to the so-called breakable compounds, which are diagnosed as phrases in Chapter 3.

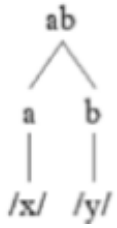
According to Inkelas and Zoll (2005), compounds formed through reduplication usually take one of the following two structures.

(8) Structural configuration of compounds formed through reduplication (adapted from Inkelas & Zoll, 2005, p. 26)

(a) Base and reduplicant are identical



(b) Base and reduplicant are different



The uniqueness of Mandarin reduplicative compounds is that the base for compounds (i.e., synonymous compounds, hyponymous compounds, and antonymous compounds) taking structure (8b) is usually a monosyllabic lexical word or a bound root, whereas the base for compounds (i.e., compounds formed through pure reduplication) taking structure (8a) is usually a compound itself, which is formed through reduplication as well. This point will be discussed in section 4.2.1.2 in detail.

Since reduplicative compounds are not the focus of the present study, the formation process is not analysed in detail here. The properties of reduplicative compounds in Mandarin, however, definitely deserve further research. The following section introduces how they are sub-categorized in this thesis.

4.2.1.2 Reduplicative compounds in Mandarin

According to the discussion in the previous section, reduplicative compounds in Mandarin can be classified into the following types: (a) synonymous compounds, (b) hyponymous compounds, (c) antonymous compounds, and (d) pure reduplication. In all these compounds, the base and the reduplicant belong to the same syntactic category. This is an important property of compounds formed through reduplication.

4.2.1.2.1 Synonymous compounds

Based on the degrees of semantic similarity, synonymous compounds in Mandarin can be categorized into three sub-classes. The following words belong to the first class:

(9) $[N\ N]_N$

a. ai-qing (love-love, 'love')

b. qi-min (vessel-vessel, 'vessel')

(10) $[V\ V]_V$

a. yan-jiu (research-research, 'research')

b. pi-ping (criticize-criticize, 'criticize')

(11) $[A\ A]_V$

a. chou-lou (ugly-ugly, 'ugly')

b. mei-li (beautiful-beautiful, 'beautiful')

These examples in (9) to (11) are typical synonymous compounds whose constituents agree on all the semantic features except for stratum and register

(Inkelas & Zoll, 2005). In some synonymous compounds, the constituents agree on most semantic features. Inkelas and Zoll (2005, p. 62) term these compounds "near-synonym constructions".

(12) a. jun-zhu (king-master, 'monarch') $[N\ N]_N$

b. li-lun (reason-discuss, 'argue') $[V\ V]_V$

c. you-shan (friendly-kind, 'kind-hearted') $[A\ A]_A$

Besides near-synonym constructions, some words are even marginal in the synonymous compound category, because their constituents are members of the same semantic set. These synonymous compounds are mostly nouns.

(13) a. hua-cao (flower-grass, 'plants')

b. lei-dian (thunder-lightening, 'thunder and lightening')

c. zhi-bi (paper-pen, 'paper and pen')

As illustrated by (9) to (13), irrespective of the differences in their degrees of semantic similarity, these synonymous compounds are two-headed in the sense that "both constituents semantically contribute to the interpretation of the whole compound" (Ceccagno & Basciano, 2007, p. 218). This finding is consistent with Chao's (1968) and Sun's (2006) opinion of this type of compounds in Mandarin.

Although most synonymous compounds in Mandarin are endocentric, there are still a few of them exhibiting semantic opacity, namely, they are exocentric. For example,

(14) a. wen-bi (article-pen, 'style of writing')

b. xue-jiu (learn-research, 'pedant')

Exocentricity is not a property exclusive to Mandarin synonymous compounds. Similar phenomena are also found in other languages such as Khmer (Ourn & Haiman, 2000).

A corpus study carried by Zhou (2004) reveals that nominal and verbal synonymous compounds exhibit different properties. A few nominal synonymous compounds are composed of three constituents (e.g, *duan-ping-kuai* (short-flat-fast, 'a skill in volleyball playing')), but verbal synonymous compounds are limited to two constituents.

4.2.1.2.2 Hyponymous compounds

According to Inkelas and Zoll (2005), hyponymous compounds are words in which one constituent is the hyponym of the other. They find that in some Turkish nominal compounds, the second constituent often refers to a class, of which the first constituent is a member, such as *martı-kuş* (seagull-bird, 'seagull'), *meşe-ağacı* (oak-tree, 'oak'), and so on. Hyponymous compounds of similar patterns are also found in Mandarin. Like Turkish, endocentric hyponymous compounds in Mandarin also take the structure $[N\ N]_N$, and are left-headed.

(15) a. song-shu (pine-tree, 'pine')

b. ju-hua (chrysanthemum-flower, 'chrysanthemum')

In contrast to synonymous compounds, some hyponymous compounds in Mandarin consist of more than two syllables. For example,

(16) a. shi-liu-shu (pomegranate-tree, 'pomegranate tree')

b. mei-gui-hua (rose-flower, 'rose')

In compounds like (16), the first constituent is often a binding word, which is treated as a disyllabic monomorphemic word in the literature (Taft & Zhu, 1995).

As will be discussed in Chapter 3, when a binding word functions as a constituent in certain types of Mandarin compounds, such as compounds formed through head movement, one of its syllables must be deleted. In hyponymous compounds, however, syllable deletion is not needed, as shown in (11). Examples like (16) show the advantage of the classification method proposed in this thesis. Although excluding trisyllabic compounds like (16) would not cause the hyponymous compounding type to be ignored, it would definitely have some impact on whether a complete picture of the phonological properties of hyponymous compounds can be provided.

It deserves noting that hyponymous compounds in Mandarin are limited to nouns. Verbs in hyponymy relation seldom combine together to form a verbal hyponymous compound. For example, the verb *dong* ('move') is the hypernym of many action verbs such as *xing* ('walk'), *zou* ('walk'), and so on. Yet, *dong* ('move') does not form verbal compounds with any of its hyponyms. Instead, it is usually the hyponyms of *dong* ('move'), which are either synonyms with each other or members of the same semantic set combining with each other and form synonymous compounds:

(17) a. xing-zou (walk-walk, 'walk')

b. ao-xiang (fly-fly, 'fly')

4.2.1.2.3 Antonymous compounds

If one constituent of a compound happens to be the opposite of the other constituent, this compound is an antonymous compound. Antonymous compounds behave quite differently from synonymous and hyponymous compounds. While only a few exocentric compounds are found in the previous two types of compounds, a large portion of antonymous compounds are headless (Zhang, 2007) . In general, these exocentric compounds are highly productive (S. Huang,

1998). Exocentric antonymous compounds are sometimes both syntactically and semantically headless, as shown in (18).

(18) a. da-xiao (big-small, 'size') $[A\ A]_N$

b. kai-guan (open-close, 'switch') $[V\ V]_N$

c. hao-dai (good-bad, 'anyhow') $[A\ A]_{Ad}$

d. mai-mai (buy-sell, 'business') $[V\ V]_N$

Nonetheless, there are still quite a few endocentric compounds as well, such as *cun-wang* (live-die, 'live and die'), *shi-fei* (right-wrong, 'right and wrong'), and *yi-tong* (difference-sameness, 'difference and sameness'), and so on. As can be seen from these examples, endocentric antonymous compounds are two-headed because both constituents contribute to meaning of the whole compound.

With regard to the second type of antonymous compounds, there are usually two heads indicating the two sides of a relationship; therefore, they are also know as relational compounds.

(19) a. fu-qi (husband-wife, 'husband and wife') $[N\ N]_N$

b. shi-sheng (teacher-student, 'teacher and student') $[N\ N]_N$

c. mu-zi (mother-son, 'mother and son') $[N\ N]_N$

Antonymous compounds are generally binary in foot since they are composed of two constituents that are opposite either in meaning or on side.

4.2.1.2.4 Pure reduplication

Pure reduplication refers to the process in which both the phonological and semantic features of the base are reduplicated, and the reduplicant is, therefore,

identical with the base. In section 4.2.1.1, it was discussed that, in Mandarin compounds, the base for pure reduplication is usually itself a compound formed through reduplication. Two strategies of pure reduplication are frequently adopted in Mandarin compounding, which naturally produce two types of structures.

In the first type, the base is usually a verbal synonymous compound. The reduplication strategy here is to reduplicate the base as a whole. That is to say, if the structure of the base is [AB], the larger compound produced through pure reduplication takes the structure [ABAB]. The larger verbal compound formed in this way usually undergoes a slight semantic change from 'do something' to 'do something a little bit' (C. N. Li & Thompson, 1981). This is a common property of reduplication. When the base and the reduplicant are combined, the higher node would modify "their meanings in a predictable way" (Kirchner, 2010, p. 121). For example,

(20) a. yan-jiu (research-research, 'research')

b. yan-jiu yan-jiu (research-research, 'research a little')

(21) a. pi-ping (criticize-criticize, 'criticize')

b. pi-ping pi-ping (criticeze-criticeze, 'criticize mildly')

As for the second type, the base for the reduplication is usually an adjectival synonymous compound. The reduplication strategy is to repeat each constituent independently. That is to say, if the structure of the base is [AB], then the larger compound formed through pure reduplication takes the structure [AABB]. Unlike the first type in which the larger compound shows a slight semantic difference from the base, in the adjective-based reduplication, the larger compound agrees with the base on most of the semantic features except that it is used in a more informal register, as illustrated by (22) and (23).

(22) a. jian-dan (simple-simple, ‘simple’)

b. jian-jian-dan-dan (‘simple’)

(23) a. qing-chu (clear-clear, ‘clear’)

b. qing-qing-chu-chu (‘clear’)

Not all adjectival synonymous compounds can undergo reduplication, though. This distinguishes them from verbal synonymous compounds, almost every member of which can undergo reduplication to produce a larger compound. As shown in (24) and (25), reduplication of the adjectival synonymous compounds *chou-lou* (ugly-ugly, ‘ugly’) and *mei-li* (beautiful-beautiful, ‘beautiful’) results in ungrammaticality.

(24) a. chou-lou (ugly-ugly, ‘ugly’)

b. *chou-chou-lou-lou

(25) a. mei-li (beautiful-beautiful, ‘beautiful’)

b. *mei-mei-li-li

4.2.1.3 Analysis

So far, four types of Mandarin compounds formed through reduplication have been discussed. Some of these compounds fall into the category of coordinate compounds while some of them are not often mentioned in the literature (e.g., the appearance of the binding words in hyponym compounds, and the compounding structures formed through pure reduplication). The reason for these compounds being ignored in the literature is that most research on Mandarin compounding has focused on disyllabic compounds (e.g., Ceccagno & Basciano, 2007; Ceccagno & Scalise, 2006; Dai, 1992; Packard, 2000; X. Zhang, 2001). The negative impact of

this approach is clear now. Excluding compounds with more than two syllables from their investigation, these studies have either left out certain compounding types from the whole category or failed to reveal certain phonological properties of the compounds.

In the present study, through a close examination of reduplicative compounds differing in syllable count, some properties of these compounds are identified. First, according to the discussion in section 4.2.1.2, verbal synonymous and antonymous compounds are limited to two syllables, and hyponymous compounds are scarcely verbal. The implication is that verbal reduplicative compounds are subject to FTBIN, a constraint requiring two syllables. Since a semantic-driven account for reduplication suggests that the reduplicant does not need to be phonologically identical but needs to be semantically related with the base, trisyllabic nominal reduplicative compounds are identified. The requirement for maintaining the semantic relation between the base and the reduplicant can be defined as a constraint IDENT(SR), where SR stands for semantic relation.

(26) IDENT(SR): Maintain the required semantic relation between the base and the reduplicant.

This constraint must rank higher than FTBIN so as to ensure that the optimal candidate is selected: IDENT(SR) >> FTBIN. The constraint FTBIN is defined at the syllabic level at the moment:

(27) FTBIN: A foot must be binary at the syllabic level.

The formation of the trisyllabic hyponymous compound *mei-gui-hua* (rose-flower, 'rose') is illustrated with a tableau in (28). The hyponomy relation between the two constituents must be maintained. When this relation is replaced by another semantic relation, hence incurring the violation of IDENT(SR) (e.g., synonomy

between the two constituents in **mei-gui-shan-cha* (rose-camelia)), the satisfaction of FTBIN does not help the candidate to be selected.

(28) mei-gui-hua (rose-flower, 'rose')

$[[\text{mei-gui}]_N[\text{hua}]_N]_N$	IDENT(SR)	FTBIN
☞mei-gui-hua		*
mei-gui-shan-cha	*!	

As for verbal reduplicative compounds, it is assumed that the constraint ranking should be IDENT(SR)... FTBIN, which means that the optimal candidate must satisfy both constraints. Take the antonymous compound *da-xiao* (big-small, 'size') as an example. In (29), the losing candidates **da-da* and **da-xiao-da* violate the constraints IDENT(SR) and FTBIN respectively, while the winning candidate *da-xiao* satisfies both IDENT(SR) and FTBIN.

(29) kai-guan (open-close, 'open and close')

$[[\text{kai}]_V[\text{guan}]_v]_V$	IDENT(SR)	FTBIN
☞kai-guan		
kai-kai	*!	
da-kai-g		*!

Another property of Mandarin reduplicative compounds is that reduplication is recursive; namely, reduplication can occur multiple times. Recursiveness is a typical property of compounds (Spencer, 1991), and this property has been identified in various languages including Mandarin Chinese, English, Dutch, Italian, Japanese, and so on (Arcodia, Grandi, & Montermini, 2009; Booij, 2005b, 2009, 2010; Duanmu, 2000; Mukai, 2013; Packard, 2000). There is substantial debate, however, on whether reduplicative compounds admit recursiveness (Štekauer, 2012). According to Štekauer, in many languages, such as Ilocano, Karao, Telugu, and Hausa, recursion is not accepted in compounds formed through reduplication. Counter examples are identified in some African languages

and South East Asian and Oceanic languages (Harrison, 1973; Rose, 2003). In these languages, a word structure that has undergone reduplication may be reduplicated once more, which is known as triplication (Wiltshire & Marantz, 2000, p. 559). Reduplicative compounds in Mandarin admit a slightly different strategy of reduplication. Namely, instead of reduplicating the same base, in Mandarin reduplicative compounds, the structure formed in the first step of reduplication functions as the base for further reduplication. Thus, in Mandarin, recursive reduplication can produce compounds with four syllables. Word structures that are formed through the same reduplication strategy as Mandarin are also identified in other languages, such as Emai and Thao (Blust, 2001; Egbokhare, 2001). The reason for the different properties shown in triplication and reduplication in these languages might be that in the latter it is a pure reduplication occurring after a synonym reduplication (i.e., partial reduplication), while in the former both steps take the pure reduplication strategy.

4.2.2 Compounds formed through merge

4.2.2.1 Basic structures

Within the framework of Minimalist Program (Chomsky, 1993, 1995, 2000), language is composed of three components: narrow syntax, phonological form and logical form. Narrow syntax, the syntactic component of the computational system, is a sequence of derivational processes that involves two types of operations: merge and move, which are later termed as external merge and internal merge respectively by Chomsky (2001b). Examining compounding from a syntactic point of view, merge and move are seen as the ways to produce complex word structures in this thesis. Compounds produced through movement are the focus of this thesis and will hence be discussed extensively in the following chapters. This section mainly focuses on compounds formed through

merge. According to Chomsky (1995), merge is an operation that combines two syntactic elements into one constituent. In other words, within the Minimalist Program, merge is a binary operation. This is different from X-bar theory (Chomsky, 1970; Jackendoff, 1977), in which the syntactic branching can be either binary or unary.

In Mandarin, the endocentric compounds produced through merge are usually right-headed, although some of them are semantically opaque. Compounds produced through merge are approximately equal to the attributive compounds, but as discussed in section 4.1, not all attributive compounds identified in the literature are produced through merge. The structures of endocentric compounds formed through merge could be (M represents modifier):

(30) a. b.

The output of (30a) is a nominal compound. In a nominal compound, the modifier can be a noun, an adjective, or a verb. Examples (31d) and (31e) suggest that nominal compounds in Mandarin are not subject to FTBIN.

(31) a. ti-wen (body-temperature, 'temperature') $[N\ N]_N$

b. bai-cai (white-vegetable, 'Chinese cabbage') $[A\ N]_V$

c. beng-chuang (jump-bed, 'trampoline') $[V\ N]_N$

d. pi-[jia-zi] (leather-folder, 'wallet') $[N\ N]_N$

e. [pu-tao]-tang (grape-sugar, 'glucose') $[N\ N]_N$

The output of (30b) is a verbal compound. The modifier in a verbal compound is usually an adjective, an adverb, or a noun. In contrast to nominal compounds in Mandarin, a verbal compound formed through merge is subject to FTBIN. This constraint on verbal compounds in Mandarin is shown in (32). The examples suggest that when a disyllabic compound merges with another constituent to form a verbal compound, the excess syllable must be deleted.

(32) a. kuang-ben (crazy-run, 'run wildly') [A V]$_V$

b. *[feng-kuang]-ben (crazy-run)

c. hu-dong (mutually-act, 'interact') [Ad V]$_V$

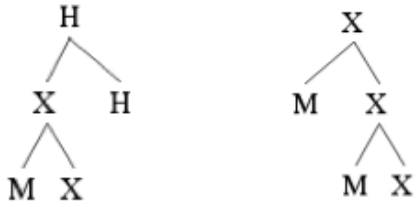
d. *[hu-xiang]-dong (mutually-act)

4.2.2.2 Recursiveness

One important characteristic of merge is recursiveness, a consequence of the recursive language system (Chomsky, 1995, 2001b). Specifically, the output of merge can merge with another syntactic element producing a larger structure (A.-M. Di Sciullo & Isac, 2008). This characteristic suggests that, in Mandarin, compounds formed through merge can be composed of more than two syllables.

Given the recursive characteristic of merge, the output structure may become a modifier or a head in a larger compound to reproduce themselves (Roeper, 2007). Replacing the syntactic head in the tree structures in (30) with X and submitting these structures to a further step of merge, larger compounding structures can be produced (the mother node is labeled as H(ead) if X is not the head of the final output):

(33) a. b.



For example, the nominal compound *ti-wen* (body-temperature, 'temperature') can appear in the modifier position of (33a) and merge with a nominal head forming larger nominal compound, illustrated by (34a). The nominal compound *bai-cai* (white-vegetable, 'Chinese cabbage') can appear in the head position of (33b) and merge with a modifier to form a larger nominal compound, shown in (34b). According to the discussion in section 3, the wordhood of the examples in (34) can be diagnosed with the insertion of the phrasal marker *de*.

(34) a. [ti-wen]-biao (temperature-meter, 'thermometer')

*ti-wen-de-biao

b. da-[bai-cai] (big-Chinese cabbage, 'a kind of Chinese cabbage')

*da-de-bai-cai[10]

The verbal compounds can be re-submitted to merge as well, but further merge with a verbal compound can only produce a nominal compound, which suggests that verbal compounding is bounded, as shown in (35).

(35) a. [hu-dong]-ke (interact-class, 'interactive lecture')

b. shen-[hu-dong] (deep-interact, 'active interaction')

[10] The structure *da-de-bai-dai* would be acceptable if *da-bai-cai* (big-white-cabbage) is understood as 'a big cabbage'. When used with this meaning, *da-bai-cai* is a phrase.

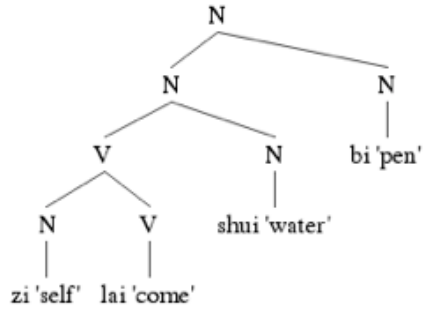
In contrast, recursion in nominal compounding is potentially unlimited. This property of nominal compounding is illustrated with the examples in (36), whose derivational processes are depicted in (37).

(36) a. [zi-lai]-shui-bi (self-come-water-pen, ‘pen’)

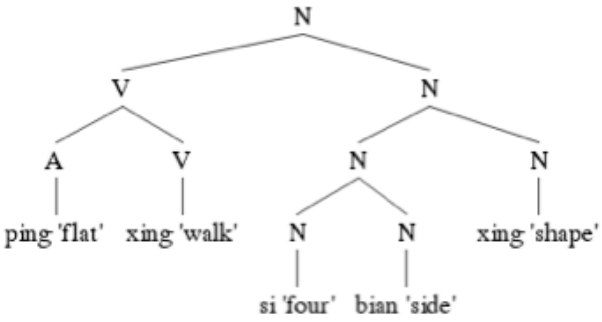
b. [ping-xing]-[si-bian]-xing (flat-walk-four-side-shape, ‘parallelogram’)

c. [dian-ying]-[yi-shu]-[zuo-pin]-zhan (film-art-works-exhibition, ‘exhibition of motion picture art works’)

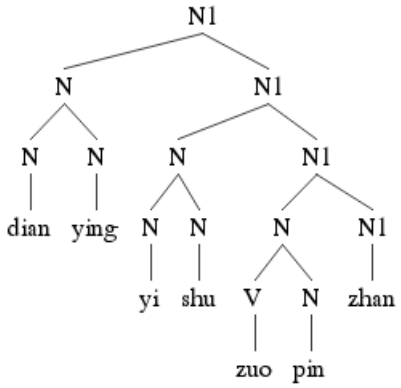
(37) a.



b.



c.



4.2.2.3 Analysis

According to the discussion in the previous sections, recursion in nominal compounds in Mandarin can be potentially unlimited and they are not subject to FTBIN; while verbal compounds formed through merge in Mandarin are strictly constrained by FTBIN, which requires that excess syllables in the constituents be deleted. In other words, FTBIN must dominate MAX so as to derive a binary foot for the verbal compound, illustrated in (38).

(38) Derivation of a verbal compound in Mandarin

kuang-ben (crazy-run, 'run wildly')	FTBIN	MAX
☞kuang-ben		*
feng-kuang-ben	*!	

In contrast, in order to derive a nominal compound in Mandarin, faithfulness to the constituents must be guaranteed, hence the constraint ranking MAX >> FTBIN.

(39) Derivation of a nominal compound in Mandarin

pu-tao-tang (grape-sugar, 'glucose')	MAX	FTBIN
pu-tao-tang		*
pu-tang	*!	
tao-tang	*!	

5 Conclusion

With a close observation of the different compounding types classified in the literature, this chapter proposes a new classification of compounding in Mandarin. Specifically, this thesis proposes to categorize compounds by their formation processes. It is suggested that there are three main types of compound formation processes: reduplication, merge, and head movement.

Through the discussion of the first two compound formation processes, it is found that a binary foot effect holds in verbal compounds formed through either reduplication or merge, whereas FTBIN is violable in nominal compounds. The FTBIN effect in Mandarin verbal compounds needs further verification, though, since the third type, head movement, which produces verbal compounds, has not been discussed yet. From the next chapter on, this thesis starts to focus on compounds formed by means of head movement, or more specifically, by means of incorporation (Baker, 1988; Hale & Keyser, 1993, 2002). Syllable deletion, a very important strategy employed in the derivation of a binary foot in verbal compounds, is also discussed in detail in Chapter 3.

Chapter 3 Noun incorporation and pseudo noun incorporation

1 Introduction

Two types of compound formation processes were discussed in Chapter 2: reduplication and merge. From this chapter on, compounds formed through head movement, or more specifically, through incorporation, are to be examined in detail. In this chapter, two types of incorporation in Mandarin are examined: (a) noun incorporation (NI), which produces compounding structures $[VN]_V$ and $[NV]_{V;}$ and (b) pseudo noun incorporation (PNI), which generates breakable $[VN]_V$ constructions. Because both the compounding structures formed through NI and the breakable $[VN]_V$ structures formed through PNI surface as $[V+N]_V$[11], they exhibit some similarities in form. In order to distinguish the two from each other, section 2 provides a brief account of $[V+N]_V$ constructions in Mandarin and summarizes their general properties. It is clarified in this section that breakable $[VN]_V$ constructions are de facto phrase structures. With the characteristics of NI and PNI summarized at the beginning, section 3 reveals that the properties of $[VN]_V$/$[NV]_V$ compounds and breakable $[VN]_V$ constructions conform to the characteristics of NI and PNI, respectively. It is therefore proposed that the two types of structures are the products of the two different syntactic processes. Section 4 explores the formation process and the phonological properties of $[VN]_V$ compounds. It shows that $[VN]_V$ compounds are NI constructions derived through head movement and that, as word structures, they exhibit a strong binary foot effect, which is the product of head movement. Section 5 proposes a phrasal movement account for the formation of breakable $[VN]_N$ constructions in

[11] Word order is not reflected in this structure.

Mandarin. Section 6 discusses the formation of $[NV]_V$ compounds in Mandarin. Section 7 discusses the linearization of these constructions with the conclusion that the $[VN]_V$/$[NV]_V$ compounds are compatible to their syntactic counterparts in word order, and are therefore a violation of the Mirror Principle. Section 8 concludes the chapter.

2 $[V+N]_V$ structures in Mandarin

The literature identifies two types of $[V+N]_V$ structures in Mandarin: (a) structures with the order [NV], and (b) those with the order [VN] (Lü, 1979; Lu, 1957). According to Lu (1957), these two types can be further classified as breakable and non-breakable structures. It is worth noting that with regard to semantic relations, the nominal component N in the $[V+N]_V$ structures is usually an argument of the verbal component V, as shown in (1).

(1) a. wang-gou (net-buy, 'shop online')

b. shui-xi (water-wash, 'clean with water')

c. lu-ji (road-hold a memorial ceremony, 'hold a memorial ceremony on road')

d. zhuang-xiang (pack-box, 'pack something into a container such as a box')

e. bao-mi (protect-secret, 'keep a secret')

Examples (1a) to (1c) all exhibit the $[NV]_V$ order. In (1a), the nominal component *wang* ('net') is the platform through which the action of purchase is completed. In (1b), the nominal element *shui* ('water') is the instrument with which the cleaning is done. In (1c), the nominal component *lu* ('road) is the location where the memorial ceremony is held. Examples (1d) and (1e) exhibit the $[VN]_V$ order. The nominal component *xiang* ('box) in (1d) is the semantic goal where things are

packed, and the nominal element *mi* (‘secret’) is the theme of the verb *bao* (‘protect’).

In the following sections, the properties of the two constituent orders and their sub-categories are discussed in detail. It is intended to show that the different distributions of the nominal elements in the two orders can be attributed to the different thematic roles they possess. Moreover, this section also demonstrates that the non-breakable sub-category of each order is a verbal compounding structure whereas the breakable sub-category of each order is a verbal phrasal structure.

2.1 $[NV]_V$ structures

According to Huang (2014), judging from the relations between N and V, there exist the following two types of $[NV]_V$ structures in Mandarin: breakable $[SV]_V$ (with S as the agent of V) and non-breakable $[NV]_V$ (with N as the internal argument of V). In this section, it is demonstrated that a breakable $[SV]_V$ is in fact a verbal phrase and that a non-breakable $[NV]_V$ is a verbal compound.

2.1.1 Breakable $[SV]_V$ structures

In a $[SV]_V$ structure in Mandarin, the nominal element is the subject of the verbal element (C. N. Li & Thompson, 1981), as illustrated by (2).

(2) a. *tou-teng* (head-ache, ‘have a headache’)

b. *di-zhen* (earth-quake, ‘earthquake occurs’)

That the nominal element in a $[SV]_V$ construction is the subject of the verbal element is not the only criterion distinguishing a $[SV]_V$ structure from a $[NV]_V$ structure. The other differentiating factor is that the constituents in $[SV]_V$ constructions can be modified, but $[NV]_V$ structures do not allow for such modification (C. N. Li & Thompson, 1981; Shen, 2002; Shuhua Zhao & Zhang,

1996). As can be seen in (3), the adverbs *hen* ('very') and *chang-chang* ('often') can precede the verbal element of the $[SV]_V$ structure *tou-teng* (head-ache, 'have a headache') as a modifier of V.

(3) a. ta tou hen teng.
he head very ache
'He has a very bad headache.'

b. ta tou chang-chang teng.
he head often ache
'He often has a headache.'

According to the Lexical Integrity Hypothesis (Booij, 2005a; Chomsky, 1970; A.-M. Di Sciullo & Williams, 1987; Lapointe, 1980; Lieber & Scalise, 2006; Selkirk, 1982; Spencer, 2005), a compound, as a word structure, would not permit any syntactic manipulation of its constituents, such as insertion and modification. It is only in a verbal phrase that an adverb can be used to modify the verbal element. A verbal compound does not permit such a behavior. The examples in (3) clearly indicate that breakable $[SV]_V$ structures function as verbal phrases.

2.1.2 Non-breakable $[NV]_V$ structures

A $[NV]_V$ structure usually consists of a verb and the verb's indirect internal argument (Spencer, 1991). The nominal argument is usually the verb's instrument, manner/method, or location. A $[NV]_V$ structure can function as either a transitive predicate or an intransitive one, depending on the valency of the verb. In contrast to a $[SV]_V$ construction that allows for insertion and modification of its constituent, a $[NV]_V$ structure would not be able to undergo these processes, as shown by the examples in (4) to (6).

The examples in (4) illustrate the usage of the $[NV]_V$ structure *shui-xi* (water-wash, 'clean with water'), where the nominal element *shui* ('water') functions as the instrument of the verbal element *xi* ('wash'). The structure as a whole is a

transitive verb and can be followed by a direct object (see (4a) and (4c)). Example (4b) indicates the wordhood status of *shui-xi* (water-wash, 'clean with water') because it does not permit the insertion of the tense and aspect marker *le* between its constituents. In addition, although the structure as a whole can be modified by the adverb *chang-chang* ('often') (see (4c)), modifying its verbal constituent with the adverb results in ungrammaticality (see (4d)).

(4) Instrument (*shui-xi* (water-wash, 'clean with water'))

a. wo shui-xi le zhe-jian shang-yi.
I water-wash TAM this-CL coat
'I cleaned this coat with water.'

b. *wo shui-le-xi zhe-jian shang-yi.
I water-TAM-wash this-CL coat

c. wo chang-chang shui-xi zhe-jian shang-yi.
I often water-wash this-CL coat
'I often clean this coat with water.'

d. *wo shui-chang-chang-xi zhi-jian shang-yi.
I water-often-wash this-CL coat

The nominal elements in the $[NV]_V$ structures listed in (5) and (6) function as manner/method and location of the verbal elements, respectively. The first two examples in (5) and (6) show that the tense and aspect marker *le* is banned from being inserted in between the nominal and the verbal constituents. Further, the last two examples in (5) and (6) suggest that although each structure as a whole can be modified by an adverb, modifying the verbal constituent with an adverb is not acceptable.

(5) Manner/method (*wang-gou* (net-buy, 'shop online'))

a. ta wang-gou le liang-ben tu-shu.
he net-buy TAM NUM-CL book
'He bought two books online.'

b. *ta wang-le-gou liang-ben tu-shu.
he net-TAM-buy NUM-CL book

c. ta chang-chang wang-gou tu-shu.
he often net-buy book
'He often buy books online.'

d. *ta wang-chang-chang-gou tu-shu.
he net-often-buy book

(6) Location (*lu-ji* (road-hold a memorial ceremony, 'hold a memorial ceremony on the road'))

a. ta lu-ji le wang-you
he road-hold a memorial ceremony TAM dead-friend
'He held a memorial ceremony on the road for a dead friend.'

b. *ta lu-le-ji wang-you.
he road-TAM-hold a memorial ceremony dead-friend

c. ta chen-tong-de lu-ji le wang-you.
he sadly road-hold a memorial ceremony TAM dead-friend
'With sorrow, he held a memorial ceremony on the road for a dead friend.'

d. *ta lu-chen-tong-de-ji le wang-you
he road-sadly-hold a memorial ceremony TAM dead-friend

Based on the examples above, the wordhood of $[NV]_V$ structures in Mandarin can be determined. The characteristics of the Mandarin $[NV]_V$ compounds are summarized in (7).

(7) Characteristics of $[NV]_V$ compounds in Mandarin

a. A $[NV]_V$ compound in Mandarin is composed of two roots: a root noun and a root verb.

b. The thematic role of N in a $[NV]_V$ compound is usually the instrument, manner/method, or location.

c. In a $[NV]_V$ compound, N precedes V.

d. A $[NV]_V$ compound does not permit any type of insertion or modification of its internal structure.

2.2 $[VN]_V$ structures

2.2.1 Non-breakable $[VN]_V$ structures

In terms of breakability, $[VN]_V$ structures are categorized into two types in the literature: non-breakable $[VN]_V$ and breakable $[VN]_V$ (Lü, 1979; Lu, 1957). A non-breakable $[VN]_V$ structure is usually composed of a verbal element and its direct internal argument (theme) or an indirect internal argument such as the semantic goal, as illustrated by the examples in (8).

The non-breakable $[VN]_V$ construction in (8a) consists of a verbal root *jie* ('control') and its direct argument *ai* ('sadness'). Example (8b) consists of a verb *zhuang* ('pack') and its indirect internal argument (goal) *xiang* ('box'). These non-breakable $[VN]_V$ constructions conform to Lexical Integrity as they do not permit any type of insertion or constituent modification. Therefore, a non-breakable $[VN]_V$ in Mandarin should be considered a verbal compound.

(8) a. *jie-ai* (control-sadness, 'restrain one's grief')

qing jie-ai.
please control-grief
'Please restrain your grief.'

b. *zhuang-xiang* (pack-box, 'pack')

gong-ren-men	zheng-zai	zhuang-xiang	ping-guo.
workers	TAM	pack-box	apple

'The workers are packing the apples.'

The characteristics of $[VN]_V$ compounds in Mandarin are summarized in (9).

(9) Characteristics of $[VN]_V$ compounds in Mandarin:

a. A non-breakable $[VN]_V$ compound in Mandarin is composed of a verbal root and a nominal root.

b. In a $[VN]_V$ compound, N is usually V's direct or indirect internal argument.

c. In a $[VN]_V$ compound, N follows V.

d. A $[VN]_V$ compound does not permit any type of insertion or modification of its internal structure.

The number of non-breakable $[VN]_V$ compounds in Mandarin is limited. Most $[VN]_V$ structures are breakable (C. N. Li & Thompson, 1981; Packard, 2000). Their properties are to be discussed in the next section.

2.2.2 Breakable $[VN]_V$ structures

Some properties of a breakable $[VN]_V$ structure in Mandarin are similar to those of a $[VN]_V$ compound. For example, the nominal element in a breakable $[VN]_V$ structure follows the verbal element and is usually a direct or an indirect internal argument of the verbal element (C. N. Li & Thompson, 1981). These are also the characteristics of a $[VN]_V$ compound (see (11)). What distinguishes the two is that a $[VN]_V$ compound does not permit any type of insertion or modification of its constituents whereas a breakable $[VN]_V$ structure does, as illustrated by the examples in (10).

(10)*xiu-hua* (embroider-flower, ‘do embroidering work’)

a. jie-jie xiu hua le.
sister embroider flower TAM
‘My sister has done some embroidering work.’

b. jie-jie xiu wu-duo hua le.
sister embroider NUM-CL flower TAM
‘My sister has embroidered five flowers.’

c. jie-jie xiu hong-se-de hua le.
sister embroider red flower TAM
‘My sister has embroidered some red flowers.’

The construction *xiu-hua* (embroider-flower, ‘do embroidering work’) in (10) is a breakable verbal structure. In (10b), a quantifier *wu-duo* (NUM-CL, ‘five pieces’) is inserted to modify the nominal element *hua* (‘flower’). In (10c), the nominal complement is modified by an adjective *hong-se-de* (red-colour-adjective marker, ‘red’). The insertion of these elements does not result in unacceptable sentences, indicating that the breakable $[VN]_V$ structure *xiu-hua* (embroider-flower, ‘do embroidering work’) is a verbal phrase instead of a verbal compound.

It is apparent that in many respects, breakable verbal structures ($[SV]_V$ and $[VN]_V$) behave like phrases because Lexical Integrity fails to constrain them (i.e., the constituents of these constructions are accessible to syntactic manipulation, which is the same as the behavior of phrases). From this perspective, it is deemed reasonable to include these breakable verbal structures in the realm of phrases.

When viewed from other perspectives, however, these breakable verbal structures do not behave exactly like phrases. First, a phrase, under its non-technical sense, is a syntactic unit composed of two or more words. A phrase is usually smaller than a clause, and it can be part of a clause or a larger phrase (Matthews, 2007). Therefore, an expression is a phrase not only because it violates Lexical Integrity

but also because the constituents are free morphemes (i.e., words) (Matthews, 2007). In Mandarin, however, the constituents of these breakable verbal structures can be either free or bound morphemes, distinguishing them from phrases.

In view of the duality of breakable verbal structures, they are classified as breakable compounds in the literature (Lu, 1957; Shoukang Zhang, 1957). In a corpus study, Zhao and Zhang (1996) collected 355 breakable compounds, of which 29 were composed of two bound morphemes; 165, one bound morpheme and one free morpheme; and 161, two free morphemes. The variety in constituency is shown in (11).

(11) a. bi-ye (finish-study, 'graduate') [bound + bound]

b. na-shui (pay-tax, 'pay taxes') [bound + free]

c. you-yong (swim-swim, 'swim') [free + bound]

d. ba-ya (pull-tooth, 'have a tooth extraction') [free + free]

On the one hand, some properties of breakable compounds are compatible with those of compounding; on the other hand, they behave like phrases because their internal constituents are accessible to syntactic operations. These properties make breakable compounds a topic of theoretical interest in Chinese morphological research. Some of the literature suggests that these structures should be treated as compounds, provided there are no other elements intervening between V and N (Lu, 1957; D. Shi, 2002). This account of breakable verbal structures is not reasonable, however, because it only focuses on the surface forms and the underlying structures are not addressed. Some theories hold that breakable compounds form a continuum that functions as a connection between words and phrases (G. Wang & Wang, 2011). This idea of a gradient continuum between the word domain and the phrase domain is contrary to the hypothesis of modularity of

the morphological and syntactic systems (Packard, 2000). In light of the observation that breakable verbal structures in Mandarin do behave like phrases when used as verbs, breakable compounds in Mandarin are treated as phrases in this thesis. From here on out, breakable $[SV]_V$ structures and breakable $[VN]_V$ structures are termed breakable $[SV]_V$ constructions and breakable $[VN]_V$ constructions so as to differentiate them from normal VPs.

The characteristics of breakable $[VN]_V$ constructions in Mandarin are summarized in (12).

(12) Characteristics of breakable $[VN]_V$ constructions in Mandarin:

a. A breakable $[VN]_V$ construction in Mandarin is composed of a root verb and a nominal element.

b. In a breakable $[VN]_V$ construction, the nominal element is usually the direct or indirect internal argument of the verb.

c. In a breakable $[VN]_V$ construction, the nominal element appears following the verb.

d. In a breakable $[VN]_V$ construction, the nominal element can be modified by adjectives, quantifiers, or determiners.

2.3 Summary and questions

So far, four types of $[V+N]_V$ structures in Mandarin have been reviewed. They are breakable $[SV]_V$ constructions, $[NV]_V$ compounds, breakable $[VN]_V$ constructions, and $[VN]_V$ compounds. Table 1 is a summary of each type.

Table 1

Classification of [V+N]$_V$ Structures

	Non-breakable		Breakable	
Type	[NV]$_V$	[VN]$_V$	[SV]$_V$	[VN]$_V$
Constituents	free and/or bound morphemes	free and/or bound morphemes	free and/or bound morpems	free and/or bound morphemes
Semantic Relation	indirect internal argument	direct or indirect internal argument	agent	direct or indirect internal argument
Word Order	N-V	V-N	N-V	V-N
Lexical Integrity	Yes	Yes	No	No
Conclusion	compounds		phrases	

In a breakable [SV]$_V$ construction, the nominal element is the external argument of the verbal element; namely, S is not contained in the maximal projection of V. This makes it different from the other three types in which N is always the internal argument of V. This thesis only examines the formation processes of the three types that involve a verb and its internal argument. They are

(13)a. [VN]$_V$ compounds,

b. breakable [VN]$_V$ constructions, and

c. [NV]$_V$ compounds.

Given (13a) and (13b), the question would be why some [VN]$_V$ constructions in Mandarin are breakable while others are not. Given (13a) and (13c), the question would be what is the reason for the different orders of [VN]$_V$ and [NV]$_V$ compounds.

To address the first question, it is argued that [VN]$_V$ compounds in Mandarin are derived through NI (i.e., movement of a head noun N), and breakable [VN]$_V$

constructions are derived through PNI (i.e., movement of a nominal phrase NP). For the second question, it is argued that the different orders of $[VN]_V$ and $[NV]_V$ compounds are determined by their syntactic structural configurations.

3 Characteristics of NI and PNI

Before focusing on the derivational processes of these verbal compounding types in Mandarin, it is necessary to examine the properties of NI and PNI and to check whether the properties of $[VN]_V$/$[NV]_V$ compounds are consistent with those of NI and whether the properties of breakable $[VN]_V$ constructions are consistent with those of PNI.

3.1 Characteristics of NI

According to Gerdts (1998, p. 84), NI can be defined as the "compounding of a noun stem and a verb…to yield a complex form that serves as the predicate of a clause". This definition reveals a prominent characteristic of NI constructions; namely, only one verbal root and one noun root are involved[12][13] (Baker, 1988). On the basis of prior pertinent research (e.g., Baker, 1988, 2009, 2014; Baker et al., 2005; Gerdts, 1998; Hale & Keyser, 1993, 2002, 2005; Mithun, 1984, 1986), the characteristics of NI is summarized in (14).

(14) Characteristics of NI

a. NI involves only a verb root and a noun root, which is the direct or indirect argument of the verb.

[12] There are a few analyses trying to show the existence of double noun incorporation. For example, double noun incorporation is reported to exist in languages such as Koyukon Athapaskan, Sora, and so on. See Axelrod (1990) and Muro (2014) for detailed discussion.

[13] Although Hale and Keyser's (1993, 2002, 2005) analyses are limited to one root, their theories of argument structure and incorporation presuppose the existence of two roots (Erteschik-Shir & Rapoport, 2005).

b. NI compounds denote general or frequentative events or activities.

c. In most cases, the incorporated noun is non-specific in reference.

d. If the incorporated noun is morphologically complex, it must be stripped down to a simple root.

e. Proper nouns do not incorporate.

f. NI shows linear adjacency between the verb and the noun.

The summary in (14a) is about the constituent count of NI—there are only two elements in a NI construction. The structures of $[VN]_V$/$[NV]_V$ compounds in Mandarin are fully compatible with this property of NI. In sections 2.1 and 2.2, all the examples of this compounding type are composed of two elements: a verb and a noun. Moreover, the noun is usually a direct or an indirect argument of the verb.

The statement in (14b) suggests that the action denoted by a $[VN]_V$/$[NV]_V$ compound is not a one-off event or activity. It can be a habit, a hobby, or a scheduled event that often happens. Mandarin $[VN]_V$/$[NV]_V$ compounds exhibit the same effect. For example, the $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack') does not mean 'to pack once', and the $[NV]_V$ compound *shui-xi* (water-wash, 'clean with water') does not mean 'to wash once'. Instead, they refer to a daily event or a habitual activity.

The statements in (14c) to (14e) describe the properties of the incorporated nouns. The nominal element in a $[VN]_V$/$[NV]_V$ compound is consistent with NI in these respects. First, according to (14c), the semantic content of NI constructions is non-specific. Mandarin $[VN]_V$/$[NV]_V$ compounds exhibit the same effect. For example, the $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack') only means to pack things; it does not encode the exact place that the things are packed into, and the $[NV]_V$ compound *shui-xi* (water-wash, 'clean with water') does not encode

how much water is used to do the cleaning. Second, according to (14d), the form of the nominal element in a NI construction is one single root. This is a property of NI in most languages although counterexamples have been found in some languages. For example, [NN] compounds can incorporate in Koryak (Kurebito, 2001). In some languages (such as Koyukon Athapaskan and Sora), a NI construction may contain two noun roots (Axelrod, 1990; Muro, 2014). Despite these cross-linguistic exceptions, it is can be seen from the examples in the previous sections that a Mandarin $[VN]_V$/$[NV]_V$ compound contains only one noun root. Third, that proper nouns do not incorporate ((14e)) is a universal property of NI (Mardirussian, 1975). Mandarin $[VN]_V$/$[NV]_V$ compounds exhibit the same effect.

The statement in (14f) means that the verb and the noun in a NI construction should be adjacent to each other. Namely, there should be no intervening syntactic elements between the two. Mandarin $[VN]_V$/$[NV]_V$ compounds exhibit the same effect. As has been discussed in sections 2.1 and 2.2, neither $[VN]_V$ nor $[NV]_V$ compounding permits any form of insertion or modification of constituents.

3.2 Characteristics of PNI

According to Massam (2001), NI in Niuean usually involves movement of a nominal phrase NP that functions as the verb's complement. To distinguish the nominal incorporation phenomenon in Niuean from the NI constructions discussed section 3.1, Massam terms this kind of nominal incorporations as PNI. Clemens (2014, p. 28) provides a summary of the characteristics of PNI in Niuean. The ones that are relevant to Mandarin are listed in (15).

(15) Characteristics of PNI:

a. PNI is a productive phenomenon that applies to the direct or indirect object of the verb.

b. The incorporated object surfaces immediately to the right of the verb.

c. The incorporated object can be modified.

d. The incorporated object is non-specific and non-referential.

e. The event is durative or frequent.

The statements in (15a) to (15d) describe the properties of the incorporated NP. According to (15a), various phrasal objects may incorporate in Niuean. In Mandarin breakable $[VN]_V$ constructions, however, the incorporated object is usually the direct object of the verb. According to (15b), PNI constructions take $[VN]_V$ order where the verb immediately precedes NP. As has been discussed in section 2.2.2, breakable $[VN]_V$ constructions in Mandarin also take this order. The statement in (15c) indicates a clear contrast between PNI and NI. The verb and the noun in a NI construction are adjacent to each other, while a PNI construction allows the incorporated NP to be modified. Yet different from Niuean in which the NP of a PNI construction can be modified by an adjective, a coordinate phrase or a non-finite relative clause, NP in a Mandarin PNI construction is usually modified by an adjective and/or a quantifier, as shown in (16).

(16)*xiu-hua* (embroider-flower, 'do embroidering work')

a. *xiu-hong-hua* (embroider-red-flower, 'embroider red flowers')

b. xiu-wu-duo-hua (embroider-NUM-CL-flower, 'embroider five flowers')

The examples in (16) also illustrate another property of PNI, which is stated in (15d); namely, the incorporated NP is generic. As can be seen, the NP *hua* ('flower') in the breakable $[VN]_V$ construction *xiu-hua* (embroider-flower, 'do embroidering work') does not refer to either a specific type of or one specific flower; instead, it denotes flowers in general. Property (15e) is closely related to

(15d). With the incorporated NP bearing a generic interpretation, the semantic content of an entire PNI construction is also non-specific.

3.3 Summary

From the discussion in section 3.1 and 3.2, it can be seen that the characteristics of $[VN]_V$/$[NV]_V$ compounds in Mandarin are consistent with the properties of NI constructions, and that the characteristics of breakable $[VN]_V$ constructions are consistent with the properties of PNI constructions. Based on these observations, it is proposed that $[VN]_V$/$[NV]_V$ compounds are derived through NI and breakable $[VN]_V$ constructions are derived through PNI. The derivational processes and their motivation will be discussed in detail in the following sections.

4 $[VN]_V$ compounds in Mandarin

4.1 Deriving $[VN]_V$ compounds by head movement

This section examines how $[VN]_v$ compounds in Mandarin are derived through NI, or specifically, by means of head movement, and the motivation for the movement. In addition, this section also classifies the notion of conflation proposed by Hale and Keyser (2002) as a special type of incorporation.

4.1.1 The process

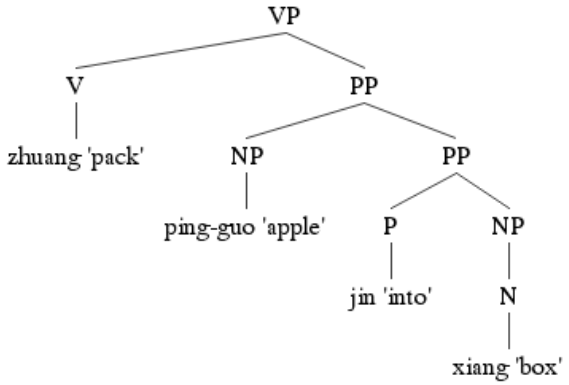
As discussed in section 2.2, in a $[VN]_V$ compound, N is usually V's direct or indirect internal argument, such as the theme or the semantic goal. Sentence (17a) contains a $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack'), in which the noun is the goal.

(17) a. ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
'He is packing the apples.'

b. ta zai zhuang ping-guo jin xiang.
he TAM pack apple into box
'He is packing those apples into the box.'

Based on the four types of argument structure introduced in Chapter 1 (see (8) in section 3.1), the structural configuration of (17b) is composed of an (8a)-type with an (8b)-type structure in the complement position, as shown in (18)[14]:

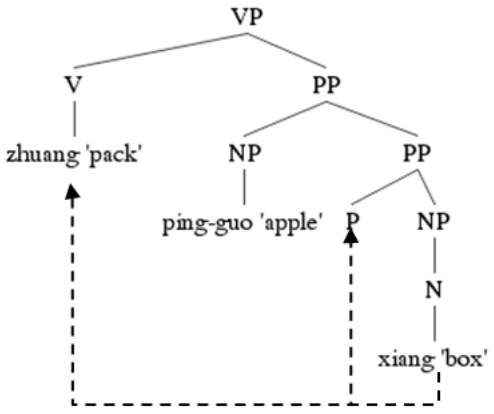
(18) Syntactic configuration of (17b)



In (18), the verb *zhuang* ('pack') takes a complement PP *jin xiang* (into-box, 'into the box'), which projects an internal specifier NP *ping-guo* ('apple'). It is assumed that the verbal compound in (17a) is derived in the syntax from a source similar to (17b), with the difference that the node P in the structural configuration of (17a) is empty so that N can move into V, as shown in (19).

[14] The information of the subject and tense is not shown in the structure for the ease of discussion.

(19) Derivation of (17a)



Here, two points with regard to the node P are worth noting. First, there is a P node in the structure because it suggests a case of terminal coincidence, a notion proposed by Hale (1986) to distinguish structures such as (20a) and (20b) (Hale & Keyser, 2002, p. 27).

(20) a. The parrot flew in its cage.

b. The parrot flew into its cage.

The two sentences are examples of central coincidence and terminal coincidence, respectively. Sentence (20a) is a case of central coincidence because the parrot is in the cage during the entire event of flying. In other words, the location of the parrot and the location of the cage coincide throughout. Sentence (20b) is an example of terminal coincidence because the parrot is not in the cage until the end of the flying event. Romeu (2015) points out that central coincidence indicates a meaning of stativity while terminal coincidence suggests a meaning of dynamicity and change. In the case of *zhuang-xiang* (pack-box, 'pack'), the word denotes a meaning of dynamicity and change (i.e. 'put something INTO a container'). However, this semantic content is not derived from the semantics of V or N but

from the "configurational relation" projected by the empty P, a preposition of terminal coincidence (Hale & Keyser, 2002, p. 27).

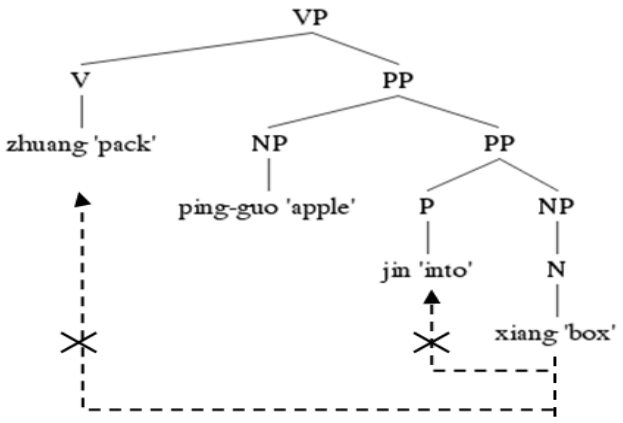
As for the second point, the node P is empty due to the constraint from the Head Movement Constraint (Travis, 1984, p. 131), as shown in (21).

(21) Head Movement Constraint

An X^0 may only move into the Y^0 which properly governs it.

According to the Head Movement Constraint, X^0 cannot skip an intervening head Z^0 to move to Y^0. In (19), N is governed by P, which means that N cannot skip P and move directly into V. The presence of *jin* ('into') at node P blocks the movement of N into this node. Thus, it is only when P is empty that N can firstly move into P and then subsequently incorporate into V. This blocking of head movement is shown in (22):

(22)



It can be observed that the Head Movement Constraint imposes a strict locality condition on the movement of heads; that is, the operation must be local in the sense that it involves only a verb head and the head of its complement. By doing so, the Head Movement Constraint prevents the possibility of over-generation to form an illegitimate structure such as (23), which is the result of moving the head

noun *xiang* (‘box’) into the higher verb head *zhuang* (‘pack’) by skipping the intervening head P *jin* (‘into’).

(23) *ta zhuang-xiang ping-guo jin.
he pack-box apple into

4.1.2 Conflation and head movement

Hale and Keyser (2002) borrow a term conflation from Talmy (1985) to refer to the movement that involves a phonologically empty head and the head of its complement which is phonologically overt (e.g., moving the head noun *xiang* (‘box’) into the empty P that governs it in the case of (19)). This thesis, however, takes this kind of movement as a special type of incorporation and does not adopt the term conflation. There are two reasons: (a) Hale and Keyser (2002) themselves admit that the two notions conflation and incorporation are closely related and may prove to be the same thing; (b) the term conflation is also employed in some studies within the framework of Distributed Morphology (e.g., Haugen, 2009; Mateu, 2010, 2012). In this vein of research, conflation involves external merge, and therefore is a different syntactic process from head movement/incorporation, which is considered a type of internal merge in the Minimalist Program (Chomsky, 2001a).

4.1.3 Information structure

4.1.3.1 Focus

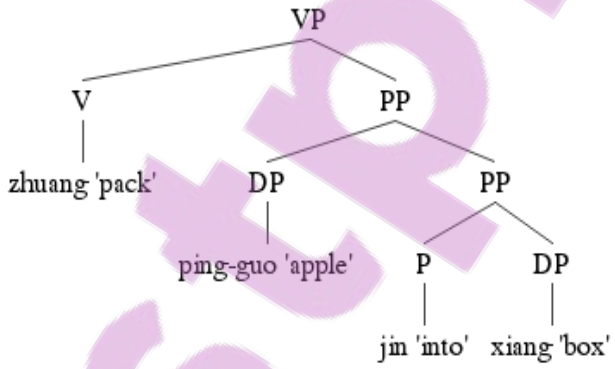
In the discussion of the NI process in section 4.1.1, it was shown that the two sentences (17a) and (17b) (rewritten as (24a) and (24b)) may share a base structure, as illustrated by (18). This base structure does not mean that (24a) is derived from (24b) though, because similar expressions are presumed to be generated independently (Chomsky, 2001a).

(24) a. ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
'He is packing the apples.'

b. ta zai zhuang ping-guo jin xiang.
he TAM pack apple into box
'He is packing those apples into the box.'

Specifically, (24b) may also be derived from a structure that is configurationally identical to (18), but with the complement of P labeled differently. As shown in (25), the complement of P in the base structure is a DP instead of NP[15] though this structure does not generate (24a). Embedded in a determiner-headed phrase, the movement of N cannot be achieved because it is not the head of the DP. As noted by Baker (1996, 2009), even the nominal in (18) is restricted in that it must be a bare NP. Thus, the base form for (24b) can be either (18) or (25), but it is only on the base of (18) that (24a) can be derived.

(25)



A closer examination of (18)/(25) and (19) suggests that the derivation of (24b) takes less effort than that of (24a), because merge is the only operation needed to

[15] The specifier of P can also be either a DP or NP. Because it does not have an impact on the derivation of the $[VN]_V$ compound, its label is not discussed here.

derive (24b)[16] whereas both merge and move are the necessary operations for the derivation of (24a). According to the principle of economy of derivation, syntactic operations must be optimal by satisfying several conditions such as the Inclusive Condition, Last Resort, and Shortest Move (Chomsky, 1991, 1995). In this sense, the derivation of (24b) is cheaper, which then raises a further question. Since the syntax can generate an expression such as (24b) on the basis of (18) with fewer operations, why does it bother to derive another expression like (24a)? As the main difference between the derivational processes of the two expressions lies in head movement, the question may be re-expressed as what motivates head movement to form a $[VN]_V$ compound. Chomsky (2001a; 2005, p. 7) proposes that internal merge or move may be motivated by "information-theoretic" conditions, such as discourse-related informational properties. In line with Chomsky's proposal, syntactic movement is information-structure based (Kučerová, 2007). This chapter explores the explanatory power of this semantic-driven account for syntactic movement in Mandarin under the premise that head movement is motivated by focus.

That syntactic movement is motivated by focus is not a novel assumption, and it has been verified in many languages. For example, it is reported that *wh*-movement in languages such as Gungbe, Kitharaka, and Bulgarian are trigged by focus (Aboh, 2004; Dukova-Zheleva, 2010; Muriungi, 2005) and that the raising of a verb's object to the sentence initial position in mixed order languages is motivated by focus (Holmberg, 2000). Although the cross-linguistic evidence has provided support for the focus-motivated approach to movement, syntactic movement in Mandarin still deserves theoretical discussion because it not only

[16] The information of the subject and tense is not considered here, since the derivation of both (24a) and (24b) take the same operations concerning these aspects.

produces a variety of sentence patterns by changing word orders but also generates a major compounding category.

Focus can target various positions in a sentence structure (Jackendoff, 1990; Rooth, 1985, 1992). In many language systems, including Mandarin, three positions in a sentence can be the focus position— the beginning, the end, or the pre-verbal position. According to the literature, in default situation, new information usually follows old/given information, and is therefore usually put at the end of a sentence; important information is usually put at the beginning or the pre-verbal position of a sentence; some given information is considered by the speaker and the hearer as salient enough (hence important) to be put in a focus position—the beginning or the pre-verbal position (Chafe, 1976, 1987; Dalrymple & Nikolaeva, 2011; Gundel, 1988; Krifka & Musan, 2012; Lambrecht, 1994; E. F. Prince, 1981). The realization of the various types of information in a specific focus position of a sentence is mainly achieved through two principles: the Given Before New Principle and the First Things First Principle (Gundel, 1988).

4.1.3.2 Given before new

It is assumed that the formation of a $[VN]_V$ compound in Mandarin is the result of putting new information in sentence-final position. Specifically, it is proposed that the movement of N to form a $[VN]_V$ compound is motivated by the Given Before New Principle, which requires that new information be put at the end of a sentence (Gundel, 1988, p. 63):

(26) Given Before New Principle

State what is given before what is new in relation to it.

In Minimalist Program, each syntactic atom (V, N, P, etc.) is composed of a set of features. For example, one feature of V is the N-feature, which requires a N to

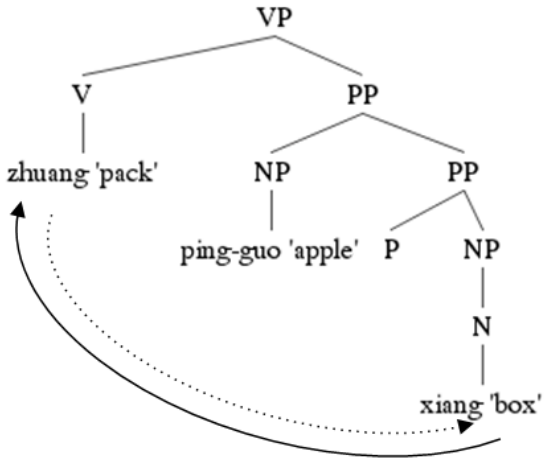
appear within V. If the N-feature of V is a strong feature, it must be checked. Feature checking in Minimalist Program "resolves to pairs of heads" (Chomsky, 2001a, p. 12). In other words, feature checking involves a relation between a *probe* (i.e., a higher head) and a *goal* (i.e., a lower head that agrees with a higher head). The probe-goal relation must be local so as to minimize search (Chomsky, 2001b). Specifically, in the process of searching, the probe always looks for the nearest relevant constituent first. Once it finds something that can check its feature, it will stop searching. In this sense, the probe-goal relation is the closest c-command relation where the goal is c-commanded by the probe and the goal must be sufficiently close to the probe. These ideas can be illustrated with the $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack').

As has been discussed, for configuration (18), sentence (24b) is the result of the least number of operations, as its derivation only involves the merge of nodes. According to the Given Before New Principle, new information in this sentence is the final location of the apples, which is expressed by the PP *jin xiang* (into-box, 'into the box'). Now, suppose the new information is not the final location of the apples, but the direct object of the verb (i.e., *ping-guo* ('apples)). The Given Before New Principle requires that the constituent *ping-guo* ('apples') take the sentence-final position so as to be the focus. To satisfy this requirement, the PP, which would have taken the end position, must be de-accented. To achieve this goal, the N-feature of the verb *zhuang* ('pack'), which has the function of de-accenting the head noun of its complement, is triggered and hence becomes a strong feature.

The strong N-feature of V *zhuang* ('pack') makes it a probe whose job is searching for a goal within its complement that can check this feature. During the search, V meets an NP *ping-guo* ('apple'). But the NP *ping-guo* ('apple') is not able to check its feature because it is a specifier of V's complement. V then

continues to search and eventually finds the NP *xiang* (‘box’) that it c-commands. Here the strong N-feature of the verb *zhuang* (‘pack’) is checked by the head noun *xiang* (‘box’) because it bears the same N-feature. The probe (i.e., V *zhuang* (‘pack’)) then attracts the goal (i.e., N *xiang* (‘box’)) to move into it, forming a compound predicate. With the head movement of *xiang* (‘box’), the end position of the sentence is left to the NP *ping-guo* (‘apple’), which bears the new information. The process is illustrated in (27). The dotted arrow represents the process of search and the solid arrow stands for the process of movement.

(27)



Since a wh-phrase in a wh-question stands for the focus (i.e., the new information) of the sentence, wh-questions can be employed to elicit the focus in a sentence. Note that in (28) the focused NP *ping-guo* (‘apple’) and the wh-phrase target the same position in the sentence.

(28) a. ta zai zhuang-xiang shen-me?
he TAM pack-box what
‘What is he packing?’

b. ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
‘He is packing apples.’

4.2 Prosody of $[VN]_V$ compounds

4.2.1 Binary foot

Section 4.1 discussed how to derive a $[VN]_V$ compound such as *zhuang-xiang* (pack-box, 'pack'). The analysis indicates that the derivation involves head movement of the nominal head *xiang* ('box') into the verb *zhuang* ('pack'). One unique aspect of Mandarin morphology is that there are some words with slightly different forms that express the same semantic content (e.g., *ba-ba* ('dad') versus *lao-ba* ('dad'), *zhuo* ('desk') versus *zhuo-zi* ('desk')).

There are two lexical words for the meaning 'box'— *xiang* and *xiang-zi*, with the latter suffixed with a nominal category defining morpheme *-zi*. As can be seen from (29), sentence (29a) can be paraphrased either by (29b) or (29c) because of their identical syntactic structures. The only difference between them is the form of the last noun *xiang* in (29b) and *xiang-zi* in (29c). With two syllables, the word *xiang-zi* contains only one root, which conforms to the characteristic of NI; that is, the incorporated noun is a single root (see (14a) in section 3.1). Based on this property and the analysis in section 4.1, the disyllabic noun in (29c) should also be able to incorporate into the verb through head movement. The key point is that when the disyllabic noun in the sentence incorporates into the verb, the resulting form is still *zhuang-xiang* (pack-box, 'pack'). As shown in (29d), the surfacing of the whole disyllabic word *xiang-zi* ('box') results in an illegitimate structure.

(29) a. ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
'He is packing the apples.'

b. ta zai zhuang ping-guo jin xiang.
he TAM pack apple into box
'He is packing the apples into the box.'

c. ta zai zhuang ping-guo jin xiang-zi.
he TAM pack apple into box
'He is packing the apples.'

d.* ta zai zhuang-xiang-zi ping-guo.
he TAM pack-box apple

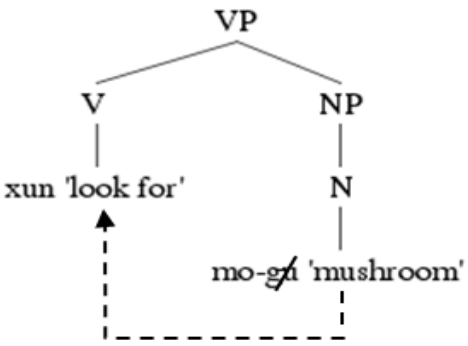
The examples in (29) indicate the impossibility of deriving a trisyllabic [VN]v compound through NI in Mandarin. The following examples show that deriving a disyllabic $[VN]_V$ compound through head movement is not a coincidence.

(30) a. ta zheng zai shang-li xun mo-gu.
he TAM in mountain look for mushroom
'He is looking for mushrooms in the mountain.'

b. ta zheng zai shang-li xun-mo.
he TAM in mountain look for-mushroom
'He is looking for mushrooms in the mountain.'

Sentence (30b) contains a [VN]v compound *xun-mo* (look for-mushroom, 'look for mushrooms'), in which N is the direct object of V. It is a near paraphrase of (30a). In (30a), the verb *xun* ('look for') combines with the NP *mo-gu* ('mushroom'), forming a transitive clause. According to the four structural configurations introduced in Chapter 1, the structure of (30b) is deemed an (8a)-type, in which the verb takes a complement, as shown in (31).

(31) Syntactic configuration of (30b)



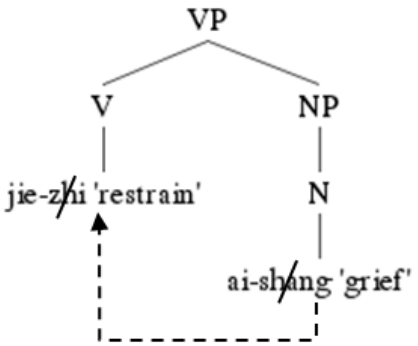
To derive the compound, the head noun of the NP *mo-gu* (‘mushroom’) moves into the verb *xun* (‘look for’), forming a complex predicate. Yet as can be seen from (31), when the incorporated structure is sent to PF, the interpretation of the structure is subject to a phonological constraint; namely, the structure needs to surface with a $[VN]_V$ form composed of two syllables.

This observation holds true for all $[VN]_V$ compounds in Mandarin. That is to say, regardless of the syllable account of the individual Vs and Ns, incorporation always results in a structure consisting of two syllables. Examples (28b) and (29b) show that when both V and N are monosyllabic words, no deletion is needed. However, as illustrated by examples (29d) and (31b), when larger structures are involved (i.e., when V and/or N is composed of more than one syllable), the phonology exerts its influence on the structure at PF by limiting the size of the output to two syllables through syllable deletion. The following example illustrates that the excess syllables are deleted when both V and N are composed of more than one syllable. The $[VN]_V$ compound *jie-ai* (control-grief, ‘restrain one’s grief’) in (32a) is derived from a structure similar to that of (32b), where the disyllabic verb *ji-zhi* (control-control, ‘control’) takes a complement *ai-shang* (sadness-sadness, ‘grief’). When the noun incorporates into the verb, the resulting incorporated structure contains two syllables. As shown in (33), this result is achieved through syllable deletion (i.e., by deleting a single syllable from each constituent).

(32) a. *jie-ai* (control-grief, ‘restrain one’s grief’)

b. jie-zhi ai-shang.
control-control sadness-sadness
‘restrain one’s grief’

(33) Syllable deletion



Thus, it can be concluded that to form a $[VN]_V$ compound in Mandarin, syllable deletion is employed as a strategy to repair the phonological form so that the output always consists of two syllables. Table 2 outlines all of the possible prosodic patterns for $[VN]_V$ compounds in Mandarin.

Table 2
Possible Prosodic Patterns for $[VN]_V$ Compounding in Mandarin (Brown & Yang, 2016, p. 4)

	Noun	
Verb	σ	σσ
σ	✓	× (repaired to σ σ)
σσ	× (repaired to σ σ)	× (repaired to σ σ)

It can be seen from the table that to form a $[VN]_V$ compound in Mandarin, at least two constituents—V and N are needed. The incorporation of N to V results in a $[VN]_V$ form with a disyllabic foot (i.e., the incorporated structure cannot be larger than two syllables), regardless of the syllable count of the individual V and N constituents. Moreover, neither of the two constituents can be composed of a zero morpheme (i.e, neither head of the nodes V or N can be empty); they are composed of at least one syllable so as to form a structure with a disyllabic foot. The reason for this binary foot effect in $[VN]_V$ compounds is clear: a $[VN]_V$

compound is derived through NI, and NI involves only a verb root and a noun root (see section 3.1). The following part of this section examines how a binary foot emerges in the process of incorporation in Mandarin.

In order to derive a binary foot for $[VN]_V$ compounds, FTBIN must dominate faithfulness to V and N so that the deletion of excess syllables can be achieved: FTBIN >> MAX. Meanwhile, the data indicates that only a single binary foot is allowed in $[VN]_V$ compounds even when both V and N consist of two syllables. It is assumed that this is the product of the constraint PERFECTWORD (Ito & Mester, 2015).

(34) PERFECTWORD: A prosodic word is coextensive with a foot: ω=f.

Violated by every word (ω) not coextensive with a foot (f).

(Ito & Mester, 2015, p. 3)

The constraint PERFECTWORD must dominate FTBIN so as to exclude the possibility of forming two feet in a $[VN]_V$ compound: PERFECTWORD >> FTBIN >> MAX. The ranking of constraints is illustrated in the tableau below with the $[VN]_V$ compound *xun-bao* (look for-treasure, 'hunt for treasure').

(35) Establishment of a binary foot (*xun-bao,* (look for-treasure, 'hunt for treasure'))

$[[xun]_V[bao]_N]_V$	PERFECTWORD	FTBIN	MAX
☞ a. $((xun_\sigma bao_\sigma)_f)_\omega$			*
b. $(((xun_\sigma zhao_\sigma)_f)bao_\sigma)_\omega$	*!		*
c. $((xun_\sigma zhao_\sigma bao_\sigma)_f)_\omega$		*!	*
d. $(((xun_\sigma zhao_\sigma)_f)(bao_\sigma zang_\sigma)_f)_\omega$	*!		

In this tableau, the losing candidate (35b) violates not only the faithfulness constraint MAX but also the highly-ranked markedness constraint PERFECTWORD. The candidate (35c) violates both MAX and FTBIN. The candidate (35d) is also a

loser because in order to fulfill the faithfulness constraint MAX, it violates the highly ranked markedness constraint PERFECTWORD. The winning candidate (35a) fulfills the two highly ranked constraints, although it violates MAX. Thus, *xun-bao* (look for-treasure, 'hunt for treasure') is a perfect word because it contains a binary foot.

4.2.2 Syllable deletion

In section 4.2.1, it was shown that in the derivation of a $[VN]_V$ compound through NI, excess syllables in the verbal and nominal constituents must be deleted so as to realize a binary foot. This section carries out a close examination of the correspondence relations between the incorporated structure derived in the syntax (input) and the phonological output of $[VN]_V$ compounds in Mandarin. It shows how the status of the excess syllables is determined, and how the deletion strategy ensures the optimal output surfaces. Before the detailed discussion of syllable deletion, it is necessary to provide a brief introduction to the internal structures of the related words; that is, the individual verbs and nouns that are involved in the incorporation process.

4.2.2.1 Word structures

Four word structures are involved in the formation of $[VN]_V$ compounds. They are monosyllabic words, disyllabic words composed of a root and an affix, disyllabic monomorphemic words, and reduplicative compounds. Each structure is illustrated by an example in (36).

(36) a. *zhuang* ('pack') (monosyllabic)

b. *xiang-zi* ('box') (disyllabic: root-affix)

c. *ai-shang* (sadness-sadness, 'grief') (disyllabic: reduplicative compound)

d. *hu-die* (‘butterfly’) (disyllabic monomorphemic)

Although most words in Mandarin are composed of two syllables, there exist some monosyllabic words, which can be found in a wide range of word categories such as verb, noun, adjective, adverb, and so on. Example (36a) is a monosyllabic verb with a verbal root. The word *xiang* (‘box’) is a monosyllabic noun with a nominal root. The letter R(oot) is used to represent these monosyllabic words. Thus, *zhuang* (‘pack’) can be represented by [R_V] and *xiang* (‘box’) can be represented by [R_N].

Example (36b) is composed of a [R_N] *xiang* (‘box’) and a nominal suffix *–zi*. Due to the limited number of affixes in Mandarin, there are not many disyllabic words composed of a root and an affix (Lü, 1963; Li Wang, 2004). For word structures like this, [R_NA] or [R_VA] are employed as the representations.

Words such as that in (36c) are the reduplicative compounds discussed in Chapter 2. In a Mandarin reduplicative compound, the first component is usually the semantic base (B), from which the reduplicant (R_e) is derived. Reduplication not only applies to nouns but also applies to verbs. For example, the verb *jie-zhi* (control-control, ‘restrain’) is a synonymous compound with *jie* (‘control’) as the base and *zhi* (‘control’) as the reduplicant. The form [BR_e] is used to represent word structures like (36c).

Words such as that in (36d) are termed binding words (Taft & Zhu, 1995). There are two opinions about binding words in the literature. One idea is that the two syllables together constitute a morpheme because one of the two syllables is considered to bear no semantic content and is never used in other contexts (Y. Zhang, 2008). For example, the first syllable *hu* in (36d) never collocates with morphemes other than *die* (‘butterfly’) and the syllable itself does not have any meaning in modern Chinese. According to that explanation, a binding word is a

disyllabic monomorphemic word. The other point of view holds that each syllable contributes some semantic content to the meaning of the word although they themselves are not considered independent morphemes (Taft & Zhu, 1995).

Diachronic research could prove the validity of both points of view, and it would also show that the so-called binding words are not significantly different from word structures such as (36b) and (36c). Synchronically, the constituent *hu* in *hu-die* ('butterfly') does not have any semantic content and is not found in any other contexts. However, a diachronic investigation indicates that *hu* was used as a prefix in ancient Chinese, where it is attached to nominal roots referring to animals (Sh. Huang, 1993). In modern Chinese, both the semantics of *hu* and its status as a prefix are lost and it is only in the word *hu-die* ('butterfly') that this form can be found. The second constituent *die* ('butterfly') is still used as a nominal root that can appear in other contexts (e.g., *die-yong* (butterfly-swim, 'butterfly stroke')). With this point of view, the structure of example (36d) is quite similar to that of (36b) (different in ordering): [AR_N].

This is a reasonable analysis because many binding words in Mandarin belong to this type, as shown in (37). The first constituent of each example in (37) was a prefix in ancient Chinese, but in modern Chinese, this usage is lost. The second constituent of each example is a nominal root that can appear in other contexts.

(37) a. *ma-yi* ('ant')

b. *zhi-zhu* ('spider')

c. *qing-ting* ('dragonfly')

In addition to structure [AR_N], a diachronic investigation also suggests that some binding words in Mandarin are actually synonymous constructions like (36c) and therefore take the form [BR_e] (W. Dong, 1994). For example, in ancient Chinese, *mo* is a nominal root that refers to plant. Based on the semantics of *mo*, a

synonymous root *gu* is created to form the word *mo-gu* (‘mushroom’). Thus, from a diachronic point of view, binding words are not significantly different from the other word types in Mandarin. The only difference between binding words and synonymous compounds is that some constituents of binding words have lost their status as morphemes in modern Chinese. For the convenience of discussion, this thesis still takes their structures as [R_NA] and [BR_e].

4.2.2.2 Root faithfulness

A summary can be made to generalize the word structures discussed in the previous section. Generally, three word structures are involved in the NI process: [$R_{N/V}$], [$R_{N/V}$A]/[A$R_{N/V}$] and [BR_e]. Now the relation between the input and the output of [VN]$_v$ compounds in Mandarin can be examined. The various relations between input and output are illustrated in (38) to (40).

(38) When both the verb and the noun are monosyllabic

		Structure	Remark
Input	zhuang (‘pack’) xiang (‘box’)	R_VR_N	
Candidate	*zhuang-xiang*	R_VR_N	faithful candidate

(39) When one of the verb or noun is monosyllabic and the other is disyllabic

a. *bai-shi* (salute-teacher, ‘formally acknowledge somebody as one’s teacher with a salute’)

		Structure	Remark
Input	bai (‘salute) lao-shi (‘teacher’)	R_v [AR_N]$_N$	
Candidates	a. *bai-lao-shi*	R_VAR_N	faithful candidate
	b. *bai-lao*	R_VA	nominal root deleted
	☞ c. bai-shi	R_VR_N	affix deleted

b. *mo-ya* (grind-tooth, 'grind one's teeth')

		Structure	Remark
Input	mo ('grind') ya-chi ('tooth')	$R_V\,[BR_e]_N$	
Candidates	a. *mo-ya-chi*	R_VBR_e	faithful candidate
	b. ☞*mo-ya*	R_VB	reduplicant deleted
	c. *mo-chi*	R_VR_e	base deleted

(40) When both the verb and noun are disyllabic (*xun-bao* (look for-treasure, 'hunt for treasure'))[17]

		Structure	Remark
Input	xun-zhao('look for') bao-zang ('treasure')	$[BR_e]_V[BR_e]_N$	
Candidates	a. *xun-zhao-bao-zang*	$B_1R_{e1}B_2R_{e2}$	faithful candidate
	b. ☞ *xun-bao*	B_1B_2	both reduplicants deleted
	c. *zhao-zang*	$R_{e1}R_{e2}$	both bases deleted

As shown by (38), when there are only two roots involved, no deletion is needed, the faithful candidate is the optimal output. Example (39a) indicates that when the input is composed of two roots and one affix, the affix is deleted and the optimal output consists of two roots. In (39b), the optimal output is the candidate that consists of a root and a base. Since a base is by default the root in reduplication (Downing, 1998a, 1998b; Nelson, 2003), the optimal output in (39b) can still be seen as composed of two roots. In (40), the input is composed of two synonymous compounds, and the optimal output is the candidate that consists of two bases, namely, two roots. The examples in (38) to (40) suggest that in the derivation of the binary foot, it is always the candidate composed of two roots that survives. Therefore, it can be concluded that syllable selection for deriving a binary foot for a $[VN]_V$ compound is constrained by foot faithfulness. This finding is compatible with the Root-Affix Faithfulness Metaconstraint (McCarthy & Prince, 1995):

[17] The candidates *xun*-bao-zang and *zhao-bao-zang* are not listed because both are phrases.

(41) Root-Affix Faithfulness Metaconstraint

Root-Faith >> Affix-Faith

5 Breakable $[VN]_V$ constructions in Mandarin

As has been discussed in section 2.2.2, although they sometimes surface with a form that is similar to $[VN]_V$ compounds, breakable $[VN]_V$ constructions in Mandarin are phrasal in nature. This section examines the derivational process of breakable $[VN]_V$ constructions and discusses how this process is different from the formation of $[VN]_V$ compounds.

According to the discussion in section 2.2.2, a breakable $[VN]_V$ construction in Mandarin is usually composed of a verb and its direct object. As discussed in section 3, breakable $[VN]_V$ constructions are PNI constructions. The notion PNI is proposed by Massam (2001) in her study of an Oceanic language Niuean. She noticed that in Niuean, there exists a type of construction whose phonological form resembles that of the NI constructions; however, the nominal elements in these constructions are phrases (NP) instead of words (N). Massam (2001) therefore terms these constructions PNIs and proposes that they are derived through phrasal movement instead of head movement. Since breakable $[VN]_V$ constructions are PNI constructions, it is assumed that their derivation also involves phrasal movement. Different from PNIs in Niuean though, breakable [VN] constructions in Mandarin also involve head movement. In fact, as will be illustrated below, PNIs in Mandarin involves two operations: (a) head movement of V to T, and (b) phrasal movement of NP to a higher specfier position of Asp(ect).

Sentence (42a) contains a breakable $[VN]_V$ construction *xiu-hua* (embroider-flower, 'do embroidering work'). The nominal element *hua* ('flower') is an NP rather than an N, which can be verified by sentence (42b) in which *hua*

('flower') is modified by a quantifier *wu-duo* (NUM-CL, 'five pieces). Sentence (42c) is an instance of the past simple where pseudo incorporation does not occur.

(42) a. ta xiu hua le.
he embroider flower TAM
'He has embroidered some flowers.'

b. ta xiu wu-duo hua le.
he embroider NUM-CL flower TAM
'He has embroidered five flowers.'

c. ta xiu le hua.
he embroider TAM flower
'He embroidered some flowers.'

There is a general consensus that Mandarin lacks inflectional morphology. The tense and aspect marker *le* is one of the few inflectional morphemes that exist in Mandarin. In some cases, verbal *le* marks the simple past tense, as in (43a), which simply indicates that an event occurred in the simple past (i.e., yesterday). To emphasize the influence of an event which happens in the past, the morpheme *le* usually appears with some adverbs to produce a present perfect form, as in (43b), where the adverb *yi-jing* is generally understood as 'already'.

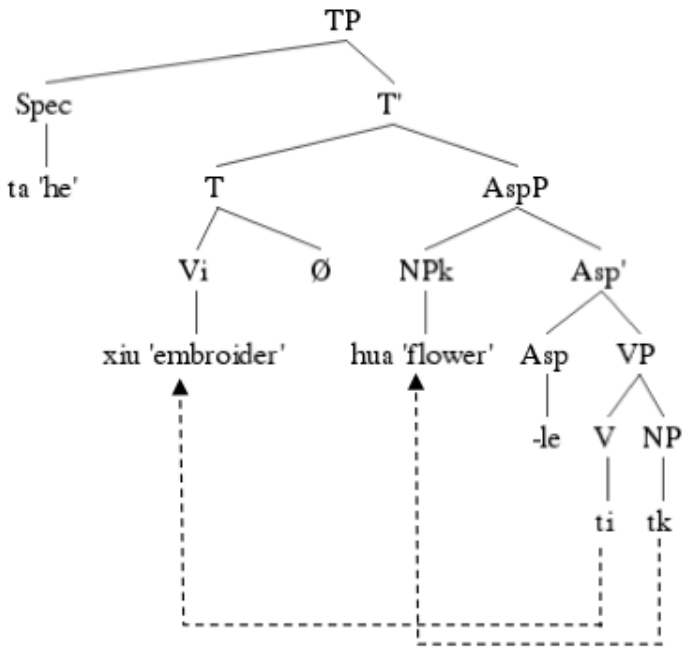
(43) a. ta zuo-tian si le.
he yesterday die TAM
'He died yesterday.'

b. ta yi-jing si le.
he already die TAM
'He has already died.'

Sometimes, though, *le* itself may fulfill the role of forming a present perfect sentence. This is where PNI is relevant. In (42c), where PNI does not take place, the tense of the sentence is interpreted as the simple past. In (42a), which contains a PNI construction, the sentence is in the present perfect.

The syntactic configuration of (42a) is an (8a)-type structure (introduced in Chapter 1) that consists of a verb and its direct object as the complement. To derive the breakable $[VN]_V$ construction in (42a), V incorporates into T through head movement while NP undergoes phrasal movement and incorporates to the specifier position of Asp, as shown in (44).

(44) Derviation of (42a)



This raises the question of what motivates PNI. Massam (2001) proposes that PNI in Niuean checks the D-feature of T, which requires the predicate phrase to move to T as a determiner of the T marker. It is argued in this thesis that PNI in Mandarin is motivated in a similar way. Specifically, PNI in Mandarin checks the D-feature of T and Asp.

Based on the discussion above, it is now clear that PNI involves two operations: (a) V moves into T, and (b) NP moves to a higher NP position checking the D feature of Asp. By doing so, a perfect aspect form is produced without the help of an

adverb. Without the second step, that is, if V moves into T directly, a simple past like (42c) would be produced.

A further question might be asked: why is it the NP instead of the head noun that incorporates in the second step? It is assumed that the answer lies in the NP. As Baker (1996, 2009) notes, to trigger NI, the complement of the verb must be a bare NP. The tree structure in (44) indicates that the direct object in the base form for PNI is not a bare NP, but a NP in which the noun is accompanied by a modifier. In this case, the head noun cannot be moved without the modifier, because that would result in stranding (i.e., some material inside the NP being left behind), which PNI constructions in Mandarin do not permit[18]. As shown in (46), moving the head noun *hua* ('flower') out of the NP and incorporating it into the verb *xiu* ('embroider') would leave the modifier *wu-duo* (NUM-CL, 'five pieces') stranded outside of the predicate. This is not acceptable in Mandarin. Therefore, to avoid producing forms like (45), it is the NP rather than the head noun that incorporates.

(45)	*ta	xiu	hua	le	wu-duo
	he	embroider	flower	TAM	NUM-CL

6 $[NV]_V$ compounds

This section examines the derivation of $[NV]_V$ compounds in Mandarin. As introduced in section 2.1.2, a $[NV]_V$ compound is usually composed of a verb and its argument of instrument, manner, or location, such as *shui-xi* (water-wash, 'clean with water'), *wang-gou* (net-buy, 'shop online'), *lu-ji* (road-hold a memorial ceremony, 'hold a memorial ceremony on the road'), *qiang-bi* (gun-shoot, 'execute by shooting'), and so on. Sentence (47) indicates that the

[18] According to Baker (1988), in some languages such as Mohawk, Southern Tiwa, and so on, NI does result in stranding. I will discuss this point in section 8.

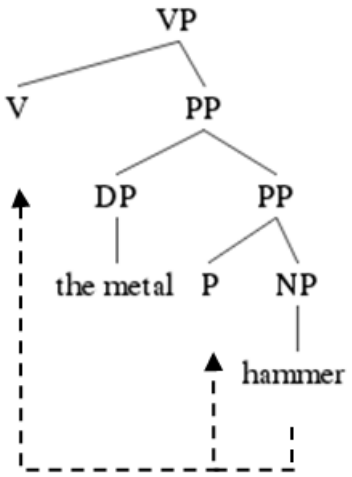
derivation of the compound *shui-xi* (water-wash, 'clean with water') involves two NPs (or a NP and a DP), the same as the $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack') discussed in section 4.1.

(46) wo shui-xi le zhe-jian shang-yi.
I water-wash TAM this coat
'I cleaned this coat with water.'

Thus, one possible configuration for (47) is a copy of that from *zhuang-xiang* (pack-box, 'pack'), which is how Acedo–Matellán and Mateu (2014) analyze words like *shui-xi* (water-wash, 'clean with water'). In their analysis of sentence (48), they propose that the verb *hammer* involves a configurational relation that hosts a preposition of central coincidence (i.e., the metal and the hammer are at the same place throughout the hammering event). Hence the derivational process of (48) should be something like (49), which is almost the same as that of the $[VN]_V$ compound *zhuang-xiang* (pack-box, 'pack') (the only difference is that V in (49) is empty, so the output is a simple word, not a compound).

(47) John hammered the metal.

(48) Derivational process of the verb *hammer* (adapted from Acedo–Matellán & Mateu, 2014, p. 27)



Acedo–Matellán and Mateu's (2014) understanding of the notion of central coincidence is different from Hale and Keyser (2002). To Hale and Keyser, the denotation of a preposition of central/terminal coincidence is that a NP/DP is the location or goal of another NP/DP, such as *he walks in the house* or *I sent a hammer to him*. In (49), however, *the metal* is neither the location nor the goal of *hammer*. Rather, *hammer* is something John used to knock *the metal*. A direct synthesis of the type (8a) structure and type (8b) structure introduced in Chapter 1 is not appropriate to explain the derivational process of simple words like *hammer*, or compounds like *shui-xi* (water-wash, 'clean with water').

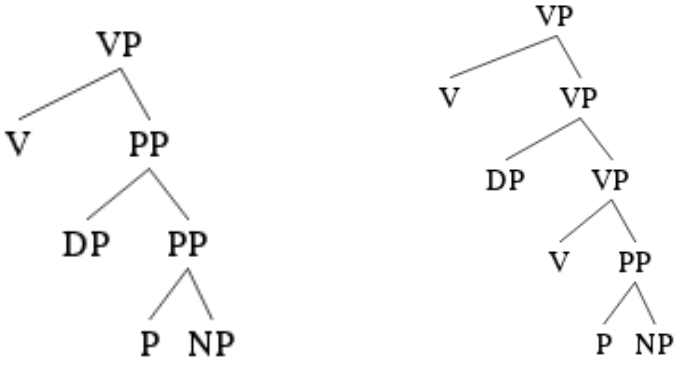
Before embarking on the exploration of how to derive the $[NV]_V$ compound *shui-xi*, I would like to review the structural configuration of the $[VN]_V$ compounds like *zhuang-xiang* (pack-box, 'pack'). According to the discussion in section 4.1, the derivation of a $[VN]_V$ compound like *zhuang-xiang* (pack-box, 'pack') involves two NPs: one is a bare NP, the head of which incorporates into V forming the compound, and the other is a DP or NP, the direct object of V. In Hale and Keyser's (2002, 2005) theory of argument structure, a preposition P projects an internal specifier and a complement so as to satisfy its relational property. For the sentence (17a) (rewritten as (50)), which contains the compound *zhuang-xiang* (pack-box, 'pack'), the relation projected by the preposition is that the specifier *ping-guo* ('apple') is being put INTO the complement *xiang* ('box'). The NP *xiang* ('box') is not something *ta* ('he') uses to pack the apples, but where *ta* ('he') puts the apples. This relation is different from that between *the hammer* and *the metal* in (48).

(49) ta zai zhuang-xiang ping-guo.
he TAM pack-box apple
'He is packing the apples.'

Hale and Keyser (2002) actually indicate a solution to sentences like (47) and (48). They employ the notions *delayed gratification* and *immediate gratification*. In the

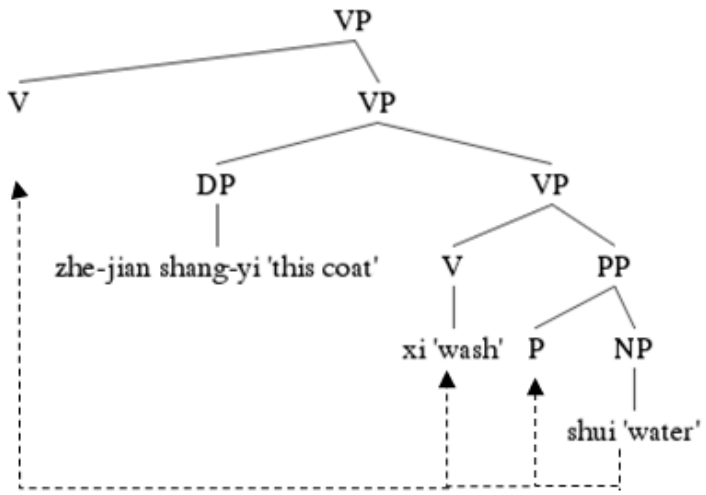
structural configuration of (50) (see (18) in section 4.1.1), the relation projected by P is immediately gratified by its specifier *ping-guo* ('apple') and complement *xiang* ('box'). Hale and Keyser then propose that instead of being projected by P, the specifier (Spec1) can be projected by V, as long as: (a) there is a higher verb to project another specifier (Spec2) that surfaces as the subject of the whole sentence, and (b) there are no other intervening specifiers so that Spec1 can still surface as the direct object of the derived verb. Hence, Spec1, which used to be internal to the P-projection, is now external to it, as shown in (51b). The structural configuration (51a), a direct combination of (8a) and (8b) (the structural types of argument structure introduced in Chapter 1), is the base form from which the $[VN]_V$ compound *zhuang-xiang* (pack-box 'pack') is derived. The structural configuration (51b) is an extension of (51a), in which the gratification of P's relational selection is delayed.

(50) a. b.



It is assumed that (51b) is the configuration for (47). Adding the constituents, the syntactic process of deriving the $[NV]_V$ compound *shui-xi* (water-wash, 'clean with water') is illustrated in (52).

(51) Derivation of the $[NV]_V$ compound *shui-xi* (water-wash, 'clean with water')



In (52), the head noun *shui* ('water') first moves into the empty P that governs it, then to V forming the $[NV]_V$ compound *shui-xi* (water-wash, 'clean with water'). In order to guarantee that the DP *zhe-jian shang-yi* (this-coat, 'this coat') still surfaces as the direct object of the predicate, the derived verbal compound further moves to the higher V node, which projects another specifier to the surface as the subject of the whole sentence.

It is assumed that this NI process to produce a $[NV]_V$ compound is still motivated by information structure, though in contrast to $[VN]_V$ compounds whose derivation is motivated by the Given Before New Principle, the formation of $[NV]_V$ compounds is motivated by specificity. Namely, among the many features of V, there is one S(pecificity)-feature, which requires a modifier to move into V so as to make V's reference more specific. In this sense, the S-feature can be assumed to be a variant of the D-feature.

In the case of *shui-xi* (water-wash, 'clean with water'), the requirement of specificity triggers the S-feature of the verb *xi* ('wash'), which hence becomes a strong feature that must be checked in the syntax. The strong S-feature of *xi*

(‘wash’) makes it a probe whose job is to search for a goal within its complement to check this feature. During the search, V meets a NP whose head noun *shui* (‘water’) bears the S-feature. The S-feature of *xi* (‘wash’) is then checked and the verb attracts the head noun to move into it forming a $[NV]_V$ compound.

With the derivational process being discussed, a question may be posed. Since both $[VN]_V$ and $[NV]_V$ compounds are derived through head movement/NI, and both are motivated by discourse-related information, why do they yield different word orders? This question is addressed in the next section.

7 Word order

So far, three types of $[V+N]_V$ constructions in Mandarin have been discussed. They are $[VN]_V$ compounds, breakable [VN] constructions, and $[NV]_V$ compounds. Breakable [VN] constructions exhibit the order of V preceding N (the internal argument of V). This is the canonical order of syntactic phrases in Mandarin because Mandarin is a SVO language. A relevant question is why do the two types of compounds exhibit different word orders.

There is a general belief that head movement follows two constraints. One is the Head Movement Constraint, which is discussed in section 4.1. The other is left adjunction, which requires that a head raise and left-adjoin to a higher head. Left adjunction is a result of the Mirror Principle (Baker, 1985, p. 375), which stipulates that morpheme order must be the mirror image of the hierarchy of syntactic projections:

(52) The Mirror Principle

Morphological derivations must directly reflect syntactic derivation (and vice versa).

According to this principle, both of the compounding types in Mandarin should take the [NV] order, since the canonical syntactic order in Mandarin is VO. From this perspective, the Mirror Principle does not seem to hold in Mandarin morphology. Violation of the Mirror Principle has actually been found in languages other than Mandarin. For example, Cupeño, a Uto-Aztecan language, permits both left-adjoining and right-adjoining head movement at the word level (Barragán, 2003; Harley, 2011a; Hill, 2005; Newell, 2008).

Mandarin compounding is generally recognized as a mixed system, with left-headed verbal compounds and right-headed nominal compounds (Ceccagno & Basciano, 2007). $[VN]_V$ compounds are compatible with this generalization, but what about $[NV]_V$ compounds?

(53) a. wo shui-xi le zhe-jian shang-yi.
I water-wash TAM this-CL coat
'I cleaned this coat with water.'

b. wo yong shui xi le zhe-jian shang-yi.
I with water wash TAM this-CL coat
'I cleaned this coat with water.'

(54) a. ta wang-gou le liang-ben shu.
he net-buy TAM NUM-CL book
'He bought two books online.'

b. ta tong-guo wang-luo mai le liang-ben shu.
he through network buy TAM NUM-CL book
'He bought two books online.'

(55) a. ta lu-ji le wang-you
he road-hold a memorial ceremony TAM dead-friend
'He held a memorial ceremony on the road for a dead friend.'

b. ta zai lu-shang ji-dian le wang-you.
he on road-top hold a memorial ceremony TAM dead-friend
'He held a memorial ceremony on the road for a dead friend.'

From (54) to (56), the first sentence of each example contains a $[NV]_V$ compound and the second sentence of each example shows the position of the incorporated N in the syntactic paraphrases. As can be observed, without head movement, the NP and its head P surface as a PP preceding V in each sentence. These paraphrasing sentences indicate that these NPs, whose thematic roles are instrument, manner, and location, usually surface as the modifier of the verb, hence the [NV] order. From this perspective, a $[NV]_V$ compound agrees with its syntactic counterpart in word order. Therefore, in Mandarin, verbal compounds formed through head movement violate the Mirror Principle.

8 Boundedness

In Chapter 2, it was demonstrated that verbal compounds formed through merge are bounded. Namely, when these compounds are re-submitted to merge, the product can only be a nominal compound. This property is also exhibited in verbal compounds formed through incorporation, as illustrated by (57).

(56) a. zhuang-xiang ji (pack-machine, 'packing machine')

b. shui-xi dian (clean with water-shop, 'launderette')

The compound in (57a), contains a $[VN]_V$ compound formed through NI. The structure of this compound is $[[VN]_VN]_N$. As can be seen from the structure, although its constituent $[VN]_V$ *zhuang-xiang* (pack-box, 'pack') is a verbal compound, when it merges with a nominal root *ji* ('machine'), the larger compound as a whole is nominal. Similarly, the merge of the $[NV]_V$ compound *shui*-xi (water-wash, 'clean with water') and the noun *dian* ('shop') in (57b) produces a nominal compound *shui-xi dian* (clean with water-shop, 'launderette'). The fact that these compounds can only be re-submitted to merge to form nominal

rather than verbal compounds provides further evidence that verbal compounding is bounded.

9 Conclusion

Based on the discussion in this chapter, it can be inferred that Mandarin $[VN]_V$/$[NV]_V$ compounds and breakable $[VN]_V$ constructions have at least two properties in common: (a) they both are generic in reference and (b) they both do not permit stranding. Baker (1988) notices that in some languages, the determiner of the incorporated noun can be stranded outside the complex predicate. He takes this as evidence to show that incorporation, which involves head movement in the syntax, is not a lexicalist compounding process. Although there is reason to agree with this syntactic approach, I would like to treat stranding as an exceptional case. With the assumption that NI only takes place if the complement of V bears a bare NP, it is hard to find a determiner in the structural configuration. Thus, it is argued that stranding is not a diagnostic for head/phrasal movement; neither $[VN]_V$/$[NV]_V$ compounds nor breakable $[VN]_V$ constructions allow stranding.

Judging from the differences between them, it is proposed head movement and phrasal movement (i.e., NI and PNI) should be treated as different syntactic operations. The reasons are: (a) the moved nominal constituents are different: N for NI and NP for PNI; (b) the triggers for the movement are different: head movement is semantically motivated by discourse-related information, but phrasal movement is syntactically motivated; and (c) the products are different: NI produces word structures, but PNI produces phrasal structures.

One aspect about the Mandarin NI and PNI constructions (i.e., $[VN]_V$/$[NV]_V$ compounds and breakable $[VN]_V$ constructions) is that word orders are determined in the syntax. Furthermore, the word structures derived through NI exhibit a strong binary foot effect. The analysis in this chapter indicates that this

binary foot is determined by the properties of NI, which involves a verb root and a noun root. When V or N consists of more than one syllable, a binary foot is achieved through syllable deletion at PF. Syllable deletion, however, is not determined by phonological properties but by syntactic headedness.

Chapter 4 Post-verbal PP complements in Mandarin

1 Introduction

In Chapter 3, the properties of noun incorporation (NI) and pseudo noun incorporation (PNI) were closely examined and analyzed. This chapter focuses on two similar processes: (a) preposition incorporation (PI), which generates a $[VP]_V$ compound and (b) pseudo preposition incorporation (PPI), which generates a verbal phrase. This chapter consists of seven sections. Following the introduction section, section 2 discusses the classification criteria for prepositions in Mandarin. It concludes that prepositions in post-verbal PP (preposition phrase) complements are, in general, monosyllabic; and only a small portion of prepositions in Mandarin can appear in this position. Section 3 examines the behavior of post-verbal PPs. It demonstrates that a post-verbal PP, being functionally identical to the NP discussed in Chapter 3, may also undergo head movement or phrasal movement, during which either the head P incorporates into V forming a verbal compound, or the phrase PP incorporates into V forming a VP. Additionally, this section examines the structures where V takes two complements: a direct object complement NP_1 and a PP complement ($[P + NP_2]$). It reveals that the two NPs are constrained by the definiteness condition when taking certain positions in the sentences. Section 4 explores the derivation of PI and PPI constructions and the motivation for their derivation. Section 5 examines the property of the theme object NP_1. It is proposed that NP_1, when taken as a topic, may occupy different positions in a sentence; and such a movement is a process of topicalization. In section 6, the prosodic properties of PI are discussed. Section 7 provides further discussion of the notion of *tonal foot*. Section 8 concludes the chapter.

2 Distribution of PPs in Mandarin

This section introduces the general properties of prepositions in Mandarin. Section 2.1 provides a classification of these prepositions based on two criteria identified in the literature: their syntactic position and their syllable count. Based on the classification, section 2.2 summarizes the properties of prepositions.

2.1 Classification of Mandarin prepositions

Chen (2002) identifies 153 prepositions in modern Mandarin. These prepositions can be classified into the following types according to their positions in a sentence: pre-subject, pre-verbal, post-verbal, and post-object (Wang, 2008; Feng, 2003).

In (1a), the PP *guan-yu zhe-ge ji-hua* ('about this plan') can only appear before the subject *wo-men* ('we'). Placing it either at the pre- or post-verbal position makes the sentence ungrammatical, as shown in (2).

(1) a. guan-yu zhe-ge ji-hua, wo-men ming-tian tao-lun.
about this plan we tomorrow discuss
'We will discuss this plan tomorrow.'

b. ta zai jia da-sao wei-sheng.
he at home clean hygiene
'He is cleaning the house.'

c. ta zhu zai Beijing.
he live in Beijing
'He lives in Beijing.'

(2) a. *wo-men ming-tian guan-yu zhe-ge ji-hua tao-lun.
we tomorrow about this plan discuss

b. * wo-men ming-tian tao-lun guan-yu zhe-ge ji-hua.
we tomorrow discuss about this plan

Not all pre-subject PPs are banned from the pre-verbal positions though. As indicated by (3a) and (3b), the pre-subject PP *an lao-ban de yao-qiu* ('according to the boss' demand') can also appear in the pre-verbal position. However, like *guan-yu zhe-ge ji-hua* ('about this plan'), it is banned from post-verbal position.

(3) a. an lao-ban de yao-qiu yuan-gong jia-ban le.
according to boss POSS demand staff work overtime TAM
'The staff worked overtime according to the boss' demand.'

b. yuan-gong an lao-ban de yao-qiu jia-ban le.
staff according to boss POSS demand work overtime TAM
'The staff worked overtime according to the boss' demand.'

c. *yuan-gong jia-ban le an lao-ban de
staff work overtime TAM according to boss POSS
yao-qiu.
demand

d. *yuan-gong jia-ban an le lao-ban de yao-qiu.
staff work overtime according to TAM boss POSS demand

The PP *zai jia* ('at home') in (1b) denotes the place of the action *da-sao* ('clean'). It can be deleted (see (4a)) but cannot be moved to the post-verbal position (see (4b)).

(4) a. ta da-sao wei-sheng.
he clean hygiene
'He does the cleaning.'

b. *ta da-sao wei-sheng zai jia.
he clean hygiene at home

This is because *zai jia* ('at home') is an adjunct (i.e., an optional part of the sentence that can be removed without affecting the acceptability of the remainder),

which, according to Mulder & Sybesma (1992), is strictly banned from post-verbal position. It is worth noting that not all pre-verbal PPs function as adjuncts and can be deleted, as shown in (5):

(5) a. ta zai Beijing zhu.
he in Beijing live
'He lives in Beijing.'

b. *ta zhu.
he live

Generally speaking, a post-verbal PP is the complement of a verb. The PP *zai Beijing* ('in Beijing') in (1c) (rewritten as (6a) here) completes the meaning of the verb *zhu* ('live') by designating the place of living; therefore, PP cannot be deleted in the sentence.

(6) a. ta zhu zai Beijing.
he live in Beijing
'He lives in Beijing.'

b. *ta zhu
he live

The similarity between the two PPs in (5a) and (6a) seems to indicate that the undeletable pre-verbal PPs can also appear in post-verbal position, which will be further discussed in section 3.2.

In addition to the three aforementioned preposition types, Feng (2003) highlights the existence of post-object PPs in modern Mandarin.

(7) a. ta fang le yi-zhang zhi zai na ge bei-zi shang.
he put TAM NUM-CL paper at that-CL cup top
'He put a piece of paper on that cup.'

b. ta xie le yi-ge zi zai zhuo-zi shang.
he write TAM NUM-CL character on table top
'He wrote a character on the table.'

(adapted from Feng, 2003, p. 1087)

In the examples, the verbs *fang* ('put') and *xie* ('write') are immediately followed by the objects *yi zhang zhi* ('a piece of paper') and *yi ge zi* ('a character'), respectively. The PPs *zai na ge beizi shang* ('on that cup') and *zai zhuozi shang* ('on the table') appear in post-object position. However, a closer examination of the two examples uncovers that both PPs, in fact, can appear in other positions as well. As shown by (8b) and (9b), the two PPs can also appear in pre-verbal position.

(8) a. ta fang le yi-zhang zhi zai na-ge bei-zi shang.
he put TAM NUM-CL paper at that-CL cup top
'He put a piece of paper on that cup.'

b. ta zai na-ge bei-zi shang fang le yi-zhang zhi.
he at that-CL cup top put TAM NUM-CL paper
'He put a piece of paper on that cup.'

c. ta fang zai na-ge bei-zi shang le yi-zhang zhi.
he put at that-CL cup top TAM NUM-CL paper
'He put a piece of paper on that cup.'

d. *ta fang le zai na-ge bei-zi shang yi-zhang zhi.
he put TAM at that-CL cup top NUM-CL paper

e. *ta fang le yi-zhang zhi.
he put TAM NUM-CL paper

(9) a. ta xie le yi-ge zi zai zhuo-zi shang.
he write TAM NUM-CL character on table top
'He wrote a character on the table.'

b. ta zai zhuo-zi shang xie le yi-ge zi.
he on table top write TAM NUM-CL character
'He wrote a character on the table.'

c. *ta xie zai zhuo-zi le shang yi-ge zi.
he write at table TAM top NUM-CL character

d. *ta xie le zai zhuo-zi shang yi-ge zi.
he write TAM at table top NUM-CL character

e. ta xie le yi-ge zi.
he write TAM NUM-CL character
'He wrote a character.'

The two PPs, however, have different syntactic roles. The PP *zai na ge beizi shang* ('on that cup') is the complement of the verb *fang* ('put') in (8a). In (9a), the PP *zai zhuozi shang* ('on the table') functions as an adjunct, as demonstrated by (9c), (9d), and (9e), where the adjunct PP is either banned from the post-verbal position or deleted without affecting the acceptability of the remainder of the sentence.

The examples in (8) and (9) indicate that an adjunct PP can only occupy pre-verbal or post-object positions whereas a complement PP can occupy pre-verbal, post-verbal, or post-object positions in a sentence.

In addition to the classification by position, PPs can also be grouped according to syllable count. Prepositions in Mandarin are either monosyllabic or disyllabic, with the former representing the majority. Chen (2002) points out that of the 153 prepositions in Mandarin, only around one third of them are composed of two syllables.

Syllable count is closely related to the position of PPs. Previous research indicates that disyllabic prepositions in Mandarin only appear in pre-subject or pre-verbal

position whereas monosyllabic prepositions can also appear in post-object position (Feng, 2000, 2003; L. Wang, 2008).

(10) a. guan-yu zhe-ge ji-hua, wo-men ming-tian tao-lun.
about this-CL plan we tomorrow discuss
'We will discuss this plan tomorrow.'

b. ta-men yi-zhao guan-li zheng-li le shu-ju.
they according to convention organize TAM data
'They organized the data according to convention.'

c. an lao-ban de yao-qiu yuan-gong jia-ban le.
according to boss POSS demand staff work overtime TAM
'The staff worked overtime according to the boss' demand.'

d. ta yin gan-mao que-xi le hui-yi.
he because of cold be absent TAM meeting
'He was absent from the meeting because of the cold.'

e. lun-chuan shi xiang dong-fang.
ship sail to east
'The ship sailed to the east.'

f. ta fang le yi-ben shu zai di-shang.
he put TAM one-CL book on floor-top
'He put a book on the floor.'

2.2 Characteristics of Mandarin prepositions

Based on the discussion in the previous section, a summary of the characteristics of Mandarin prepositions can now be laid out.

First, prepositions in Mandarin can be classified with respect to syllable count or their position in a sentence. The two criteria are closely related to each other. Disyllabic prepositions only appear in pre-subject or pre-verbal position whereas

monosyllabic prepositions can occupy pre-subject, pre-verbal, post-verbal, or post-object position.

Second, some mono- and disyllabic prepositions can appear in pre-subject position, a few of which can also be inserted in pre-verbal position, and these prepositions are banned from post-verbal position. Since the present analysis focuses mainly on post-verbal prepositions, I will not make any further comments on the pre-subject prepositions.

Third, pre-verbal prepositions in Mandarin exhibit different characteristics with regard to whether they can appear in post-verbal position. Some pre-verbal prepositions function as adjuncts in sentences, and are therefore excluded from appearing in post-verbal position. These adjunct prepositions can also be deleted. Some pre-verbal prepositions cannot be deleted, but can appear in the post-verbal position to function as the verb's complement. The present study focuses on the latter type.

Fourth, a post-verbal PP in Mandarin consists of a monosyllabic P and is usually the complement of the verb. It completes the meaning of the verb and cannot be deleted. This is the focus of the present study, and its properties will be more closely examined in the next section.

Fifth, a post-object PP in Mandarin, which also contains a monosyllabic P, can be either an adjunct or a complement of the verb. The former type cannot appear in post-verbal position whereas the latter can. It is the latter that is examined in the present study.

In short, this chapter examines the PPs that function as the complement of a verb.

3 Post-verbal PPs in Mandarin

Based on the generalization in section 2, this section investigates the behavior of the prepositional phrases that function as complements of verbs. With the diagnostics for wordhood introduced in Chapter 2 and the analysis of PNI in Chapter 3, section 3.1 identifies two incorporation structures: PI and PPI. Section 3.2 discusses the possible structures when V is followed by both a PP complement and a theme object complement. Section 3.3 examines the definiteness condition on these complements when they are present in particular positions in sentences. In light of the observations made in the first three sections, section 3.4 puts forward the research questions of this chapter.

3.1 A complex verb?

Based on Chen (2002) and the *Contemporary Chinese Dictionary* (1996), there are eight prepositions that can be used post-verbally: *zai* (*at*), *yu* (*to*), *wang* (*to*), *xiang* (*to*), *dao* (*to*), *gei* (*to*), *yi* (*with*), and *zi* (*from*).

Of the eight prepositions, the last two *yi* (*with*) and *zi* (*from*) are different from the rest. The literature indicates that a post-verbal preposition has a resultative meaning (Feng, 2003; Mulder & Sybesma, 1992); however, when used post-verbally, *yi* ('with') and *zi* ('from') are different from the rest in that they refer to instrument and source, respectively, failing to generate resultative meaning.

(11) a. ta-men gei zhe-bu ju pei yi chuan-tong yin-yue.
they to this-CL play match with traditional music
'They use classic music as the background music for this play.'

b. ta lai zi dan-mai.
he come from Denmark
'He comes from Denmark.'

In addition, unlike the other six prepositions, sentences containing *yi* (‘with’) or *zi* (‘from’) do not allow the addition of the tense and aspect marker *le*.

(12) a. ta-men gei zhe-bu ju pei yi chuan-tong yin-yue.
they to this-CL play match with traditional music
‘They use classical music as the background music for this play.’

b. *ta-men gei zhe-bu ju pei yi le chuan-tong yin-yue.
they to this-CL play match with TAM traditional music

c. *ta-men gei zhe-bu ju pei le yi chuan-tong yin-yue.
they to this-CL play match TAM with traditional music
‘They use classical music as background for this play.’

(13) a. ta lai zi dan-mai.
he come from Denmark
‘He comes from Denmark.’

b. *ta lai zi le dan-mai.
he come from TAM Denmark
‘He comes from Denmark.’

c. *ta lai le zi dan-mai.
he come TAM from Denmark
‘He comes from Denmark.’

As indicated by (12) and (13), the sentences that contain *yi* (‘with’) and *zi* (‘from’) do not allow the insertion of the tense and aspect marker *le*, which means it would be hard to diagnose the wordhood of the [VP] structure. Therefore, the prepositions *yi* (‘with’) and *zi* (‘from’) are excluded from this study.

The word *gei*, which can function as a preposition (‘to’) as well as a verb (‘give’) (Y. R. Chao, 1968; C. N. Li & Thompson, 1981; Y.-h. Li, 1990), is mainly used in double object constructions.

(14) a. ta song gei le wo yi-ben shu.
he give to/give TAM me NUM-CL book
'He gave me a book.'

b. ta song le wo yi-ben shu.
he give TAM me NUM-CL book.
'He gave me a book?'

In (14a), the word *gei* ('to/give') is adjacent to the verb *song* ('give'), designating the direction of the action as being towards the recipient. Although researchers agree that the word *gei* ('to/give') can be deleted in some cases (see (14b)) (Gu, 1998; C. N. Li & Thompson, 1981), there is substantial debate on the syntactic category of *gei* ('to/give') in the sentence (C.-R. Huang & Ahrens, 1999; Y.-h. Li, 1990; S. Zhang, 1990). These special properties distinguish *gei* ('to/give') from most other post-verbal prepositions. The discussion of the verbal and prepositional *gei* ('to/give') is left to the analysis in the next chapter. This chapter focuses on the rest of the prepositions, all of which can appear in post-verbal position.

(15) Ta ba na-ben shu fang zai zhuo-zi shang.
He BA that-CL book put at table top
'He put that book on the table.'

(16) xin-xi-lan dui yi 0:4 fu yu mei-guo dui.
New Zealand team with 0:4 lose to USA team
'New Zealand lost 0:4 against USA.'

(17) ta-men ba zhe-xie che xiao wang ba-ge guo-jia.
they BA these car sell to NUM-CL country
'They sold these cars to eight countries.'

(18) lun-chuan shi xiang dong-fang.
ship sail to east
'The ship sailed to the east.'

(19) ta pao dao xue-xiao.
he run to school
'He ran to school.'

To date, most research focuses on two of the five prepositions *zai* ('at') and *dao* ('to') (e.g., Y. R. Chao, 1968; C. Chen, 2002; Feng, 2003; Y.-h. Li, 1990). Some researchers hold that the post-verbal preposition (P) and the preceding verb (V) form a complex verb (e.g., Feng, 2000, 2003; Y.-h. Li, 1990). The validity of this claim is supported by the examples in (20) to (24), where the compound status of the $[VP]_V$ structures is diagnosed with the insertion of the tense and aspect marker *le*.

(20) a. ta ba na-ben shu fang zai zhuo-zi shang.
he BA that-CL book put at table top
'He put that book on the table.'

b. ta ba na-ben shu fang zai le zhuo-zi shang.
he BA that-CL book put at TAM table top
'He put that book on the table.'

c. *ta ba na-ben shu fang le zai zhuo-zi shang.
he BA that-CL book put TAM at table top
'He put that book on the table.'

d. ta ba na-ben shu fang zai zhuo-zi shang le.
he BA that-CL book put at table top TAM
'He put that book on the table.'

(21) a. xin-xi-lan dui yi 0:4 fu yu mei-guo dui.
New Zealand team with 0:4 lose to USA team
'New Zealand lost 0:4 against USA.'

b. xin-xi-lan dui yi 0:4 fu yu le mei-guo dui.
New Zealand team with 0:4 lose to TAM USA team
'New Zealand lost 0:4 against USA.'

c. *xin-xi-lan dui yi 0:4 fu le yu mei-guo dui.
New Zealand team with 0:4 lose TAM to USA team
'New Zealand lost 0:4 against USA.'

d. xin-xi-lan dui yi 0:4 fu yu mei-guo dui le.
New Zealand team with 0:4 lose to USA team TAM
'New Zealand lost 0:4 against USA.'

(22) a. ta-men ba zhe-xie che xiao wang ba-ge guo-jia.
they BA these car sell to NUM-CL country
'They sell these cars to eight countries.'

b. ta-men ba zhe-xie che xiao wang le ba-ge guo-jia.
they BA these car sell to TAM NUM-CL country
'They sold these cars to eight countries.'

c. *ta-men ba zhe-xie che xiao le wang ba-ge guo-jia.
they BA these car sell TAM to NUM-CL country

d. ta-men ba zhe-xie che xiao wang ba-ge guo-jia le.
they BA these car sell to NUM-CL country TAM
'They sold these cars to eight countries.'

(23) a. lun-chuan shi xiang dong-fang.
ship sail to east
'The ship sailed to the east.'

b. lun-chuan shi xiang le dong-fang.
ship sail to TAM east
'The ship sailed to the east.'

c. *lun-chuan shi le xiang dong-fang.
ship sail TAM to east
'The ship sailed to the east.'

d. lun-chuan shi xiang dong-fang le.
ship sail to east TAM
'The ship sailed to the east.'

(24) a. ta pao dao xue-xiao.
he run to school
'He ran to school.'

b. ta pao dao le xue-xiao.
he run to TAM school
'He ran to school.'

c. *ta pao le dao xue-xiao.
he run TAM to school
'He ran to school.'

d. ta pao dao xue-xiao le.
he run to school TAM
'He ran to school.'

As a tense and aspect marker, the morpheme *le* is commonly placed after verbs in Mandarin, indicating the simple past or the present perfect. It cannot be inserted into verbs due to lexical integrity. Therefore, a verbal expression can be diagnosed as a word if it does not allow *le* insertion. All sentences under (b) and (c) in (20) to (24) provide evidence for the claim that when a verb is followed by a PP complement, V and P form a complex word structure $[VP]_V$. According to the discussion in Chapter 3, the linear adjacency of V and N is a main property of NI (i.e., after the nominal head moves into the verb, the two constitute an integral whole). Given the fact that the $[VP]_V$ structure exhibits the same property (i.e., V and P must be adjacent when PP appears in post-verbal position), it is assumed that $[VP]_V$ compounds in Mandarin are also formed through incorporation. However, an unexpected ramification from this assumption is that the whole PP complement can precede *le*. This property of the post-verbal PP complement is illustrated by each (d) sentence in (20) to (24). Therefore, on the basis of the discussion on the PNI constructions in Chapter 3, it is further assumed that the plausibility of attaching the tense and aspect marker *le* to the $[V\ PP]_V$ structure indicates that it is a pseudo incorporation structure.

3.2 Two complements

As discussed in section 2.2, if a sentence contains an object complement, the complement PP can appear in either post-object or post-verbal position. For the convenience of reading, parts of example (8) are re-written as (25) here.

(25) a. ta fang le yi-zhang zhi zai na-ge bei-zi shang.
he put TAM NUM-CL paper at that-CL cup top
'He put a piece of paper on that cup.'

b. ta fang zai na-ge bei-zi shang le yi-zhang zhi.
he put at that-CL cup top TAM NUM-CL paper
'He put a piece of paper on that cup.'

In (25a), the verb *fang* ('put') is followed by an indefinite theme object *yi-zhang-zhi* ('a piece of paper') and a definite PP *zai na ge beizi shang* ('on that cup'). In (25b), it is the PP that immediately follows the verb and the indefinite object that is placed at the end of the sentence. Feng (2003) suggests that the definiteness of the theme object and the PP is fixed; namely, the theme object must be an indefinite NP whereas the PP must contain a definite NP.

(26) a. [V $NP_{1indefinite}$ P $NP_{2definite}$]

b. [V P $NP_{2definite}$ $NP_{1indefinite}$]

Though this claim about the definiteness of the two NPs appears to be plausible, many counter-examples to Feng's (2003) claim have been found. Some examples from online novels, blogs, and news reports are listed below.

(27) na-zhi cui-niao you fei le hui-lai, nen-huang de shuang-zhua-zhong hai zhua zhe yi-duo hong-hua. xiao-hou-ye zhang-kai shou, cui-niao bian fei-luo le xia-lai, **fang le na-duo hua zai ta shou-zhong**. (Translation: That kingfisher flew back, with a red flower in its bright yellow claws. The Duke opened his hand. The kingfisher flew down and **put that flower in his hand**.)
(from http://www.01xiang.com/wanjie/2008-11-17/2118.html)

(28) wo mei dong ni-de zhao-pian, zhi-shi **fang le wo-de zai ni-de shang-mian**. (Translation: I did not touch your photo. I just **put mine on top of yours**.)
(from http://www.fushuwang.com/book/36049_2.html?2)

(29) wo chu-shi yi-wei jie-zhi die-luo zai wei-sheng-jian de jiao-luo huo chuang-wai, dan wo-men shen-zhi ba wei-sheng-jian de di-ban he yu-gang dou chai le, reng-ran zhao-bu-dao. hou-lai, wo yi-zhi hui-xiang shi-bu-shi **fang le jie-zhi zai qi-ta di-fang**. (Translation: At first, I thought I might have dropped the ring at the corner of the bathroom or it might have fallen outside the window. But we still could not find it even after we removed the floor and the bathtub in the bathroom. Then I started to doubt whether I **had put the ring somewhere else**.)
(from http://news.163.com/08/0926/18/4MPNHOI30001121M.html)

(30) sheng-pa zi-ji hu-tu-de nao-dai you-tian hui wang-ji ni. suo-yi wo **fang le wo-men de zhao-pian zai zhuo-bian**, zhe-yang wo jiu-hui shi-ke xiang-zhe ni. (Translation: I was afraid that I would forget you one day. Therefore, I **put our photo on the desk** so that I would miss you all the time.)

Each example in (27) to (30) contains a sentence where there is a theme object and a post-verbal PP complement. As can be seen from the bolded excerpts, in the structure [V NP_1 P NP_2], both the NPs in the theme object and the PP complement are definite. Based on (25) and the examples in (27) to (30), it seems that although NP_2 needs to be definite in all the cases, there is no requirement that NP_1 be definite. Hence, Feng's (2003) generalization of this structure is revised from (26a) to (31).

(31) [V NP_1 P $NP_{2definite}$]

Feng's (2003) generalization in (26b) seems to hold, because in the [V P NP_2 NP_1] ordering, a definite NP_1 results in ungrammaticality. This point can be illustrated by the examples (32) to (35). From (32) to (35), the first sentence of each example (i.e., (a)) takes the structure in (31) and is a legitimate expression but as shown by the second sentence of each example, the movement of P and the definite NP_2 to the preceding position of the definite NP_1 results in ungrammaticality. NP_1 must be an indefinite expression when appearing in post-PP position (i.e., at the end of

the sentence), as indicated by (32c), which takes the structure [V P $NP_{2definite}$ $NP_{1indefinite}$].

(32) a. cui-niao fang le na-duo hua zai ta shou-zhong.
Kingfisher put TAM that-CL flower in his hand-center
'The kingfisher put that flower in his hand.'

b. *cui-niao fang zai ta shou-zhong le na-duo hua.
kingfisher put into his hand-center TAM that-CL flower

c. cui-niao fang zai ta shou-zhong le yi-duo hua.
Kingfisher put into his hand-center TAM NUM-CL flower
'The kingfisher put a flower in his hand.'

(33) a. wo fang le wo-de zai ni-de shang-mian.
I put TAM mine on yours top.
'I put mine on top of yours.'

b. *wo fang zai ni-de shang-mian le wo-de.
I put on yours top TAM mine.

(34) a. wo fang le jie-zhi zai qi-ta di-fang.
I put TAM ring at other place.
'I put the ring somewhere else.'

b. *wo fang zai qi-ta di-fang le jie-zhi.
I put at other place TAM ring.

(35) a. wo fang le wo-men-de zhao-pian zai zhuo-bian.
I put TAM our photo on desk-edge.
'I put our photo on the desk.'

b. *wo fang zai zhuo-bian le wo-men-de zhao-pian.
I put on desk-edge TAM our photo.

3.3 Definiteness of the NPs and ordering

As has been discussed, some post-verbal complement PPs can also appear pre-verbally. For convenience, (6a) and (5a) appear as (36a) and (36b), respectively.

(36) a. ta zhu zai Beijing.
he live in Beijing
'He lives in Beijing.'

b. ta zai Beijing zhu.
he in Beijing live
'He lives in Beijing.'

In (36a), the PP *zai Beijing* ('in Beijing') is the complement of the verb *zhu* ('live'). Example (36b) shows that this post-verbal PP complement can also appear in pre-verbal position. The NP contained in the PP in (36) is a definite expression. The examples in (37) show that a PP can also be an indefinite expression.

(37) a. wo zhu zai yi-ge xiao-zhen.
I live in NUM-CL small-town
'I live in a small town.'

b. wo zai yi-ge xiao-zhen zhu.
I in NUM-CL small-town live
'I live in a small town.'

Things become more interesting when there are two complements of the verb; that is, there is a theme object complement and a PP complement. Recall that the two complements may exchange positions according to the definiteness of the NPs—[V NP_1 P $NP_{2definite}$] and [V P $NP_{2definite}$ $NP_{1indefinite}$]. The two structures indicate that when the theme object (NP_1) is indefinite, it may come either before or after the PP complement; but when NP_1 is a definite expression, it is banned from

post-PP position. Moreover, NP_1 may also appear in other positions in a sentence, depending on definiteness. These options are illustrated in the following examples.

(38) Position of NP_1 when both NP_1 and NP_2 are definite

a. wo fang le wo-men-de zhao-pian zai zhuo-shang.
I put TAM our photo on desk-top
'I put our photo on the desk.'

b. wo ba wo-men-de zhao-pian fang zai le zhuo-shang.
I BA our photo put on TAM desk-top
'I put our photo on the desk.'

c. wo-men-de zhao-pian, wo fang zai le zhuo-shang.
our photo I put on TAM desk-top
'I put our photo on the desk.'

(39) Position of NP_1 when NP_1 is indefinite and NP_2 is definite

a. wo fang le yi-zhang zhi zai zhuo-shang.
I put TAM NUM-CL paper on desk-top
'I put a piece of paper on the desk.'

b. wo ba yi-zhang zhi fang zai le zhuo-shang.
I BA NUM-CL paper put on TAM desk-top
'I put a piece of paper on the desk.'

c. *yi-zhang zhi, wo fang zai le zhuo-shang.
NUM-CL paper I put on TAM desk-top

The examples in (38) show that besides the two structures [V NP_1 P $NP_{2definite}$] and [V P $NP_{2definite}$ $NP_{1indefinite}$], when both NP_1 and NP_2 are definite expressions, NP_1 may also appear in pre-verbal position within a *ba* construction or at the beginning of the sentence as a topic. Things are different, however, when only NP_2 is definite. As shown in (39b), an indefinite NP_1 can only appear in pre-verbal

position within a *ba* construction. Placing it at the beginning of the sentence results in an illegitimate expression (see (39c)).

Furthermore, sentences in (38) and (39) highlight that the verb has only one complement (the PP complement) when NP_1 appears in pre-verbal position or at the beginning of the sentence. Based on the discussion in section 3.1, in this situation, V can either form a complex verb structure $[VP]_V$ with P (see (38b), (38c), and (39b)) or form a pseudo incorporation construction $[V\ PP]_V$. The latter option is illustrated in the following examples.

(40) a. wo ba wo-men-de zhao-pian fang zai zhuo-shang le.
I BA our photo put on desk-top TAM
'I put our photo on the desk.'

b. wo-men-de zhao-pian, wo fang zai zhuo-shang le.
our photo I put on desk-top TAM
'I put our photo on the desk.'

c. wo ba yi-zhang zhi fang zai zhuo-shang le.
I BA NUM-CL paper put on desk-top TAM
'I put a piece of paper on the desk.'

3.4 Research questions

Given what has been discussed in the previous sections, the distribution of PPs in Mandarin can be generalized as follows:

(41) a. All of the post-verbal prepositions are monosyllabic.

b. When V is only followed by a PP complement, either V and P form a complex verb $[VP]_V$ (an incorporation construction) or V and PP form a pseudo incorporation structure $[V\ PP]_V$. There is no requirement about the definiteness of the NP contained in PP.

c. When V is followed by an object complement and a PP complement, PP can appear either in post-verbal or post-object position. When PP is in post-verbal position, V and PP form a pseudo incorporation construction (see (25b)), where the tense and aspect marker *le* appears in post-PP position. The definiteness of the NPs has a significant impact on the grammaticality of the sentences, as well as their word orders.

Based on the summary in (41b) and the examples listed in section 3.3, when V is only followed by a PP complement, its structure can be summarized as follows:

(42) a. $[[VP]_V\ NP_2]$

b. $[V\ P\ NP_2]_V$

Given (42) (in which the NP is labeled as NP_2 so as to be distinguished from the theme object of the verb), the questions would be: how are the compound structure $[VP]_V$ and the phrase structure [V PP] derived, and what is the motivation for each derivational process?

Based on the summary in (41c), seven structures are formulated:

(43) a. $[V\ NP_1\ P\ NP_{2definite}]$

b. $[[VP]_V\ NP_{2definite}\ NP_{1indefinite}]$

c. $[[V\ P\ NP_{2definite}]_V\ NP_{1indefinite}]$

d. $[ba\ NP_1\ [VP]_V\ NP_2]$

e. $[ba\ NP_1\ [V\ P\ NP_2]_V]$

f. $[NP_{1definite}\ S\ [VP]_V\ NP_2]$

g. $[NP_{1definite}\ S\ [V\ P\ NP_2]_V]$

Given (43), the questions that arise include: when the verb is followed by an object complement and a PP complement, how is each structure in (43) derived? How does the definiteness of the NPs affect linearization, and what is the motivation for each derivational process? These questions will be addressed in the following sections.

4 Derivation of $[VP]_V$ and $[V\ P\ NP_2]_V$ structures

This section discusses the derivation of $[VP]_V$ and $[V\ P\ NP_2]_V$ structures in Mandarin, as well as the motivation for each process. It consists of three sub-sections. Section 4.1 examines how PI and PPI constructions are derived. Section 4.2 explores the motivation for the head movement and the phrasal movement involved in the derivation of PI and PPI. Section 4.3 discusses a unique characteristic of PPI—P-drop.

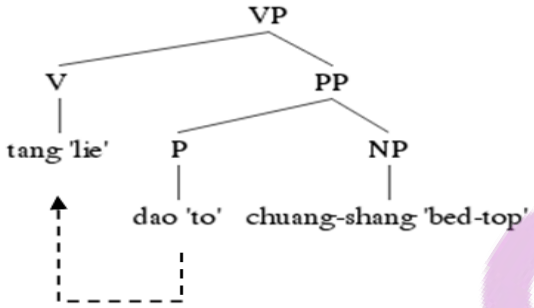
4.1 Deriving $[VP]_V$ by head movement and $[V\ P\ NP_2]_V$ by phrasal movement

This section analyzes five structures summarized in section 3.3: (42a), (42b), (43a), (43b), and (43c). As discussed in section 3.1, when a verb is followed by a PP complement, the post-verbal preposition and the preceding verb form a complex verb (Feng, 2000, 2003; Y.-h. Li, 1990). It is proposed that the derivation of the $[VP]_V$ compound structure is achieved in the same way as the production of $[VN]_V$ compounds; namely, the production of $[VP]_V$ compounds involves the verb's argument structure, in which the head of the verb's complement moves into V, forming a complex predicate (Hale & Keyser, 1993, 2002, 2005). Sentence (44) contains a $[VP]_V$ compound *tang-dao* (lie-to, 'lie in').

(44) ta tang dao le chuang-shang.
he lie to TAM bed-top
'He lay in bed.'

In light of the four structural types introduced in Chapter 1, the syntactic configuration of (44) consists of a simplified (8b)-type structure in the complement position of the (8a)-type. The structure (8b) is regarded as simplified because the preposition does not project an internal specifier. The schematic configuration for sentence (44) is shown in (45).

(45) Derivation of the $[VP]_V$ compound *tang-dao* (lie-to, 'lie in')

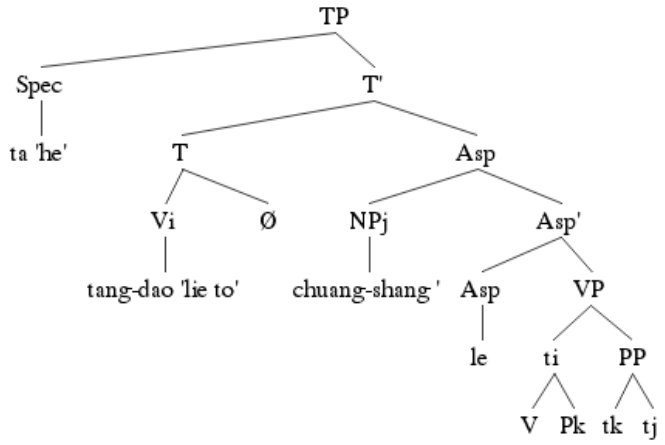


As shown in (45), the verb *tang* ('lie') takes a PP complement. The node P is occupied by *dao* ('to'), which is a preposition of terminal coincidence (i.e., the location of the subject *ta* ('he') and the location of the NP *chuang-shang* (bed-top, 'the top of the bed') do not coincide until the end of the event). As the head of the complement, P moves into the governor V, forming a complex verb *tang-dao* (lie-to, 'lie in').

For a configuration such as (45), the movement of the NP phrase is also possible (see (47)), which would produce a pseudo incorporation construction in (46).

(46)	ta	tang	dao	chuang-shang	le.
	he	lie	to	bed-top	TAM
	'He has gone to bed.'				

(47) Derivation of (46)



In (47), the movement of NP into the specifier position of AsP is nothing more than the type of PNI discussed in Chapter 3 (see section 5). The only difference is that before V incorporates into T, the prepositional head P incorporates into V first to form a VP compound. For these kinds of constructions, the term PPI (pseudo preposition incorporation) is employed.

When a verb is followed by two complements, namely, an object complement and a PP complement, one of the three structures in (43a), (43b), and (43c) can be derived. These structures are illustrated in (48a), (48b) and (48c), respectively.

(48) a. ta fang le na-zhang zhi zai na-ge bei-zi shang.
he put TAM that-CL paper at that-CL cup top
'He put that piece of paper on that cup.'

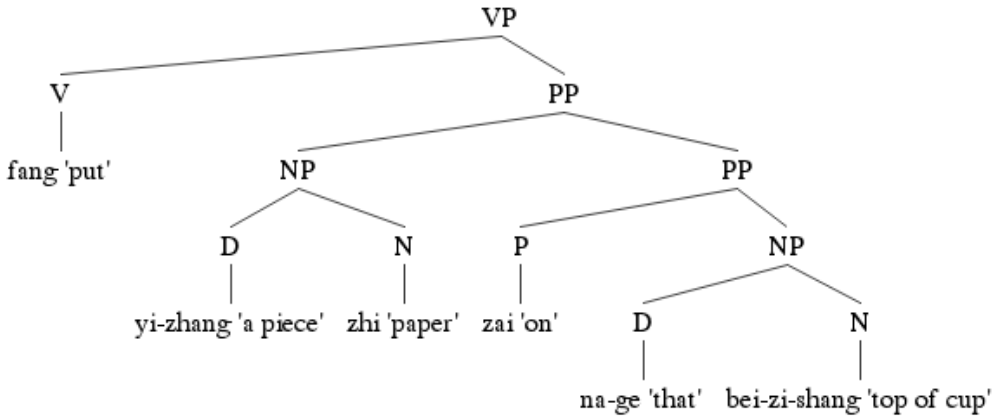
b. ta fang zai le na-ge bei-zi shang yi-zhang zhi.
he put at TAM that-CL cup top NUM-CL paper
'He put a piece of paper on that cup.'

c. ta fang zai na-ge bei-zi shang le yi-zhang zhi.
he put at that-CL cup top TAM NUM-CL paper
'He has put a piece of paper on that cup.'

Based on the four structural types of argument structure proposed by Hale and Keyser (2002) (introduced in Chapter 1), it is assumed that the syntactic

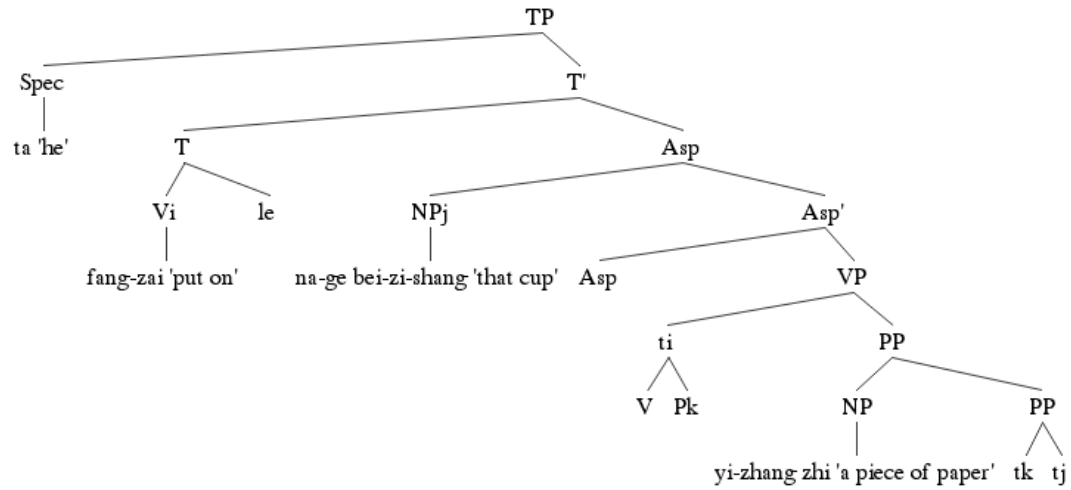
configuration of (48a) is composed of an (8b)-type structure in the complement position of the (8a)-type, as shown in (49).

(49)



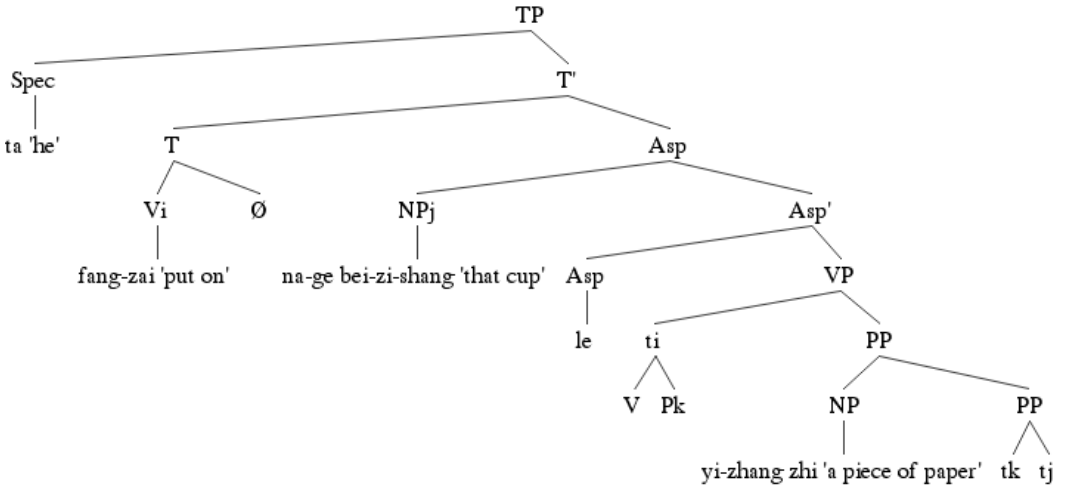
In (49), the verb *fang* ('put') takes a complement PP *zai na-ge bei-zi-shang* ('on that cup'), whose head P *zai* ('on') projects an internal specifier NP *yi-zhang zhi* ('a piece of paper'). It is assumed that (48b) is derived from this configuration through three steps of movement: two steps of head movement and a step of phrasal movement. In the first step, P, the head of PP, moves into V forming a $[VP]_V$ compound. In the second step, the $[VP]_V$ compound moves to T checking its D feature. In the third step, the complement NP of the P moves to the specifier position of Asp. In the derivation of the simple past, it is the tense marker verbal *le* that surfaces in the clause, as shown in (50).

(50)



The derivation of (48c) is achieved through a similar procedure of syntactic operations. The difference, though, is that, in the formation of (48c), it is the aspect marker sentential *le* that surfaces, as shown in (51).

(51)

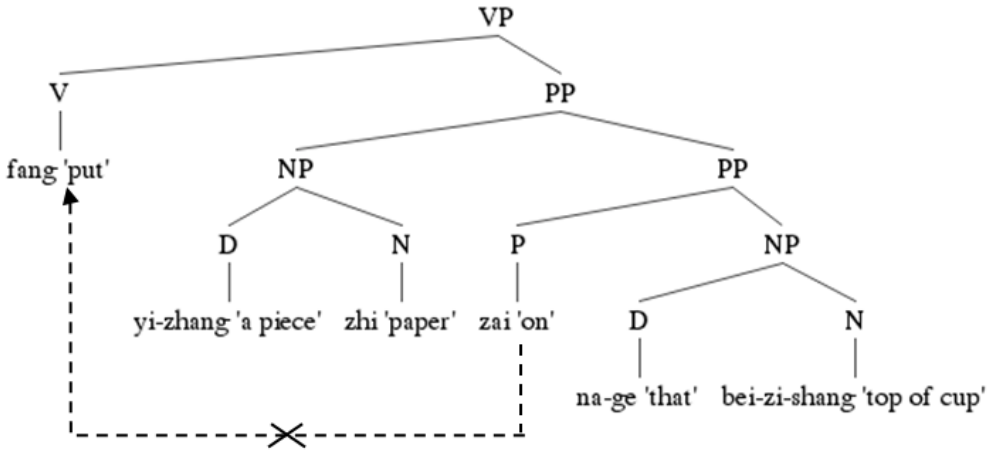


This account of (48b) and (48c) is different from Feng (2000, 2003) who treats sentences like these as containing a PI construction by directly embedding

structure (42a) into (43b)[19]. The problem with the idea of a single head movement is that this would result in stranding by leaving some parts of the PP behind, resulting in ungrammaticality, as illustrated in (52) and (53).

(52) *ta fang zai yi-zhang zhi na-ge bei-zi.
he put on NUM-CL paper that-CL cup
Intended meaning: 'He put a piece of pater on that cup.'

(53)



4.2 Motivations for the movement

4.2.1 Different views

There are few references discussing the motivation for phrasal movement of PP, but several opinions are found about the motivation for PI. Peck and Sells (2006) suggests that in Chinese grammar, the structure SVO is more acceptable than SVP.

[19] Feng (2003) does not overtly propose that ordering [V PP NP] contains a PI but not a PPI. His general assumption about post-verbal PP is that when PP is adjacent to the preceding V, P and V form a verbal compound $[VP]_V$, regardless of whether there is another post-verbal object complement or not. Therefore, although he does employ sentence structures such as (38b) where the tense and aspect marker *le* is inserted after the whole PP rather than between P and NP_1 in his analysis, it does not mean that he bases his analysis on phrasal movement.

Therefore, when a verb is followed by a PP complement, the syntax tends to move P into V forming a complex predicate and leaving NP_2 (see (42a)) as the complement of the predicate, so that the structure SVP is changed to the more acceptable SVO structure. This proposal might work with the situations where V is followed by only a PP complement and P must incorporate into V for some reason. However, it fails to answer why when V is followed by both an object complement and a PP complement, P does not necessarily move to V (e.g., structure (43a)). Feng (2003) proposes that it is a special version of the Nuclear Stress Rule (NSR) that motivates PI, which he terms G-NSR.

(54) G(overnment)-NSR (in Chinese) (Feng, 2003, p. 1091):

Given two sister nodes C1 and C2, if C1 and C2 are selectionally ordered, the one lower in selectional ordering and containing an element governed by the selector is more prominent.

Since NSR in Chinese is based on government, Feng (2003) also provides a definition for the notion Government:

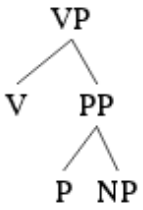
(55) Government (Feng, 2003, p. 1092)

α governs β if and only if
i. α is an X^0, and
ii. α c-commands β, and
iii. every branching node dominating α dominates β.

Feng holds that to a structure such as (56), NP is the informational focus to which the nuclear stress (NS) should be assigned (Zubizarreta, 1998; Zubizarreta & Vergnaud, 2006). However, in (56), V, as the governor, "does not govern the NP. As a result, V cannot assign NS to the NP" (Feng, 2003, p. 1095). Therefore, P must incorporate into V so that the complex predicate can govern NP and assign nuclear stress to it. How Feng arrives at this conclusion is not clear, because

according to his definition of Government, V in (56) should indeed govern PP, P, and NP.

(56)



In fact, incorporating P into V does not have any impact on V assigning nuclear stress to NP in (56). This is because, according to Zubizarreta (1998), P as a function word is metrically invisible (i.e., P is invisible to the application of NSR). Thus, in (56), PP and NP are "metrically non-distinct"; so V, PP, and NP are "metrical sisters" (Zubizarreta & Vergnaud, 2006, p. 15). Because V and PP are metrical sisters and there is a selectional relation between them (given that V selects PP as its complement), NSR applies and assigns nuclear stress to PP. Because PP and NP are metrically non-distinct, any rule that applies to PP extends to NP as well. Thus, nuclear stress is assigned to NP. To sum up, the application of G-NSR in structure (56) is not influenced by the position of P. It works (i.e., successfully assigns nuclear stress to NP) whether P undergoes incorporation or not. G-NSR does not motivate the incorporation of P.

4.2.2 PP as the only complement

In Chapter 3, Chomsky's (2001a, 2005) proposal that move tends to be motivated by discourse-related informational properties is adopted. As for PI, it is assumed that the head movement of P into V is also information-motivated; that is, the PI process is motivated by specificity, which is also the trigger for the derivation of $[NV]_V$ compounds in Mandarin. The formation of the $[NV]_V$ compound structures discussed in Chapter 3 is triggered by the S-feature of V, which requires

incorporation of N into V as a modifier so as to achieve the referential specificity of V. In the formation of $[VP]_V$ compounds, I agree with Li (1998) who suggests that the incorporated P is to introduce the result (i.e., NP_2) of the action or the event designated by the verb. In other words, it is assumed that the S-feature of the involved verbs is related to direction, goal, or result. Thus, PI checks this feature by highlighting the result-orientation of the verb.

As introduced in section 4.1, there is no distinctive difference between the derivational processes of PNI and PPI constructions when the PP complement is the only complement of V in the sentence. According to the discussion in Chapter 3, the goal of the phrasal movement NP is to check the D-feature of AsP. It is assumed that it is the same motivation that triggers PPI. Namely, PPI in Mandarin also checks the D-feature of AsP. Therefore, while PI produces a simple past (see (44)), PPI generates a present perfect (see (46)).

4.2.3 Motivations for the derivation of $[[VP]_V\ NP_{2definite}\ NP_{1indefinite}]$ and $[[V\ P\ NP_{2definite}]_V\ NP_{1indefinite}]$

Section 4.2.2 discusses the motivation for the two types of movement involved in the generation of a [V PP] construction, in which PP is the only complement of V. In this section, the motivation for the derivation of (43b) ($[[VP]_V\ NP_{2definite}\ NP_{1indefinite}]$) and (43c) ($[[V\ P\ NP_{2definite}]_V\ NP_{1indefinite}]$) is discussed. In light of the discussion in section 4.1, both structures are derived from (43a) $[V\ NP_1\ P\ NP_{2definite}]$, and both of them involve multiple-step movement.

The first steps of movement in the derivation of (43b) and (43c) are the same; namely, both involve a phrasal movement of PP from the end of the sentence to post-verbal/pre-object position. Following Chomsky (2001a, 2005) and many other syntacticians mentioned in Chapter 3, this thesis assumes that this movement is still trigged by focus that requires a focused constituent be placed in

one of the focus positions in a sentence. Specifically, PP movement is a process of displacing NP_1 that carries new information to a focus position in the sentence. This process is constrained by the Given Before New Principle (Gundel, 1988) (see section 4.1.3.1 in Chapter 3 for the definition of the principle).

In accordance with this principle, new information should appear after old information. In (57), the post-verbal complements contain two pieces of essential information: (a) the direct object that undergoes the action (NP_1), and (b) the final location of the theme object (NP_2). According to the Given Before New Principle, the new information in this sentence is the final location of the theme object *na-duo hua* ('that flower'), which is expressed by the PP complement *zai ta shou-li* ('in his hand'). As the carrier of new information, the PP is placed at the end of the sentence. Note that in (57) and (58) the focused PP and the wh-phrase target the same position in the sentence.

(57) cui-niao fang le na-duo hua zai ta shou-li.
kingfisher put TAM that-CL flower in his hand-inside
'The kingfisher put that flower in his hand.'

(58) cui-niao fang le na-duo hua zai shen-me di-fang?
kingfisher put TAM that-CL flower in what place
'Where did the kingfisher put that flower?'

Now, suppose the new information is not the final location of the theme object but the object itself. The Given Before New Principle requires that the theme object appear at the end of the sentence so as to become the focus. To satisfy this requirement, the PP *zai ta shou-li* ('in his hand') must undergo a leftward movement so that NP_1 can occupy the sentence-final focus position. According to the discussion in section 3.3, when NP_1 appears in sentence-final position, it should be an indefinite expression. This is because a definite expression usually bears given information, which, according to the Given Before New Principle,

needs to precede the new information, and therefore seldom appears at the end of a sentence. Thus, NP_1 now takes the form *yi-duo hua* ('a piece of flower'), shown in (59). The focused NP_1 can be tested with a wh-question as well. As illustrated by (60), the wh-phrase can target the sentence-final position.

(59) cui-niao fang zai le ta shou-li yi-duo hua .
kingfisher put in TAM his hand-inside NUM-CL flower
'The kingfisher put a flower in his hand.'

(60) cui-niao fang zai le ta shou-li shen-me dong-xi? .
kingfisher put in TAM his hand-inside what thing
'What did the kingfisher put in his hand?'

The head movement involved in the derivation of (43b) is a process of producing a PI construction (see section 4.2.2 for detailed discussion). With regard to the last step of movement involved in each structure, it is assumed that both the movement of the word structure $[VP]_V$ into T and the movement of the phrase structure VP into T check the D-feature of T. In (43b), the head movement of $[VP]_V$ checks the D-feature of T by forming a simple past. In (43c), the phrasal movement of VP checks the D-feature of T by forming a present perfect.

4.3 Preposition drop

According to the discussion in the previous sections, the characteristics of PI are similar to those of NI and the characteristics of PPI are similar to those of PNI. This section examines a unique property of PPI—P(reposition)-drop, which means that the preposition in a PPI construction can be deleted (Ioannidou & den Dikken, 2009; Longobardi, 2001).

(61) a. ta lai dao Beijing le.
he come to Beijing TAM
'He has arrived in Beijing.'

b. ta lai Beijing le.
he come Beijing TAM
'He has come to Beijing.'

(62) a. ta lai dao le Beijing.
he come to TAM Beijing
'He came to Beijing.'

b. *ta lai le Beijing.
he come TAM Beijing

(63) a. ta fang zai na-ge bei-zi-shang le yi-zhang zhi.
he put at that-CL cup-top TAM NUM-CL paper
'He has put a piece of paper on that cup.'

b. ta fang na-ge bei-zi-shang le yi-zhang zhi.
he put that-CL cup-top TAM NUM-CL paper
'He has put a piece of paper on that cup.'

(64) a. ta fang zai le na-ge bei-zi-shang yi-zhang zhi.
he put at TAM that-CL cup-top NUM-CL paper
'He put a piece of paper on that cup.'

b. *ta fang le na-ge bei-zi-shang yi-zhang zhi.
he put TAM that-CL cup-top NUM-CL paper

As shown in (61) and (63), in a sentence containing a PPI construction ((61a) and (64a)), the head P of the incorporated phrase PP can be omitted ((61b) and (63b)). However, P-drop is not permitted in PI constructions. In (62) and (64), the deletion of P from the PI construction results in an illegitimate expression. The fact that P-drop is banned from PI constructions provides further evidence for the word status of $[VP]_V$ structures, for this is in line with Lexical Integrity, which does not allow for deletion of its internal constituents.

The deletion of P from a post-verbal PP complement has been reported in languages such as Veneto dialects, Latin, and Greek (Gehrke & Lekakou, 2012;

Ioannidou & den Dikken, 2009; Longobardi, 2001). The following part of this section discusses the properties of P-drop in PPI constructions.

First, P-drop does not occur in all PPI constructions. It seems that of the five Mandarin prepositions that can be used post-verbally, only *zai* ('on/in/at') and *dao* ('to') can be deleted. As shown in (65) to (67), if the prepositions *yu* (*to*), *wang* (*to*), *xiang* (*to*) are deleted from the PPI construction, an ungrammatical expression will be yielded.

(65) a. xin-xi-lan dui yi 0:4 fu yu mei-guo dui le.
New Zealand team with 0:4 lose to USA team TAM
'New Zealand has lost to USA with 0:4.'

b. *xin-xi-lan dui yi 0:4 fu mei-guo dui le.
New Zealand team with 0:4 lose USA team TAM

(66) a. zhe-xie chan-pin yi-jing xiao wang hen-duo guo-jia le.
These product already sell to many countries TAM
'These products have been sold to many countries.'

b. * zhe-xie chan-pin yi-jing xiao hen-duo guo-jia le.
These product already sell many countries TAM

(67) a. lun-chuan shi xiang dong-fang le.
ship sail to east TAM
'The ship has sailed to the east.'

b. *lun-chuan shi dong-fang le.
ship sail east TAM

A similar situation is also attested in Greek. Of the locative and directional PP complements of verbs, only the preposition *se* ('at') can be deleted from the sentence (see (68)) (Gehrke & Lekakou, 2012; Ioannidou & den Dikken, 2009; Terizi, 2010). Deletion of other prepositions from PP complements results in ungrammaticality, as illustrated by (69).

(68) a. Pame (stin) paralia?
go.1PL at the beach.ACC
'Shall we go to the beach?"

b. Tha mino (sto) spiti.
FUT stay.1SG at the house.ACC
'I will stay (at) home.'

(69) Imun *(kato apo tin) karekla.
was.1SG under from the chair.ACC
'I was under the chair.'

(Gehrke & Lekakou, 2012, pp. 1-2)

Another noteworthy property of P-drop in Greek is that the deletion of P has a direct impact on its NP complement. Ioannidou and de Dikken (2009) suggest that the dropping of P is accompanied by the deletion of D in the following NP; namely, the expression that follows the omitted P must be a bare NP (Terizi, 2010). P-drop in Mandarin is different from Greek in this aspect. As can be seen from (70), the deletion of P in a PPI construction does not affect the following NP. In (70a), the NP *bei-zi-shang* ('the top of the cup') is still determined by D *na-ge* ('that') after P is omitted. This does not mean that the determiner cannot be deleted though. The sentence in (70b) is still acceptable with the occurrence of P-drop and D-drop. The existence of D indicates that the NP in the incorporated PP is specific in reference, which is different from the characteristic of PNI constructions, in which the incorporated NP is non-specific in reference (Clemens, 2014; Massam, 2001).

(70) a. ta fang na-ge bei-zi-shang le yi-zhang zhi.
he put that-CL cup-top TAM NUM-CL paper
'He has put a piece of paper on that cup.'

b. ta fang bei-zi-shang le yi-zhang zhi.
he put cup-top TAM NUM-CL paper
'He has put a piece of paper on the cup.'

However, PPI in Mandarin is consistent with PNI constructions in another aspect; that is, the NP in a PPI construction still permits modification with P being dropped, as shown in (71).

(71) a. wo fang zai na-ge hong-se-de bei-zi-shang le yi-zhang zhi.
I put on that-CL red cup-top TAM NUM-CL paper
'I have put a piece of paper on that red cup.'

b. wo fang na-ge hong-se-de bei-zi-shang le yi-zhang zhi.
I put that-CL red cup-top TAM NUM-CL paper
'I have put a piece of paper on that red cup.'

Based on the discussion, it can be inferred that the characteristics of P-drop in PPI constructions vary across languages; and the different constructions of pseudo incorporation in Mandarin are slightly different from each other in their properties. In a PNI construction, the incorporated NP is generally non-referential; while in a PPI construction, the incorporated PP can be either generic or specific in reference.

5 Movement of NP_1

The derivation of the five structures discussed in section 4 only involved the movement of a part of PP or the whole phrase (i.e, P, NP_2, and PP). This section focuses on the last four structures summarized in (43), in which the movement of NP_1 is involved. The four structures are examined in two sub-sections. Section 5.1 explores the nature of the structures in (43d) ([*ba* NP_1 $[VP]_V$ NP_2]) and (43e) ([*ba* NP_1 [V P $NP_2]_V$]), and section 5.2 analyzes structures (43f) ([$NP_{1definite}$ S $[VP]_V$ NP_2]) and (43g) ([$NP_{1definite}$ S [V P $NP_2]_V$]).

5.1 The *ba* construction

This section looks into the structures in (43d) and (43e), which are rewritten as (72a) and (72b). The difference between the two structures is that (72a) involves a

PI process while (72b) involves a PPI process. Since the two processes have been discussed in section 4, this section focuses on the movement of the theme object NP_1 to pre-verbal position.

(72) a. [*ba* NP_1 $[VP]_V$ NP_2]

b. [*ba* NP_1 $[V\ P\ NP_2]_V$]

In accordance with the discussion in section 4, one way to derive a sentence in which the verb is followed by two complements is to combine the elements through external merge. Thus, given a basic structure like (43a) [V NP_1 P NP_2], the simplest operation is to merge the nodes and produce a sentence like (74).

(73)

wo	fang	le	yi-zhang	zhao-pian	zai	qian-bao-li.
I	put	TAM	NUM-CL	photo	in	wallet-inside

'I put a photo in my wallet.'

According to the Given Before New Principle, the new information in (74) is provided by the PP complement *zai qian-bao-li* ('in the wallet'). With the new information about the location, the speaker hopes that the hearer will get more knowledge about NP_1 *yi-zhang zhao-pian* ('a photo'). So, the PP *zai qian-bao-li* ('in the wallet') takes the end focus position. However, if NP_1 *yi-zhang zhao-pian* ('a photo'), the object complement, constitutes the new information, the Given Before New Principle would motivate the phrasal movement of PP into post-verbal position so as to leave the end focus position to NP_1. At this point, it is relevant to question what would happen if the information in both NP_1 and PP is new. In this situation, "a binomial information division of the sentence is simply not enough" (Vallduví, 1992, p. 44). Besides the given/new dimension, another dimension is needed so that the two dimensions can work together to determine the word order in a sentence. The second dimension is the importance of

information, about which Gundel (1988) also proposes a principle—the First Thing First Principle.

(74) First Thing First Principle

Provide the most important information first.

According to this principle, in a sentence, the constituent that the speaker cares about or is interested in (and is hence a topic) tends to appear first. At first glance, the Given Before New Principle and the First Thing First Principle seem to be in conflict. In fact, however, the two principles are compatible with each other because they deal with different types of information.

In the case of (73), it is the Given Before New Principle that plays a dominant role, according to which the PP that bears new information takes the final position of the sentence. However, one question may arise: how come NP_1, an indefinite expression, is treated as given information? It is assumed that the answer lies in the relation between NP_1, the topic of the sentence, and NP_2, the speaker's comment about the topic.

Although as a topic an indefinite NP_1 tends to bear new information in the sentence (i.e., something that the speaker hopes that the hearer can know more about), there can be information newer than it. That information would be the speaker's comment about the topic (i.e., the information with which the hearer can know more about the topic). For example, in (69), although the information provided by the indefinite NP_1 *yi-zhang zhao-pian* ('a photo') is new when the hearer hears it, compared with its location, the information carried by NP_1 is always given, because it would be impossible to discuss the location of a topic if the speaker knows nothing about it. In this sense, although both topic and comment can be new, the topic always bear old or given information with regard

to the comment (Gundel, 1988). In other words, the information in the indefinite NP_1 is comparatively older than the information expressed by PP.

When both NP_1 and PP bear new information, the First Thing First Principle comes into play. As a constituent that bears new information, the importance of the topic NP_1 increases. However, it cannot take the end position of the sentence, because that position should be left to PP, which provides more information about the topic and is hence newer than NP_1. It is not suitable to simply keep NP_1 in post-verbal position either (as in (73)), because as has been discussed, the word order in (73) is derived through the simplest operations and is hence a default order (i.e., an unmarked order). The position of NP_1 in this default order hardly attracts the hearer's attention. Since the importance of NP_1 has increased, it does need more attention. One option is to move NP_1 to a focused position in the sentence. According to the discussion in Chapter 3, focus generally targets three positions in a sentence—the beginning, the end, and the pre-verbal position. The First Things First Principle requires that the constituent that bears important information appear in the leftward position in a sentence. Thus, the syntax needs to do something to satisfy this requirement. This is how the movement of NP_1 to pre-verbal position is motivated. In the case of (73), the result of the movement is shown in (75).

(75) wo ba yi-zhang zhao-pian fang zai le qian-bao-li.
I BA NUM-CL photo put in TAM wallet-inside
'I put a photo in my wallet.'

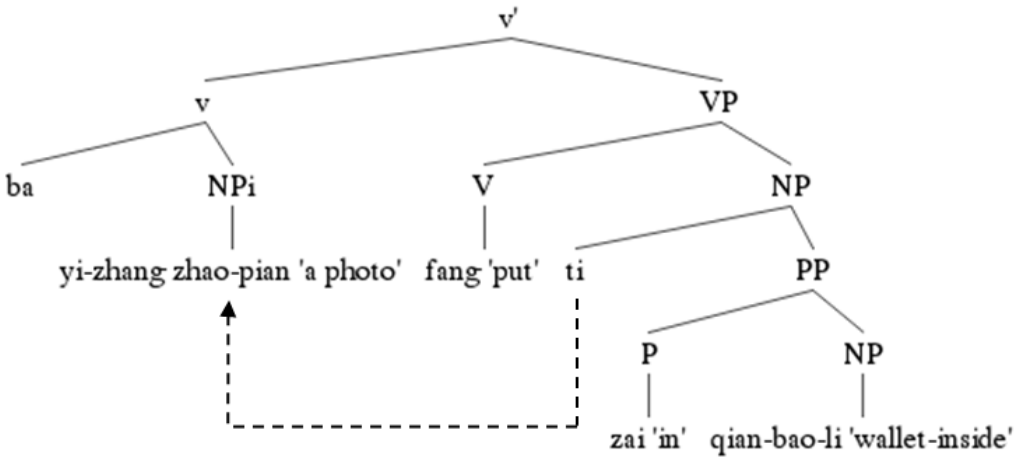
As shown in (75), when NP_1 moves to pre-verbal position, it surfaces with a morpheme *ba.* There is general consensus in the literature that the [*ba* NP] construction is a topic or focus construction (G. Chen, 1983; C. N. Li & Thompson, 1981; Meng, 2000; Tsao, 1987). As for the morpheme *ba*, it is treated as either a light verb or a preposition in the literature (den Dikken & Sybesma,

1998; Hornstein, Nunes, & Grohmann, 2005; Ye, Zhan, & Zhou, 2007). There is no significant difference between the two approaches to *ba*, since both a light verb and a preposition can be part of the predicate. This thesis employs the notion of light verb in the analysis.

In general, a light verb is an abstract null verb that has a strong V-feature, which motivates the main verb to move into it and realize its form. A light verb is ultimately identical in form with the main verb in most cases (Butt, 2010). Under some circumstances, however, a light verb can be realized by an allomorph that is not phonologically null (den Dikken & Sybesma, 1998). The word *ba* is such an allomorph of a light verb.

In the case of NP_1 moving to pre-verbal position, it is assumed that instead of the V-feature, the First Thing First Principle triggers the N-feature of the light verb, which is a strong feature of the allomorph *ba*. Since a strong feature must be checked in the syntax, the light verb *ba*, the probe, begins to search for a goal in its complement to check this N-feature. In (75), it firstly meets the main verb *fang* (‘put’), which cannot check an N-feature. The light verb *ba* hence continues to search and then finds NP_1 *yi-zhang zhao-pian* (‘a photo’). NP_1 bears the same feature and is c-commanded by *ba*. So NP_1 checks the N-feature of the light verb and the light verb *ba* attracts a phrasal movement of NP_1. This process is illustrated in (76) (For convenience of illustration, the PI/PPI process is not demonstrated in the tree structure).

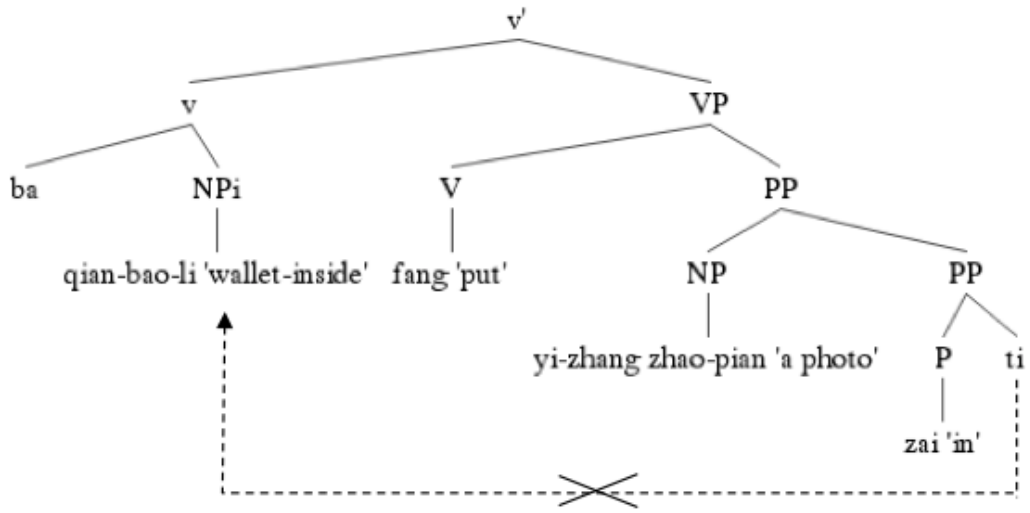
(76) Derivation of (75)



The difference between (76) and the default structure in (73) is that in (76), the complement node of V is assigned with a NP but not a PP. This is to secure the head status of NP_1 so that it can check the feature of the light verb. If V's complement is assigned with a PP, NP_1 would be an internal specifier of P and cannot fulfill the feature-checking role. In order to find a NP to check its feature, the probe *ba* would have to continue to search and eventually meet NP_2, the complement of P; but the movement of NP_2 into *v* would result in ungrammaticality, as illustrated by (77) and (78).

(77) *wo ba qian-bao-li fang le yi-zhang zhao-pian zai
I BA wallet-inside put TAM NUM-CL photo in
Intended meaning: 'I put a photo in the wallet.'

(78)



5.2 Topicalization

The movement of NP_1 into the light verb to form a [*ba* NP] construction is similar to topicalization. Usually, topicalization is achieved by moving the topic to the beginning of the sentence. Since both processes involve a leftward movement of a topic, the movement of NP_1 into the light verb *ba* is termed as weak topicalization and the other process (i.e., moving topic to sentence-initial position) as strong topicalization. The goal of this section is to illustrate that besides weak topicalization, NP_1 can also move to sentence-initial position through strong topicalization, which results in the structures in (43f) and (43g) (rewritten as (79a) and (79b) here).

(79) a. $[NP_{1definite}\ S\ [VP]_V\ NP_2]$

b. $[NP_{1definite}\ S\ [V\ P\ NP_2]_V]$

As with (73a) and (73b), (79a) is different from (79b) in that the former involves a PI process while the latter involves a PPI process. Since the two processes have

been discussed in section 4, this section only focuses on the movement of NP_1 to sentence-initial position. Compared to (73a) and (73b), structures (79a) and (79b) exert one more constraint on NP_1; that is, NP_1 must be a definite expression.

(80) a. wo ba na-zhang zhao-pian fang zai le qian-bao-li.
I BA that-CL photo put in TAM wallet-inside
'I put that photo in my wallet.'

b. wo ba yi-zhang zhao-pian fang zai le qian-bao-li.
I BA NUM-CL photo put in TAM wallet-inside
'I put a photo in my wallet.'

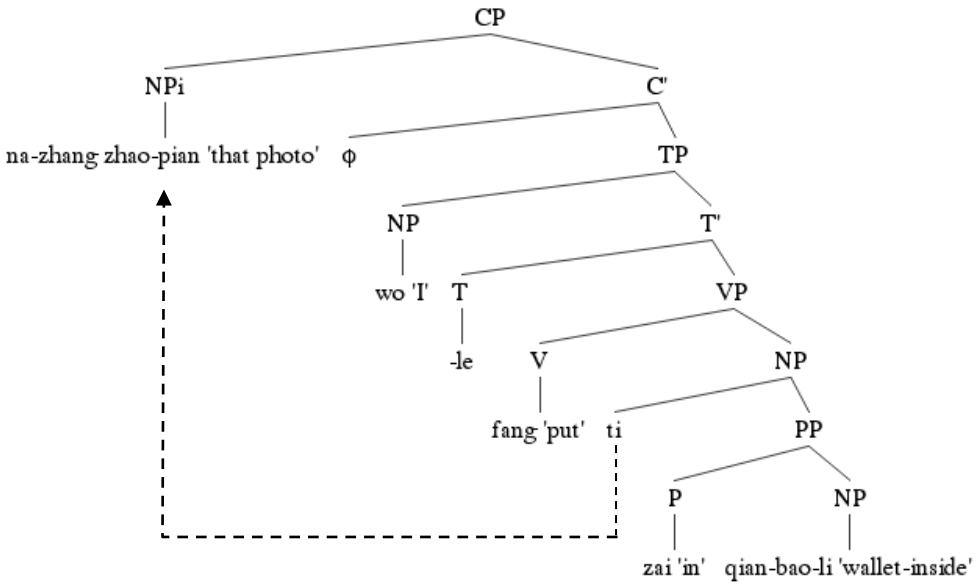
(81) a. na-zhang zhao-pian, wo fang zai le qian-bao-li.
that-CL photo I put in TAM wallet-inside
'That photo, I put it in my wallet.'

b. *yi-zhang zhao-pian, wo fang zai le qian-bao-li.
NUM-CL photo I put in TAM wallet-inside
Intended meaning: "I put a photo in my wallet.'

As shown in (80), the movement of NP_1 into the light verb *ba* is not influenced by the definiteness of the expression. However, an indefinite NP_1 would be banned from moving to sentence-initial position. This is considered as: (a) a natural result of the Given Before New Principle, which requires that given information precede new information; and (b) a need for discourse cohesion. To hold a text together, some grammatical as well as lexical devices need to be employed. With an anaphoric expression at the beginning of a sentence, the speaker and the hearer need to refer back to earlier in the text for proper interpretation. The semantic continuity of the text is hence ensured. Evidence for this constraint on strong topicalization has been found in languages other than Mandarin. For example, in Danish, topics must be given, in the sense that "they must appear in the preceding context, and … are identified by the context" (Erteschik-Shir, 2007, p. 8).

Strong topicalization is an ultimate application of the First Things First Principle, as the very first position in a sentence is the initial position. In the case of NP_1 movement, it is a direct object complement that moves to the pre-subject position, resulting in an [OSVC] order. That is to say, the strong topicalization process of NP_1 moves the phrase to a specifier position of C. In this sense, strong topicalization can be treated as a particular instance of A-bar movement (Cook & Newson, 2007; Radford, 2004). To illustrate this idea, the derivation of (81a) is demonstrated in (82). For the convenience of illustration, the PI/PPI process is not demonstrated in the tree structure.

(82) Derivation of (81a)



6 Prosody of $[VP]_V$ compounds

The analysis in Chapter 3 suggests that the phonological properties of $[VN]_V$/$[NV]_V$ compounds are derived in the syntax: the order of constituents is solved in the syntax; the binary foot effect is a result of the characteristics of incorporation/head movement; and the constraints on syllable deletion are syntax-based. Since a $[VP]_V$ compound is also derived through incorporation, a

reasonable expectation would be that its phonological form is also determined in the syntax. This section examines the phonological properties of $[VP]_V$ compound.

According to the discussion in Chapter 3, the order of constituents in a $[VN]_V$/$[NV]_V$ compound agrees with the order of constituents in its syntactic counterparts. The data in this chapter show that, syntactically, a verb precedes its PP complement (i.e., the order is [V PP]). When P incorporates into V, it does not left-adjoin to this higher head, but right-adjoins to the verb, forming a [VP] order. Therefore, a $[VP]_V$ compound is also consistent with its syntactic counterpart in word order. In other words, the word orders of the verbal compounds derived through incorporation ($[VN]_V$/$[NV]_V$ compounds and $[VP]_V$ compounds) systematically violate the Mirror Principle, which requires that morpheme order be the mirror image of the hierarchy of syntactic projections (Baker, 1985).

With regard to the binary foot effect, since all the prepositions in the post-verbal PPs are monosyllabic, a $[VP]_V$ compound would exhibit FTBIN if the possibility of V being a disyllabic word is excluded. In fact, there are $[VP]_V$ compounds with a disyllabic verb, as shown in (83).

(83) a. ta-de gong-zi [tiao-zheng dao] mei-yue yi-wan-kuai le.
his salary adjust to every-month $10,000 TAM
'His salary has been adjusted to $10,000 per month.'

b. kong-bu-fen-zi ba zha-dan [fang-zhi zai] le ta-de che-li.
terrorist BA bomb place in TAM his car
'The terrorist placed the bomb in his car.'

c. ta ba na-xie jiu [cun-fang zai] le jiu-jiao.
he BA those wine store in TAM cellar
'He stored those wines in the cellar.'

Examples in (83) seem to challenge the generalization that a verbal compound formed through incorporation bears a binary foot. There is one option to satisfy the FTBIN requirement, though. That is syllable deletion, a strategy that is employed to delete excess syllables of constituents in the process of incorporation. According to the discussion in Chapter 3, syllable deletion is not determined by phonological properties but by syntactic headedness. For example, the morpheme *zheng* in (84a) can be deleted from the $[VP]_V$ *tiao-zheng dao* ('adjust to') (based on the base-reduplicant relation between the two morphemes in the verb (see section 4.2.2 in Chapter 3)) so as to get a disyllabic $[VP]_V$ *tiao-dao* ('adjust to'). The same strategy also applies to (83b) and (83c), producing disyllabic $[VP]_V$ compounds, illustrated in (84):

(84) a. ta-de gong-zi [tiao dao] mei-yue yi-wan-kuai le.
his salary adjust to every-month $10,000 TAM
'His salary has been adjusted to $10,000 per month.'

b. kong-bu-fen-zi ba zha-dan [fang zai] le ta-de che-li.
terrorist BA bomb place in TAM his car
'The terrorist placed the bomb in his car.'

c. ta ba na-xie jiu [cun zai] le jiu-jiao.
he BA those wine store in TAM cellar
'He stored those wines in the cellar.'

The role of syllable deletion in the formation of a $[VP]_V$ compound is different from that in the $[VN]_V$ compound formation, though. As discussed in Chapter 3, syllable deletion is obligatory in the formation of $[VN]_V$ because it would otherwise result in an ungrammatical structure. In the case of $[VP]_V$ formation, however, syllable deletion is not an obligatory process since the trisyllabic $[VP]_V$ structures in (83) do not result in illegitimate expressions. The parallel $[VP]_V$ structures in (83) and (84) indicate that, unlike NI, a binary foot effect is not

produced in the process of PI. It should be something else that is influencing the $[VP]_V$ structure.

In fact, when P incorporates into a disyllabic verb, it undergoes tonal change, as shown in (85) and (86).

(85) dao ('to') Tone: 4

ta-de	gong-zi	[tiao-zheng	dao]	mei-yue	yi-wan-kuai	le.	Tone: 0
his	salary	adjust	to	every-month	$10,000	TAM	

'His salary has been adjusted to $10,000 per month.'

(86) zai ('at/in/on') Tone: 4

ta	ba	na-xie	jiu	[cun-fang	zai]	le	jiu-jiao.	Tone: 0
he	BA	those	wine	store	in	TAM	cellar	

'He stored those wines in the cellar.'

The examples in (85) and (86) suggest that in the formation of a PI construction, the presence of the disyllabic verb is accompanied by P undergoing tonal change from its citation tone to neutral tone. According to Huang (2012), neutral-toned syllables lack a phonological tonal specification in Mandarin. This indicates that a toneless syllable is metrically inert, and when it is parsed into a tonal foot, it does not count in the formation of binarity. Therefore, when there are three syllables in a $[VP]_V$ compound, it is tonal syllables that count in the computation of the binary foot. The implication of this fact is that in Mandarin, the binary foot of $[VP]_V$ compounds is tonal in nature (Leben, 1997, 2002, 2003). In other words, although the syntax permits trisyllabic $[VP]_V$ compounds formed through PI, a binary tonal foot requires the deletion of a tone so as to achieve an optimal prosodic structure, thus FTBIN >> MAXTONE, as illustrated in (87).

(87) Derivation of binary foot in a trisyllabic $[VP]_V$ compound

tiao-zheng-dao (adjust-to, 'adjust to')	FTBIN	MAXTONE
☞tiao-zheng-dao(T0)		*
tiao-zheng-dao(T4)	*	

To sum up, in the process of PI, when the verb is composed of two syllables, the syntax takes one of the following strategies: (a) determining the head or base of the verbal constituent based on which the excess syllable is deleted at PF, or (b) keeping all of the syllables of the constituents. When the second option is sent to PF for interpretation, the phonology comes into play and achieves FTBIN by deleting an excess tone. This is consistent with the inverted-Y model proposed by the Minimalist Program, which stipulates that syntax precedes phonology, and that syntactic information is sent to PF and LF of the grammar at Spell-Out. Thus, when the syntax generates a trisyllabic $[VP]_V$ compound and sends it to PF for interpretation, phonology comes into play and achieves the optimal prosodic property by producing a binary tonal foot.

7 Discussion: tonal foot

In linguistics, the notion foot is closely related to stress-languages, such as English. A typical foot consists of an alternation between strong and weak syllables (Hayes, 1995). The strong syllable is considered the head of the foot. In this sense, the presence of a foot implies the presence of stress/a head.

These notions have also been applied to Mandarin, indicating that Mandarin, like English, has a stress foot (Yip, 1980). Based on the relation between tone and stress, Yip (1980, 2004) argues that a foot, which is composed of a stressed syllable (i.e., full-toned syllable) and the unstressed syllables (i.e., toneless syllables) that follow it, is left-headed. Similar opinions are also proposed by Duanmu (2000) and Shih (1986). To Feng (1997), however, foot structures in

Mandarin words are right-headed. A third approach comes from Li (1981), who challenges the claim that a foot always has a head. He collected more than 30,000 disyllabic words, of which only about 2,000 had a clear stress (which is on the first syllable). Chen (2000) agrees with Li (1981) by proposing that Mandarin is a syllable-timed language, not a stress-timed language. If Chen (2000) and Li (1981) are correct, then the optimal foot in Mandarin word structure is headless in nature; namely, it is a metrical foot used for syllable counting, just as in Japanese (Poser, 1990).

According to the data examined in Chapter 3, both constituents of a $[VN]_V/[NV]_V$ compound surface in their citation tone (except for T3 Sandhi, see (90)), shown in (88) to (91) (the four tones are represented by T1, T2, T3, and T4).

(88) $[VN]_V/[NV]_V$ compounds beginning with T1

T1-T1	T1-T2	T1-T3	T1-T4
zhuang-xiang (pack-box)	chun-you (spring-travel)	guan-liao (officer-setttle)	xin-suan (heart-calculate)

(89) $[VN]_V/[NV]_V$ compounds beginning with T2

T2-T1	T2-T2	T2-T3	T2-T4
chou-sha (hatred-kill)	(xun-mo) (look for-mushroom)	chen-pao (morning-run)	cha-xu (tea-chat)

(90) $[VN]_V/[NV]_V$ compounds beginning with T3

T3-T1	T3-T2	T2-T3[20]	T3-T4
shou-shu (hand-write)	bi-tan (pen-talk)	shui-xi (water-wash)	wang-gou (net-buy)

[20] This tonal structure of *shui-x*i (water-wash, 'clean with water') is a result of T3 Sandhi, which means when a T3 syllable is followed by another T3 syllabe, the first syllable surfaces as T2 (M. Y. Chen, 2000).

(91) $[VN]_V$/$[NV]_V$ compounds beginning with T4

T4-T1	T4-T2	T4-T3	T4-T4
luo-biao (fall-fat)	lu-ji (road-hold a memorial ceremony)	jiao-xing (shout-wake)	ye-zhan (night-fight)

As shown in (88) to (91), when a noun incorporates into a verb forming a $[VN]_V$/$[NV]_V$ compound, both syllables are realized in their citation tone, except those containing two T3 syllables. According to T3 Sandhi, the tone of the first syllable changes to T2. In other words, $[VN]_V$/$[NV]_V$ compounds are realized with full tones. The tonal structure of $[VN]_V$/$[NV]_V$ compounds challenges the claims that feet are left- or right-headed in Mandarin.

However, trisyllabic $[VP]_V$ compounds discussed in this chapter exhibit different prosodic properties. With its citation tone changed to the neutral tone, the preposition in a $[VP]_V$ compound is metrically inert and does not count in the formation of foot binarity (K. Huang, 2012). That is to say, when there are three syllables in a $[VP]_V$ compound, it is tonal syllables that count in the computation of the binary foot. Therefore, the existence of trisyllabic $[VP]_V$ compounds argues strongly for feet in Mandarin being tonal in nature. In other words, the optimal foot in Mandarin word structure is tonal and syllable based.

8 Conclusion

Post-verbal PP complements in Mandarin exhibit unique syntactic as well as phonological behaviors. When there is only one PP complement in post-verbal position, movement is obligatory. It can be either P incorporating into V through head movement, forming a $[VP]_V$ compound; or PP incorporating into V through phrasal movement, forming a verbal phrase. The motivations for PI and PPI in these cases are different: PI is semantically motivated (information structure)

whereas PPI is syntactically motivated. When it is linked to the analysis in Chapter 3, a possible generalization might be achieved; that is, head movement is motivated by discourse-related information whereas phrasal movement is triggered by syntactic feature.

When a verb is followed by both a PP complement and a direct object complement, not only does P or PP undergo head movement or phrasal movement to form a PI or a PPI construction, but also the theme object NP_1 may move to different positions in the sentence for semantic considerations. Besides the Given Before New Principle, another information-based principle is also proposed to be the motivation of NP_1 movement. The movement of the theme object NP_1 discussed in this chapter is different from those discussed in Chapter 3. In Chapter 3, it is either the head N of NP that incorporates into V forming a $[VN]_V$ compound or the NP itself moves to V forming a larger phrasal predicate. In the [V NP_1 PP] structure, however, NP_1 moves to every position in the sentence (sentence-initial, pre-verbal, and post-PP/sentence-final positions) except the predicate.

The definiteness condition on either NP_1 or NP_2 when they are present in particular positions in a sentence is another piece of evidence for the influence of information structure on movement.

As a function word, the incorporation of P or PP demonstrates some characteristics that are exclusive to the PI and PPI constructions. First, P in a PPI construction might be deleted. This property proves from another perspective that the formation of the PPI constructions involves phrasal movement. Second, the production of trisyllabic $[VP]_V$ compounds is possible, yet FTBIN is still satisfied in the sense that P undergoes tonal change in PF and an optimal tonal foot is derived.

Chapter 5 Double object constructions in Mandarin

1 Introduction

The properties of incorporation and pseudo incorporation were closely examined in Chapters 3 and 4. The analyses in the two chapters reveal that incorporation generates word structures while pseudo incorporation produces syntactic structures. This chapter focuses on double object constructions (DOCs). It is hoped that a thorough analysis of these structures can reveal the properties of another type of verbal compound in Mandarin—$[VV]_V$ compounds derived through verb incorporation. This chapter is organized as follows. In order to get a full generalization of double object constructions in Mandarin, a literature review is carried out in section 2, based on which genuine DOCs and pseudo DOCs are distinguished from each other. A grammatical definition of Mandarin DOCs is provided at the end of the section. In accordance with the classification in section 2, section 3 examines the properties of genuine DOCs in Mandarin, based on which a summary of possible DOC structures is provided and the research questions of the chapter are raised. Due to the number of possible structural types of DOCs, diachronic evidence is checked in section 4 so as to uncover the order of appearance of these structures. Based on the diachronic evidence, the derivational processes of various DOC structures are examined and the formation of $[V\ gei]_V$ compounds is discussed. Section 5 examines the prosodic properties of $[V\ gei]_V$ compounds. This section demonstrates that different strategies are adopted so as to satisfy the FTBIN constraint. Section 6 concludes the chapter.

2 Definition and classification

The literature suggests that three issues in Mandarin DOCs remain to be resolved. They are the definition, the classification, and the formation process (J. Sun, 2006;

Yan, 2002; W. Zhang, 2013). This section aims to address the first two issues by closely examining the [V NP NP] structure in Mandarin, which is identified in the literature as the grammatical structure of DOCs (C. N. Li & Thompson, 1981; Y.-h. Li, 1990). In section 2.1, three sub-structures of DOCs are closely examined: naming structures, source-oriented structures, and goal-oriented structures. The first two structures are classified in section 2.2 as pseudo DOCs while the third type of structure, namely goal-oriented, is categorized as comprising of genuine DOCs. Based on this classification, a grammatical definition of DOCs in Mandarin is provided at the end of this section.

2.1 Classification of DOCs

The literature suggests that, in research on Mandarin DOCs, there exists a tendency to maximize their boundary (See Y. R. Chao, 1968; Lü, 1942; Ma, 2002; Zhu, 1982). Under the influence of this tendency, almost all [V NP NP] structures in Mandarin are placed in the DOC category. For example,

(1) a. wo feng ta dai-ba-wang.
I name him dumb-bully
'I call him the dumb bully.'

b. wo kua ta hao-hai-zi.
I praise him good-child
'I praise him as a good boy.'

c. wo chi xiao-wang yi-ge tao.
I eat Mr. Wang NUM-CL peach
'I ate one of Mr. Wang's peaches.'

d. wo mai ta yi-ben shu.
I buy him NUM-CL book
'I bought a book from him.'

e. wo song gei[21] ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

f. wo reng gei ta yi-ge qiu.
I throw to/give him NUM-CL ball
'I threw him a ball.'

All of the examples in (1) are treated as DOCs in the literature because they share the structure [V NP NP] (Y.-h. Li, 1990; Ma, 2002). The first NP, which immediately follows the verb, is labeled NP_2 because it is usually considered the indirect object of the verb. In this manner, *xiao-wang* ('Mr Wang') in (1c) and *ta* ('him') in (1a), (1b), and (1d) to (1f) are all NP_2 as they all serve as the indirect objects. The second NP (i.e., *dai-ba-wang* ('dumb bully'), *hao-hai-zi* ('good child'), *yi-ge-tao* ('an apple'), *yi-ben-shu* ('a book'), and *yi-ge-qiu* ('a ball') in (1a) to (1f), respectively) are labeled as NP_1 because they are the direct objects. The examples in (1) represent three categories of DOCs identified in the literature: naming structures ((1a) and (1b)), source-oriented structures ((1c) and (1d)), and goal-oriented structures ((1e) and (1f)).

2.1.1 Naming structures

The examples in (1a) and (1b) represent naming structures, in which NP_1 renames NP_2 or indicates what NP_2 has become (Ma, 2002; Zhu, 1982). In this manner, *dai-ba-wang* ('dumb-bully') is a name for *ta* ('him') in (1a), and *hao-hai-zi* ('good-child') for *ta* ('him') in (1b). NP_1 in the two sentences is employed to identify NP_2. More characteristics of naming structures can be found with a closer look at the sentences in (2) and (3). First, as shown in (2b), (2c), (3b), and (3c), though a naming structure permits the insertion of tense and aspect marker *le*

[21] The literature debates whether *gei* (to/give) is a preposition or a verb here. This issue will be discussed in section 3.1.2.

between V and NP_2, it does not allow *le* to be inserted between NP_2 and NP_1 (i.e., after [V NP_2]). Since *le* was introduced in Chapter 2 as a diagnostic for wordhood in Mandarin, this property of naming structures indicates that V and NP_2 do not form a compound.

(2) a. wo feng ta dai-ba-wang.
I name him dumb-bully
'I call him the dumb bully.'

b. wo feng le ta dai-ba-wang.
I name TAM him dumb-bully
'I call him the dumb bully.'

c. *wo feng ta le dai-ba-wang.
I name him TAM dumb-bully
'I call him the dumb bully.

d. *wo feng ta.
I name him

e. *wo feng dai-ba-wang[22].
I name dumb-bully

(3) a. wo kua ta hao-hai-zi.
I praise him good-child
'I praise him as a good boy.'

b. wo kua le ta hao-hai-zi.
I praise TAM him good-child
'I praised him as a good boy.'

c. *wo kua ta le hao-hai-zi.
I praise him TAM good-child

[22] This sentence is legitimate when understood in another way: 'I claim to be a dumb-bully'.

d. ?wo kua ta.
I praise him

e. *wo kua hao-hai-zi[23].
I praise good-child

Second, as illustrated by (2d), (2e), (3d), and (3e), it is unclear whether both NPs are complements of the verb. There is no doubt that NP_2 in each of the two sentences is the verb's complement, because the presence of NP_2 completes the meaning of the verb. But unlike NP_2, NP_1 in each of the two examples completes the meaning of the indirect object NP_2 by renaming it. Therefore, although both NPs are complements, they are the complements of different elements in the sentences. NP_2 is the complement of V, and NP_1 is the complement of NP_2. Given this, it would be unreasonable to treat NP_1 as the direct object of V. It would also be unreasonable to treat naming structure as a DOC since there are not two objects of the verb in this type of structure.

2.1.2 Source-oriented structures

The examples in (1c) and (1d) represent source-oriented structures. Like naming structures, source-oriented structures exhibit some distinctive properties. First, as illustrated by (4b) and (5b), inserting the tense and aspect marker *le* between V and NP_2 does not affect the grammaticality of the sentences, which indicates that V and NP_2 do not form a compound.

(4) a. wo chi xiao-wang yi-ge tao.
I eat Mr Wang NUM-CL peach
'I ate one of his peaches.'

[23] Like (2e), (3e) would be a grammatical sentence if interpreted as 'I praised a good child.'

b. wo chi le xiao-wang yi-ge tao.
I eat TAM Mr Wang NUM-CL peach
'I ate one of his peaches.'

(5) a. wo mai ta yi-ben shu.
I buy him NUM-CL book
'I bought a book from him.'

b. wo mai le ta yi-ben shu.
I buy TAM him NUM-CL book
'I bought a book from him.'

Second, NP_2 in source-oriented structures is the source or the location from/at which NP_1 is transferred to the agent (Y.-h. Li, 1990; Ma, 2002; Zhu, 1982). As illustrated by (6) and (7), (6a) and (7a) can be rewritten with either a preposition phrase ((6b) and (6c)) or a possessive phrase ((7b) and (7c)) to indicate this function of NP_2.

In (6b), sentence (6a) is re-produced with a prepositional phrase *zai xiao-wang na-er* ('at Mr Wang's place') consisting of a location preposition *zai* ('at') and NP_2 *xiao-wang* ('Mr Wang'). In (7b), sentence (7a) is re-produced with a prepositional phrase *cong ta na-er* ('from him') which is composed of a source preposition *cong* ('from') and NP_2 *ta* ('him'). In (6c), the possessive phrase *xiao-wang de yi ge tao* ('one of Mr Wang's peaches') indicates that NP_2 is the owner of NP_1 and hence the source. The same situation is shown in (7c).

(6) a. wo chi xiao-wang yi-ge tao.
I eat Mr Wang NUM-CL peach
'I ate one of his peaches.'

b. wo zai xiao-wang na-er chi yi-ge tao.
I at Mr Wang there eat NUM-CL peach
'I ate a peach at Mr Wang's place.'

c. wo chi xiao-wang de yi-ge tao.
I eat Mr Wang POSS NUM-CL peach
'I ate one of his peaches.'

(7) a. wo mai ta yi-ben shu.
I buy him NUM-CL book
'I bought a book from him.'

b. wo cong ta na-er mai yi-ben shu.
I from him there buy NUM-CL book.
'I bought a book from him.'

c. wo mai ta de yi-ben shu.
I bought him POSS NUM-CL book
'I bought a book from him.'

It should be noted that not just any source-oriented structure can be re-produced in both ways (i.e., with a prepositional phrase and a possessive phrase). Though many can be re-produced in two ways (as shown in (6) to (11)), some can only be re-produced in one. In (12) and (13), only the possessive phrase is acceptable; the re-production with a prepositional phrase results in ungrammaticality.

(8) a. wo mai le ta yi-zhi ji.
I buy TAM him NUM-CL chicken
'I bought a chicken from him.'

b. wo cong ta na-er mai le yi-zhi ji.
I from him there buy TAM NUM-CL chicken
'I bought a chicken from him.'

c. wo mai le ta de yi-zhi ji.
I buy TAM him POSS NUM-CL chicken
'I bought a chicken from him.'

(9) a. wo ying le ta liang-kuai qian.
I win TAM him NUM-CL money
'I won two dollars from him.'

b. wo cong ta na-er ying le liang-kuai qian.
I from him there win TAM NUM-CL money
'I won two dollars from him.'

c. wo ying le ta de liang-kuai qian.
I win TAM him POSS NUM-CL money
'I won two dollars from him.'

(10) a. wo tou le ta liang-kuai qian.
I steal TAM him NUM-CL money
'I stole two dollars from him.

b. wo cong ta na-er tou le liang-kuai qian
I from him there steal TAM NUM-CL money
'I stole two dollars from him.'

c. wo tou le ta de liang-kuai qian.
I steal TAM him POSS NUM-CL money
'I stole two dollars from him.'

(11) a. wo na le ta san-ge ji-dan.
I take TAM him NUM-CL egg
'I took three eggs from him.'

b. wo cong ta na-er na le san-ge ji-dan.
I from him there take TAM NUM-CL egg
'I took three eggs from him.'

c. wo na le ta de san-ge ji-dan.
I take TAM him POSS NUM-CL egg
'I took three eggs from him.'

(12) a. wo hua le ta liang-kuai qian.
I spend TAM him NUM-CL money
'I spent two of his dollars.'

b. wo hua le ta de liang-kuai qian.
I spend TAM him POSS NUM-CL money
'I spent two of his dollars.'

*c. wo cong ta na-er hua le liang-kuai qian.
I from him there spend TAM NUM-CL money

(13) a. wo chuan le ta yi-jian yi-fu.
I wear TAM him NUM-CL coat
'I wore his coat.'

b. wo chuan le ta de yi-jian yi-fu.
I wear TAM him POSS NUM-CL coat
'I wore his coat.'

c. *wo cong ta na-er chuan le yi-jian yi-fu.
I from him there wear TAM NUM-CL coat

The fact that some source-oriented structures can only be re-expressed with a possessive phrase does not have a major impact on their main properties, as either a possessive phrase or a prepositional phrase leads to the same conclusion. The prepositional phrase helps determine the role of NP_2 in the source-oriented structure. The examples in (14c) and (15c) show that placing the PP in post-verbal position is unacceptable. According to the discussion in Chapter 4, although the position of a PP in a sentence is quite flexible, only a complement PP can appear in post-verbal position; an adjunct PP cannot. Therefore, it can be concluded that NP_2 in a source-oriented structure is the verb's adjunct and can be freely removed (illustrated by (14d) and (15d)). In contrast to NP_2, NP_1 is the verb's complement and is, therefore, not removable, as shown in (14e) and (15e), where the deletion of NP_1 results in ungrammaticality.

(14) a. wo chi xiao-wang yi-ge tao.
I eat Mr Wang NUM-CL peach
'I ate one of his peaches.'

b. wo zai xiao-wang na-er chi yi-ge tao.
I at Mr Wang there eat NUM-CL peach
'I ate a peach at Mr Wang's place.'

c. *wo chi zai xiao-wang na-er yi-ge tao.
I eat at Mr Wang there NUM-CL peach

d. wo chi yi-ge tao.
I eat NUM-CL peach
'I ate a peach.'

e. *wo chi xiao-wang[24].
I eat Mr Wang

(15) a. wo mai ta yi-ben shu.
I buy him NUM-CL book
'I bought a book from him.'

b. wo cong ta na-er mai yi-ben shu.
I from him there buy NUM-CL book.
'I bought a book from him.'

c. wo mai ta de yi-ben shu.
I bought him POSS NUM-CL book
'I bought a book from him.'

d. wo mai yi-ben shu.
I buy NUM-CL book
'I bought a book.'

e. *wo mai ta[25].
I buy him

For source-oriented expressions like (12) and (13), which can only be re-produced with a possessive phrase, the same conclusion can be reached. In a possessive phrase [NP_2 *de* NP_1] ('NP_2's NP_1' or 'NP_1 of NP_2'), NP_1 is the head and cannot be deleted; however, the possessor NP_2 can be seen as a modifier and is removable.

[24] This sentence would be acceptable if the speaker does eat another person, which in normal situations is unlikely to happen.

[25] Another case which is unlikely to happen in a civilised world.

Therefore, deleting NP_2 in (12b) and (13b) (re-presented as (16a) and (17a)) results in acceptable expressions (16b) and (17b). The removability of NP_2 indicates that it is not a complement of the verb but an adjunct. That is to say, although surfacing with a [V NP NP] structure, there are not two objects of the verb in source-oriented structures, and it is, therefore, unreasonable to categorize a source-oriented structure as a double object construction.

(16) a. wo hua le ta de liang-kuai qian.
I spend TAM him POSS NUM-CL money
'I spent two of his dollars.'

b. wo hua le liang-kuai qian.
I spend TAM NUM-CL money
'I spent two dollars.'

(17) a. wo chuan le ta de yi-jian yi-fu.
I wear TAM him POSS NUM-CL coat
'I wore his coat.'

b. wo chuan le yi-jian yi-fu.
I wear TAM NUM-CL coat
'I wore a coat.'

2.1.3 Goal-oriented structures

The sentences (1e) and (1f) represent goal-oriented structures. In contrast to a source-oriented structure in which NP_2 refers to the source from which NP_1 is transferred to the agent, NP_2 in a goal-oriented structure denotes the recipient of the direct object NP_1, and therefore comes to be the possessor of NP_1 (Kayne, 1984; Y.-h. Li, 1990; Ma, 2002; Zhu, 1982). Thus, in (18a), NP_2 *ta* ('him') is the receiver of NP_1 *yi ben shu* ('a book'); and in (19a), NP_2 *ta* ('him') is the receiver of NP_1 *yi ge qiu* ('a ball').

(18) a. wo song gei ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

b. * wo song gei ta.
I send to/give him

c. * wo song gei yi-ben shu.
I send to/give NUM-CL book

(19) a. wo reng gei ta yi-ge qiu.
I throw to/give him NUM-CL ball
'I threw him a ball.'

b. *wo reng gei ta.
I threw to/give him

c. *wo reng gei yi-ge qiu.
I throw to/give NUM-CL ball

Most of the characteristics of goal-oriented structures are to be discussed in section 3. Here, the discussion just focuses on one property that differentiates goal-oriented structures from naming structures and source-oriented structures. According to the discussion in sections 2.1.1 and 2.1.2, in naming structures and source-oriented structures, the verb has only one complement (i.e., NP_1), whereas in goal-oriented structures, both NP_2 and NP_1 function as the verb's complements and cannot be deleted. As illustrated by (18b) and (18c), the deletion of either NP_2 *ta* ('him') or NP_1 *yi ben shu* ('a book') produces an ungrammatical structure. The same problem also arises in (19b) and (19c). Therefore, in a goal-oriented structure, both NP_2 and NP_1 are the verb's complements, with NP_1 as its direct object and NP_2 as its indirect object. A goal-oriented structure in Mandarin is a DOC.

2.2 DOCs and pseudo DOCs in Mandarin

On the basis of the previous section, this section summarizes the properties of the three [V NP NP] structures in Mandarin.

Naming structures exhibit three main properties. First, in a naming structure, NP_1 identifies NP_2. Next, while naming structures permit the insertion of the tense and aspect marker *le* in between V and NP_2, it does not allow *le* to appear between NP_2 and NP_1 (i.e., after [V NP_2]). The implication is that V and NP_2 do not form a compound, but constitute a phrase. Third, NP_1 in a naming structure is not the verb's complement but rather NP_2's complement. The verb has only one complement: NP_2. This suggests that there is only one object in a naming structure. Therefore, naming structures in Mandarin should not be categorized as comprising of DOCs.

Source-oriented structures in Mandarin exhibit three distinctive properties. First, a source-oriented structure can also be re-presented in a sentence with either a prepositional phrase or a possessive phrase, which demonstrates that NP_2 is the source or the location from/at which NP_1 is transferred to the agent. Next, a source-oriented structure permits the insertion of *le* between V and NP_2. This suggests that V and NP_2 in source-oriented structures do not form a compound. Third, although NP_1 in a source-oriented structure is the verb's complement, its object, NP_2, is an adjunct and can be freely deleted. This indicates that there is only one object in source-oriented structures and this structure should not be categorized as belonging to the DOC.

Two properties of goal-oriented structures were discussed in section 2.1.3. First, a goal-oriented structure denotes an event in which NP_1 is transferred from the agent to NP_2. Second, both NP_2 and NP_1 are the verb's complements and cannot

be deleted. This means that there are two objects and a goal-oriented structure is, therefore, a double object construction.

Therefore, although all of the examples in (1) are categorized as DOCs in the literature, they exhibit very different grammatical properties. While a goal-oriented structure has two objects and hence counts as a double object construction, a naming structure and a source-oriented structure have only one object each and should not be treated as double object constructions. Given the discussion above, naming structures and source-oriented structures are treated as pseudo DOCs in this thesis, while goal-oriented structures are treated as genuine DOCs. A grammatical definition based on the behavior of DOCs in Mandarin can be summarized as follows: a DOC in Mandarin is **a [V NP NP] construction, in which V is followed by two NPs functioning as its complements**.

3 DOCs in Mandarin

So far, two characteristics of DOCs in Mandarin have been discussed: (a) both NP_2 and NP_1 serve as V's complements, and (b) NP_2 refers to the recipient of the direct object NP_1. Besides those two characteristics, DOCs in Mandarin also exhibit other properties. Some characteristics are closely related to *gei* ('give/to'), a constituent of the predicate. For example, *gei* ('give/to') is obligatory in some cases but optional in others. Moreover, in Chapter 4, it was mentioned that *gei* ('give/to') is distinguishable from other prepositions because this word can also function as a verb. Thus, the predicate of DOCs can be [V gei_V] or [V gei_P]. One related question would then be whether [V $gei_{V/P}$] is a compound or a phrase. All of these properties are examined in section 3.1. This section also discusses the relation between DOCs and dative constructions (DCs). Based on the discussion in section 3.1, the research questions of this chapter are put forward in section 3.2.

3.1 Properties of DOCs in Mandarin

3.1.1 Is *gei* ('to/give') obligatory or optional?

In examples (20a) and (21a), one may notice the presence of the word *gei* ('to/give') in the two sentences.

(20) a. wo song gei ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

b. wo song ta yi-ben shu.
I give him NUM-CL book
'I gave him a book.'

(21) a. wo reng gei ta yi-ge qiu.
I throw to/give him NUM-CL ball
'I threw him a ball.'

b. *wo reng ta yi-ge qiu.
I throw him NUM CL ball
'I threw him a ball.'

The presence of the word *gei* ('to/give') in these examples provides another piece of evidence to distinguish DOCs from pseudo DOCs. Sentences (22) and (23) are examples of pseudo DOCs. Inserting the word *gei* ('to/give') into any of them results in ungrammaticality. This explains why pseudo DOCs are also called *gei*-forbidden DOCs by Li and Thompson (1981).

(22) Source-oriented pseudo DOC

a. wo qiang le ta liang-wan-kuai qian.
I rob TAM him NUM-CL money
'I robbed him of $20,000.'

b. *wo qiang gei ta liang-wan-kuai qian.
I rob give/to him NUM-CL money

(23) Naming pseudo DOC

a. wo han ta ge-ge.
I call him older brother
'I call him older brother.'

b. *wo han gei ta ge-ge.
I call to/give him older brother

One word stands out in Li and Thompson's *gei*-forbbiden DOCs—the verb *gei* ('give') itself. In this thesis, the verb *gei* ('give') is considered a typical verb employed in DOCs (see (24a)). However, as shown in (24b), when the verb in a DOC is *gei* ('give'), it does not allow another *gei* to follow it. It is assumed that (24a) represents a DOC type in Mandarin: [gei_V NP_2 NP_1].

(24) a. wo gei ta yi-ben shu.
I give him NUM-CL book
'I gave him a book.'

b. *wo gei gei ta yi-ben shu.
I give to/give him NUM-CL book

One may have noticed that the deletion of *gei* in (20b) and (21b) have different impacts on the acceptability of the sentences. When *gei* in (20b) is deleted, the verb *song* ('send') itself serves as the predicate of the clause and the sentence is still acceptable. However, the deletion of *gei* results in an illegitimate structure in (21b). It seems that the verb *reng* ('throw') itself cannot function as a predicate in a DOC.

The contrast between (20b) and (21b) suggests the existence of two other types of Mandarin DOC structures. In the first type, *gei* ('to/give') is an obligatory part of the predicate; while in the other, *gei* is optional:

(25) a. [[V (*gei*)]$_V$ NP_2 NP_1]

b. [[V *gei*]$_V$ NP_2 NP_1]

According to Li and Thompson (1981), in a DOC, if the predicate contains a verb such as *tui* ('push'), *ti* ('kick'), *zu* ('rent'), or *ban* ('move'), the word *gei* would be an obligatory part of the predicate; but if the predicate contains a verb such as *huan* ('return'), *fu* ('pay'), *jie* ('lend'), or *pei* ('compensate'), the presence of *gei* in the predicate is optional. The sentences in (26) to (28) illustrate the situation when *gei* is obligatory. It can be seen that the first verbal part cannot function as the predicate itself if *gei* is removed. In (29) to (31), however, *gei* is optional and the deletion of *gei* does not affect the grammaticality of the sentence.

(26) a. ta dai gei Zhang-san yi-bao tang.
He bring give/to Zhang-san NUM-CL candy
'He brought a bag of candy to Zhangsan.'

b. *ta dai Zhang-san yi-bao tang.
He bring Zhang-san NUM-CL candy

(27) a. wo shu gei ta yi-kuai qian.
I lose give/to him NUM-CL money
'I lost one dollar to him.'

b. *wo shu ta yi-kuai qian.
I lose him NUM-CL money

(28) a. wo ban gei ta yi-ge zhuo-zi.
I move give/to him NUM-CL table
'I moved a table over to him.'

b. *wo ban ta yi-ge zhuo-zi.
I move him NUM-CL table

(29) a. ta huan gei ni yi-wan rou.
he return give/to you NUM-CL meat
'He returned a bowl of meat to you.'

b. ta huan ni yi-wan rou.
he return you NUM-CL meat
'He returned a bowl of meat to you.'

(30) a. wo fu gei ta liang-bai-kuai qian.
I pay give/to him NUM-CL money
'I paid $200 to him.'

b. wo fu ta liang-bai-kuai qian.
I pay him NUM-CL money
'I paid $200 to him.'

(31) a. wo jie gei ta yi-liang yin-zi.
I lend give/to him NUM-CL silver
'I lend one ounce of silver to him.'

b. wo jie ta yi-liang yin-zi.
I lend him NUM-CL silver
'I lend one ounce of silver to him.'

The present study is inspired by Li and Thompson's (1981) classification of constituent V in DOCs. It will be shown in section 4.4 that the transitivity of V is closely related to presence-or-not of *gei* ('to/give').

3.1.2 Is *gei* ('to/give') a verb or a preposition?

The previous section identifies three types of DOCs in Mandarin:

(32) a. [gei_V NP_2 NP_1]

b. [V (*gei*) NP_2 NP_1][26]

c. [V *gei* NP_2 NP_1]

[26] The parentheses mean that *gei* is optional at the post-verbal position.

As indicated by (32a), there is no doubt that the word *gei* ('give') in the first type is a verb. Then what about the word *gei* ('to/give') in (32b) and (32c)? Is it a verb in those instances as well? Actually, there is substantial debate on the status of *gei* in DCs and DOCs in Mandarin. To Li (1990), Huang and Ahren (1999), and Huang (2009), *gei* is a verb in these constructions, but to Zhang (1990), Shi (2002), Liu (2005), and Li and Shi (2015), the post-verbal *gei* should be a preposition, which is derived from the verb *gei* ('give') through grammaticalization. If the latter is the case, is it possible that *gei* in (32b) and (32c) is a preposition? With the possibility of *gei* in (32b) and (32c) being a verb or a preposition, five possible structures of the DOCs in Mandarin can be summarized:

(33) a. [gei_V NP_2 NP_1]

b. [V (gei_V) NP_2 NP_1]

c. [V (gei_P) NP_2 NP_1]

d. [V gei_V NP_2 NP_1]

e. [V gei_P NP_2 NP_1]

Structure (33a) represents a type of DOC in Mandarin, in which the verb *gei* ('give') itself functions as the predicate. This structure does not permit another *gei* to appear post-verbally. As for the DOC expressions where *gei* is optional, they can be represented by structure (33b) if *gei* is a verb or structure (33c) if it is a preposition. Structures (33d) and (33e) represent the DOC expressions that require *gei* to appear post-verbally.

3.1.3 Is the predicate in the DOCs a V or a VP?

As shown by the three structures in (32), the predicate in (32a) consists of only one element, the verb *gei* ('give'), and the predicates in (32b) and (32c) can be or

are composed of two elements, a V and/or the word *gei*. One immediate question can be raised. Is the predicate [V *gei*]$_V$ a verbal compound or a verbal phrase? According to the discussion in Chapter 2, this question can be answered with the insertion of the tense and aspect marker *le*.

(34)a. wo song gei ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

b.* wo song le gei ta yi-ben shu.
I send TAM to/give him NUM-CL book

c. wo song gei le ta yi-ben shu.
I send to/give TAM him NUM-CL book
'I gave him a book.'

d. wo song gei ta le yi-ben shu.
I send to/give him TAM NUM-CL book
'I gave him a book.'

(35)a. wo reng gei ta yi-ge qiu.
I threw to/give him NUM-CL ball
'I threw him a ball.'

b. *wo reng le gei ta yi-ge qiu.
I threw TAM to/give him NUM-CL ball

c. wo reng gei le ta yi-ge qiu.
I throw to/give TAM him NUM-CL ball
'I threw him a ball.'

d. wo reng gei ta le yi-ge qiu.
I throw to/give him TAM NUM-CL ball
'I threw him a ball.'

As can be seen from (34) and (35), the insertion of *le* in between V (*song* ('send') in (34a) and *reng* ('throw') in (35a)) and *gei* ('to/give') results in

ungrammaticality (shown in (34b) and (35b)). In (34c) and (35c), *le* is placed in post-*gei* position, and the two sentences are acceptable. This suggests that V and *gei* together form a "single referential unit" (Lieber, 2004, p. 10) that does not allow any syntactic manipulation of its constituents. In other words, like the $[VN]_V/[NV]_V$ compounds discussed in Chapter 3 and the $[VP]_V$ compounds discussed in Chapter 4, the predicate $[V\ gei]_V$ in (34a) and (35a) is a compound, not a phrase.

When *le* is inserted in between NP_2 and NP_1, the result is still acceptable, as shown in (34d) and (35d). This, however, does not indicate a further step of compounding. According to the Lexical Integrity Hypothesis, a compound only permits modification of the word as a whole; any modification of its individual constituent elements is unacceptable. That is to say, if $[V\ gei]_V$ and NP_2 form a compound, it would not allow a modifier to be inserted to modify NP_2. However, as illustrated by (36b) and (37b), the insertion of the adjective *pang-pang-de* ('fat') into each DOC does not result in ungrammaticality, indicating that $[V\ gei]_V$ and NP_2 do not form a compound. Instead, they form a verbal phrase in which NP_2 can be freely modified.

(36) a. wo song gei ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

b. wo song gei pang-pang-de ta yi-ben shu.
I send to/give fat him NUM-CL book
'I gave the fat man a book.'

c. wo song gei le ta yi-ben shu.
I send to/give TAM him NUM-CL book
'I gave him a book.'

d. wo song gei ta le yi-ben shu.
I send to/give him TAM NUM-CL book
'I have given him a book.'

(37)a. wo reng gei ta yi-ge qiu.
I threw to/give him NUM-CL ball
'I threw him a ball.'

b. wo reng gei pang-pang-de ta yi-ge qiu.
I threw to/give fat him NUM-CL ball
'I threw him (the fat guy) a ball.'

c. wo reng gei le ta yi-ge qiu.
I threw to/give TAM him NUM-CL ball
'I threw him a ball.'

d. wo reng gei ta le yi-ge qiu.
I threw to/give him TAM NUM-CL ball
'I have thrown him a ball.'

At this point, it is relevant to question whether the different positions of *le* have any impact on the interpretation of the sentence. According to the discussion in Chapter 1, the form [V *le*] has the function of placing an event in past time and is therefore interpreted as simple past; while form [V NP *le*] has an interpretation of present perfect. Thus, (36c) and (37c) are interpreted as simple past and (36d) and (37d) are interpreted as present perfect.

3.1.4 DOCs and dative constructions (DCs)

In the following examples, (38a) and (39a) are DOCs, and (38b) and (39b) are termed dative structures or constructions (DCs) in the literature (Larson, 1988).

(38)a. wo song gei ta yi-ben shu.
I send to/give him NUM-CL book
'I gave him a book.'

b. wo song yi-ben shu gei ta.
I send NUM-CL book to/give him
'I gave him a book.'

(39) a. wo reng gei ta yi-ge qiu.
I throw to/give him NUM-CL ball
'I threw him a ball.'

b. wo reng yi-ge qiu gei ta.
I throw NUM-CL ball to/give him
'I threw him a ball.'

Researchers agree that there is an asymmetrical command relation between NP_1 and NP_2 in both constructions, and they also agree that DOCs and dative constructions are structurally related (e.g., Aoun & Li, 1989; Bruening, 2001; Hale & Keyser, 2002; Larson, 1988; Marantz, 1993). However, there is substantial debate among researchers on how the two constructions are related. Some hold that DOCs are derived from DCs (e.g., Gu, 1998; Hale & Keyser, 2002; Larson, 1988). Others propose that DCs are derived from DOCs (e.g., Aoun & Li, 1989).

3.2 Summary and questions

Based on the discussion in the previous section, this section summarizes the properties of DOCs in Mandarin.

First, besides the two properties discussed in section 2 (i.e., both NPs function as the verb's complements, and NP_2 is the recipient of the direct object NP_1), the third property that distinguishes DOCs from pseudo DOCs is the presence of *gei* ('to/give') in DOCs. While the word *gei* is banned from pseudo DOCs, it is obligatory in some DOCs and optional in others. A special type of DOCs directly takes *gei* as the predicate: [gei_V NP_2 NP_1]. Structure [[V (*gei*)]$_V$ NP_2 NP_1] represents the DOCs in which the word *gei* is optional, and structure [[V *gei*]$_V$ NP_2 NP_1] stands for the DOCs in which the word *gei* is obligatory.

Second, while there is no doubt that *gei* is a verb meaning 'to give' in the structure [gei_V NP_2 NP_1], no firm conclusion has been drawn in the literature about the grammatical category of *gei* in the other two structures. Some take it as a verb (e.g., C.-R. Huang & Ahrens, 1999; Y.-h. Li, 1990); some hold that it is a preposition equivalent to the preposition *to* in English (e.g., S. Zhang, 1990). Thus, each type has two possible structures: [[V (gei_V)]$_V$ NP_2 NP_1], [[V (gei_P)]$_V$ NP_2 NP_1], [[V gei_V]$_V$ NP_2 NP_1] and [[V gei_P]$_V$ NP_2 NP_1].

Third, the tense and aspect marker *le* cannot be inserted between V and *gei* in a DOC, but it can be placed in post-*gei* position. The indication is that the predicate [V *gei*]$_V$ in DOCs is a compound, not a phrase. Although *le* can also be inserted in post-NP_2 position, since a modifier is allowed to precede NP_2, the possibility of taking [V *gei* NP_2] as a compound is excluded. The ordering [V *gei le*] forms a past simple while [V *gei* NP_2 *le*] forms a present perfect.

Fourth, the literature suggests that there exists a close link between DOCs and DCs [V NP_1 *gei* NP_2].

Given the summary above, this chapter addresses the following issues: (a) the structural relation between DOCs and DCs, (b) the derivation of DOCs, (c) the formation of [V *gei*] compounds and motivation for the compounding, (d) the removability of *gei* ('to/give'), and (e) the derivation of simple past and present perfect DOCs.

4 Derivation of DOCs in Mandarin

It was introduced in section 3.1.4 that while it is generally assumed that DOCs and DCs are structurally related to each other, there is debate on whether DOCs are derived from DCs or vice versa (e.g., Aoun & Li, 1989; Bruening, 2001; Gu, 1998; Hale & Keyser, 2002; Larson, 1988; Marantz, 1993).

Due to the number of possible structural types of DOCs summarized in section 3, diachronic evidence is checked in section 4.1 so as to uncover the order of appearance of these structures. It turns out that the various structures of DOCs and DCs in Mandarin appeared in different periods of history, with the DOC structure [gei_V NP_2 NP_1] appearing earliest, indicating that it is the origin of all other DC or DOC structures. Based on the diachronic evidence, assumptions about the two structures in Mandarin are proposed. The derivational processes of the various DOC types are analyzed in the following sections.

4.1 Diachronic evidence

The literature suggests that the verbal usage of *gei* appears before its prepositional usage. The use of *gei* as a verb meaning 'give' first appears in the pre-Qin period (a period of time before 221 BC) (Zhao, 2003), while the prepositional usage of *gei* does not appear until the Ming dynasty (1368-1644) (Yao, 2015). Based on Zhao's (2003) and Yao's (2015) diachronic investigations of the word *gei* ('give/to'), the appearance of the various DOC and DC structures can be organized in chronological order. According to Zhao (2003), when *gei* as a verb appears in the pre-Qin period, the DOC structure [gei_V NP_2 NP_1] appears as well. The DC structure [V NP_1 *gei* NP_2] does not appear until the Han and Wei dynasty (8-265). Since the prepositional usage of *gei* had not appeared at that point, *gei* in this DC structure should be a verb, hence [V NP_1 gei_V NP_2]. The DOC structure [V gei_V NP_2 NP_1] does not appear until the Sui dynasty (581-618), and this usage is "comparatively rare" in that period while the DC structure [V NP_1 gei_V NP_2] was frequently used (Shiju Zhao, 2003, p. 47). Finally, after the verb *gei* ('give') underwent grammaticalization producing a prepositional usage in the Ming dynasty (1368-1644) (P. Liu, 2013), the DC structure [V NP_1 gei_P NP_2] and the DOC structure [V (gei_P) NP_2 NP_1] begin to appear and the preposition *gei* ('to')

can be deleted from the DOC structure (Yao, 2015). The chronological order of the various DOC and DC structures is illustrated in the following table.

Table 3

Chronological Order of DOCs and DCs

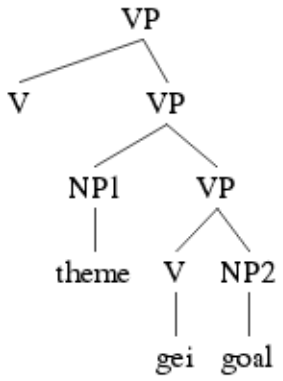
Construction type	Structural type	Time of appearance
DOC	[gei_V NP_2 NP_1]	pre-Qin (before 221 BC)
DC	[V NP_1 gei_V NP_2]	Han and Wei dynasty (8-265)
DOC	[V gei_V NP_2 NP_1]	Sui dynasty (581-618)
DC	[V NP_1 gei_P NP_2]	Ming dynasty (1368-1644)
DOC	[V (gei_P) NP_2 NP_1]	Ming dynasty (1368-1644)

Several points can be summarized from Table 3. First, since no DCs are identified before the appearance of the DOC structure [gei_V NP_2 NP_1], there is little possibility that this structure is derived from DCs, and it is reasonable to assume that all the DCs and other DOC structures take the DOC structure [gei_V NP_2 NP_1] as their base. Second, it can be assumed that the derivational process of the DC structure with a prepositional *gei* (‘to’) is similar to that of the DC with a verbal *gei* (‘give’), since the prepositional *gei* is a product of the grammaticalization of the verb *gei*. Third, the word *gei* can be deleted when it functions as a preposition in DOCs.

4.2 Derivation of [gei_V NP_2 NP_1]

In accordance with the four structural types introduced in Chapter 1, it is assumed that the syntactic configuration of the DOC [gei_V NP_2 NP_1] consists of an (8b)-type embedded in an (8a)-type.

(40) Syntactic configuration of [*gei*$_V$ NP_2 NP_1]



It is noteworthy that the theme (i.e., NP_1) is higher than the goal (i.e., NP_2) in the syntactic configuration. In other words, it is assumed that NP_1 asymmetrically c-commands NP_2 in DOCs. The literature is inconsistent on the structural relation between NP_1 and NP_2 in DCs and DOCs. Some propose that NP_2 asymmetrically c-commands NP_1 in DOCs and NP_1 asymmetrically c-commands NP_2 in DCs (e.g., Larson, 1988; Marantz, 1993; Soh, 2005), while others hold that NP_1 asymmetrically c-commands NP_2 in both constructions (e.g., Hale & Keyser, 2002). It is the latter point of view that is adopted in this thesis. The reason is that the two NPs exhibit an asymmetry in the passivization of DCs and DOCs. Specifically, in Mandarin DCs and DOCs, only the theme (i.e., NP_1) can be passivized, as shown by (42b), (43b), and (44b). The passivization of the goal (i.e., NP_2) results in ungrammaticality, shown by (42c), (43c), and (44c). This property of DCs and DOCs in Mandarin indicates that theme (i.e., NP_1) must be in a higher position than goal (i.e., NP_2) in the two constructions, so that NP_1 can move to spec-TP to derive a legitimate passive.

(41) a. ta ti gei le wo yi-ge qiu.
he kick to/give TAM me NUM-CL ball
'He kicked a ball to me.'

b. yi-ge qiu bei ti gei le wo.
NUM-CL ball PASS kick to/give TAM me
'A ball was kicked to me.'

c. *wo bei ti gei le yi-ge qiu.
I PASS kick to/give TAM NUM-CL ball
Intended meaning: 'I got a ball because it was kicked to me.'

(42) a. wo mai gei le ta yi-dong fang-zi.
I sell to/give TAM him NUM-CL house
'I sold him a house.'

b. yi-dong fang-zi bei mai gei le ta.
NUM-CL house PASS sell to/give TAM him
'A house was sold to him.'

c. *ta bei mai gei le yi-dong fang-zi.
he PASS sell to/give TAM NUM-CL house
Intended meaning: 'He got a house because it was sold to him.'

(43) a. mali reng le yi-ge ping-guo gei wo.
Mary throw TAM NUM-CL apple to/give me.
'Mary threw an apple to me.'

b. yi-ge ping-guo bei reng gei le wo.
NUM-CL apple PASS throw to/give TAM me
'An apple was thrown to me.'

c. *wo bei reng le yi-ge ping-guo gei.
me PASS throw TAM NUM-CL apple to/give
Intended meaning: 'I got an apple because it was thrown to me.'

In Chapters 3 and 4, various structural configurations were introduced. One common property of these base structures is that a sentence can be produced by directly merging the nodes in the structures. This is consistent with current Minimalist research in which the operation merge is assigned a central role in syntactic derivations (Lasnik, 2002; Roeper, Snyder, & Hiramatsu, 2002).

However, a direct merge of the nodes in (40) does not produce a legitimate structure in Mandarin, as shown in (45).

(44) *wo yi-ben shu gei ta.
I NUM-CL book give him
Intended meaning: 'I gave him a book.'

Although the word order in (45) is unacceptable in modern Mandarin, this expression is a legitimate structure in ancient Chinese, because sentence word order in ancient Chinese is SOV; the direct object frequently precedes the verb (Feng, 1997; C. Shi, 1986; Li Wang, 1980; Yu, 1981). Example (46) is a sentence from the *Records of the grand historian*, a book written in the Han dynasty (Cited from Shiju Zhao, 2003, p. 46).

(45) nü-jia hou-feng gei Zhang-er.
female-family thick-money give a person's name
'Zhang-er's parents-in-law gave him a lot of money.'

In this sentence, the direct object (i.e., NP_1/theme) *hou-feng* ('much money') precedes the verb *gei* ('give'), and the indirect object (i.e., NP_2/goal) *Zhang-er* (a man's name) takes post-verbal position. Because the order of major sentential constituents has changed from SOV to SVO in modern Chinese, the configuration in (40) would not generate a grammatical expression if merge is the only operation employed. This explains why (40) behaves slightly differently from other structural configurations of DOCs.

Considering the purpose of this study, it is deemed that the example in (44) is still acceptable in modern Chinese. According to the Given Before New Principle, the new information in (45) is the goal of the book, which is expressed by NP_2 *ta* ('him'). When the new information is not carried by NP_2 but by NP_1, *yi ben shu* ('a book'), a focus process that moves NP_1 to a focus position is needed. In this situation, the principle would require NP_1 to appear in sentence-final position of

the sentence. To achieve this goal, the whole VP *gei ta* (‘give him’) must be left moved so as to leave the sentence-final position to NP_1, producing a double object construction like (46).

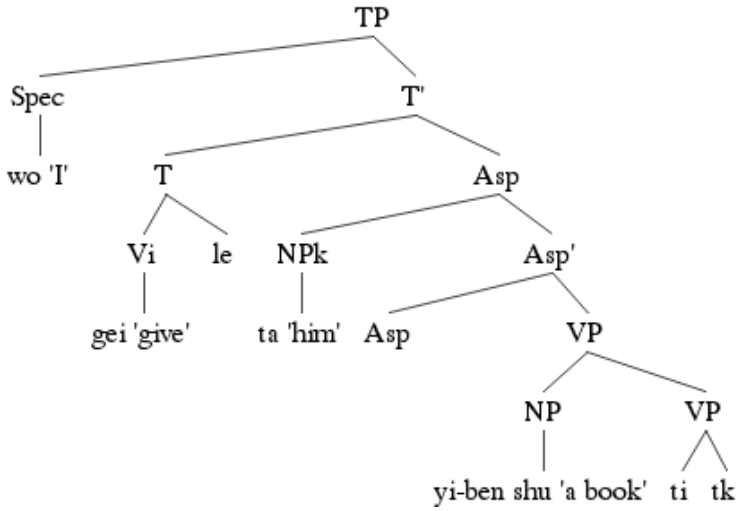
(46) wo gei ta yi-ben shu .
I give him NUM-CL book
‘I gave him a book.’

When tense and aspect marker *le* is placed in post-verbal position in (46), a simple past like (47a) is produced; when sentential *le* appears in post-NP_2 position, a present perfect like (47b) can be produced. The derivational processes of the two sentences are illustrated in (48) and (49), respectively.

(47) a. wo gei le ta yi-ben shu.
I give TAM him NUM-CL book
‘I gave him a book.’

b. wo gei ta le yi-ben shu.
I give him TAM NUM-CL book
‘I have given him a book.’

(48) Derivational process of (47a)



The derivational process in (48) involves a two-step movement. In the first step, the verb *gei* (‘give’) undergoes head movement and incorporates into T. In the

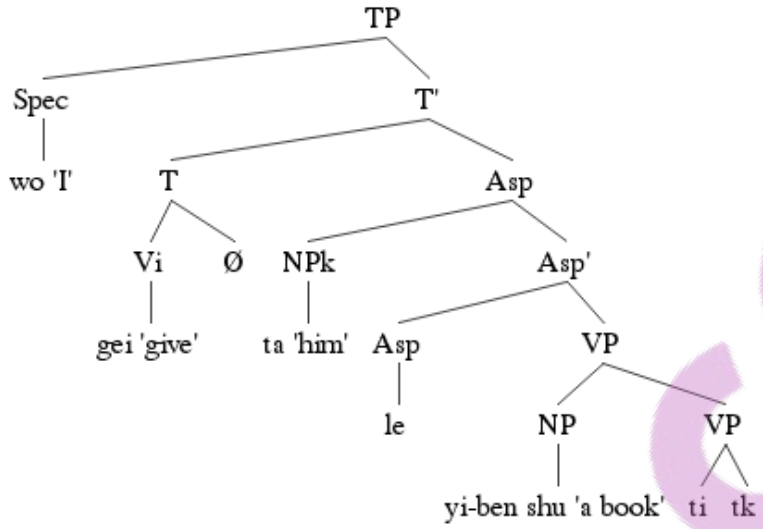
second step, the complement NP of V *ta* ('him') raises to the specifier position of Asp. As discussed above, it is assumed that the first step of movement is trigged by the D-feature of T. In (48), the verb *gei* ('give') moves to T to check the D-feature of T by forming a simple past. This is consistent with Chen's (2002) and Wu's (2004) opinion that [V *le*] has an interpretation of the simple past.

The motivation for the second step of movement is focus that requires a constituent be placed in one of the focus positions in the sentence. Specifically, the movement of the NP *ta* ('give him') is a process of displacing NP_1 *yi-ben shu* ('a book'), the bearer of new information, to a focus position of the sentence. This process is constrained by the Given Before New Principle (Gundel, 1988). According to this principle, the focus position for the bearer of new information is sentence-final. Note that in (49a) and (49b) the focused NP_1 and the wh-phrase target the same position in the sentence:

(49) a. wo gei le ta yi-ben shu.
I give TAM him NUM-CL book
'I gave him a book.'

b. ni gei le ta shen-me?
you give TAM him what
'What did you give him?'

(50) The derivational process of (47b)



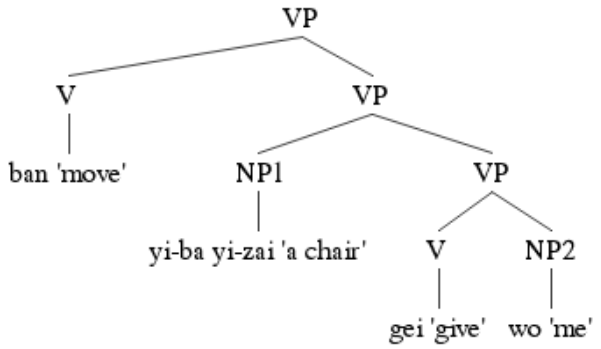
The derivational process in (50) also involves a two-step movement. In the first step, the verb *gei* ('give') moves to T so as to check the D-feature of T. Then, to ensure that NP_1 *yi ben shu* ('a book'), which carries new information, be placed at the end of the sentence, the Given Before New principle motivates NP *ta* ('give him') to raise to the specifier position of Asp through phrasal movement, forming a clause with perfect interpretation. This is consistent with Chen's (2002) opinion that [V NP *le*] has an interpretation of perfect.

4.3 Derivation of [V NP_1 gei_V NP_2] and [V gei_V NP_2 NP_1]

Table 3 in section 4.1 suggests that the DC structure [V NP_1 gei_V NP_2] appears later than the DOC structure [gei_V NP_2 NP_1]. It is assumed that the structure [V NP_1 gei_V NP_2] is derived from the same base structure as [gei_V NP_2 NP_1]. Unlike the DOC [gei_V NP_2 NP_1] though, the higher V node is not empty but occupied by a main verb in the DC structure [V NP_1 gei_V NP_2]. The derivation of a DC such as (51) proceeds with a series of merge, as shown in (52).

(51)	tang-mu	ban	le	yi-ba	yi-zi	gei	wo.
	Tom	move	TAM	NUM-CL	chair	give	me
	'Tom got a chair for me.'						

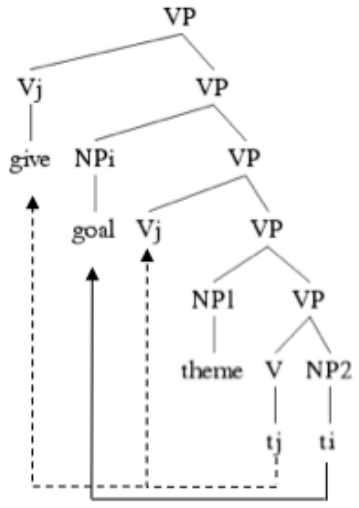
(52) Derivation of DC structure [V NP_1 *gei*$_V$ NP_2]



As can be seen from (52), there are two verbs in the DC structure [V NP_1 *gei*$_V$ NP_2]. The second verb *gei* not only functions as a goal marker but also emphasizes the 'giving' denotation of the predicate. This structure can be taken as a subtype of "serial verb constructions" (Y.-h. Li, 1990, p. 105).

With regard to DOCs, Hale and Keyser (2002) and other researchers (e.g., Larson, 1988; Marantz, 1993) propose that the syntactic configuration of DOCs is distinguished from that of DCs in that the structural configuration of DOCs is composed of a recursive (8b)-type structure in the complement position of the (8a)-type structure (structural types of argument structure introduced in Chapter 1), illustrated by (53).

(53) The structure of DOCs



In (53), the three lower VP shells present the same arrangement of arguments as in DCs. There are also two higher VP shells in which the nodes V and NP are empty. To derive a DOC in English, both the verb *give* and the goal NP_2 must raise to these higher empty positions through movement.

Hale and Keyser's proposal is based on the observation of the expressions like in (54) and (55) (selected from Hale and Keyser (2002, p. 163)), which show that in English the two structures can be followed by a descriptive adjective.

(54) a. I gave the bottle to the baby full.

b. I handed the baby to its mother crying.

c. *I gave the bottle to the baby crying.

(55) a. I gave the baby its bottle full.

b. I handed the mother her baby crying.

c. *I gave the baby its bottle crying.

The examples in (54) and (55) indicate that in both DCs and DOCs, the resulting expressions are acceptable only when the adjectives are interpreted as describing the direct object (i.e., NP_1/theme). If the adjective is used to describe the indirect object (i.e., NP_2/goal), the expression would then be ungrammatical (see (55c) and (56c)). According to Bowers (1993, p. 598), this is because the adjective that appears in this position in a DC or a DOC is regularly interpreted as a secondary predicate of the direct object, which is termed the "secondary subject" in Bower's work. Based on these observations, Hale and Keyser (2002) propose that the positions of theme and goal in the structural configurations of DCs and DOCs should be the same, and since theme is higher than goal in the syntactic configuration of DCs, the arrangement of arguments should be the same in the

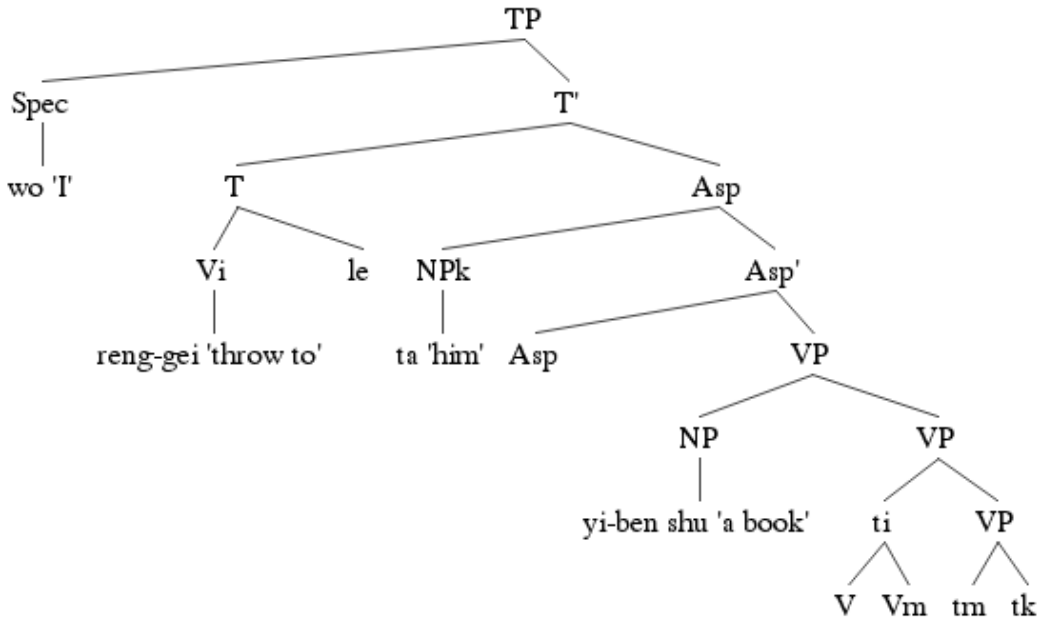
configuration of DOCs. Therefore, to derive a DOC, not only the verb but also the goal must raise; and to ensure that the goal can move to the right position in the sentence (i.e., the complement position), there needs to be one more VP shell (the highest shell) where the verb can undergo one more step of movement to its head position.

This structural configuration cannot be adopted in the analysis of Mandarin DOCs. There are three reasons. First, in English, the preposition in DCs and the verb that undergoes movement in DOCs are *to* and *give* respectively; while in Mandarin, it is the same word *gei* that plays both roles. When *gei* is a preposition in a DC, it behaves similarly to its counterpart *to* in English. However, the fact that *gei* can be either a preposition or a verb indicates that DCs and DOCs in Mandarin may behave differently from their counterparts in English. For example, as mentioned above, the two structures in English can be followed by a descriptive adjective that is interpreted as describing NP_1 (i.e., theme/direct object). In Mandarin, however, putting a descriptive adjective at the end of either a DC or a DOC results in ungrammaticality. Second, in Hale and Keyser's system, the motivation for the movement of *give* and NP_2 are the empty higher nodes. In Mandarin DOCs, however, the V node would not be empty because there is another verbal constituent beside *gei* ('give') in the predicate (represented by V in [V gei_V NP_2 NP_1]). Since the V node is not empty, there would not be motivation for the head movement of *gei* ('give'). Moreover, it was discussed in section 3 that tense and aspect marker *le* can be inserted after the [V gei_V NP_2] so as to form a present perfect. It would be hard to generate a present perfect construction with the structural configuration in (53) because NP_2 is not directly selected by the predicate as its complement and therefore cannot undergo phrasal movement with the predicate.

According to the economy principle proposed in the Minimalist Program, derivation should involve as few syntactic operations as possible (Chomsky, 1991, 1995). Since a structural relationship is held between DCs and DOCs, there exists a possibility that DOCs and DCs are derived from the same base structure. After all, Chapter 3 and Chapter 4 have demonstrated that the derivation of [VN] and [VP] compounds is based on the sentence structures in which incorporation has not occurred. Therefore, in this thesis, it is assumed that the DOC structure [V gei_V NP_2 NP_1] is derived from the base structure of DOC [gei_V NP_2 NP_1] and DC [V NP_1 gei_V NP_2]. The derivational process of [V gei_V NP_2 NP_1] is similar to that of [gei_V NP_2 NP_1], with the difference being that, in the former, the higher V node is not null but occupied by a verbal constituent other than *gei* ('give'). A [V gei_V] compound would be derived in the process, illustrated by (56) and (57).

(56) wo reng gei le ta yi-ge qiu.
I throw give TAM him NUM-CL ball
'I threw him a ball.'

(57)



As illustrated by (57), the formation of the DOC (56) involves three movement operations. In the first movement, V *gei* ('give') moves into V *reng* ('throw') through head movement, forming a $[VV]_V$ compound *reng-gei* ('throw to'). In the second step, the $[VV]_V$ compound raises to T to check its D-feature. Then, the NP *ta* ('him') moves to the specifier position of Asp through phrasal movement.

As discussed in section 4.2, this movement is trigged by the requirement that a focused constituent be placed in one of the focus positions in a sentence. Specifically, the movement of the NP *ta* ('him') is a process of displacing NP_1 *yi-ge qiu* ('a ball'), the bearer of new information, to a focus position of the sentence. This process is constrained by the Given Before New Principle (Gundel, 1988). According to this principle, the focus position for the bearer of new information is sentence-final position. As illustrated by (58), the focused NP_1 and the wh-phrase can target the same position in a sentence.

(58) a. ni reng gei le ta shen-me dong-xi?
you throw give TAM him what thing
'What did you throw to him?'

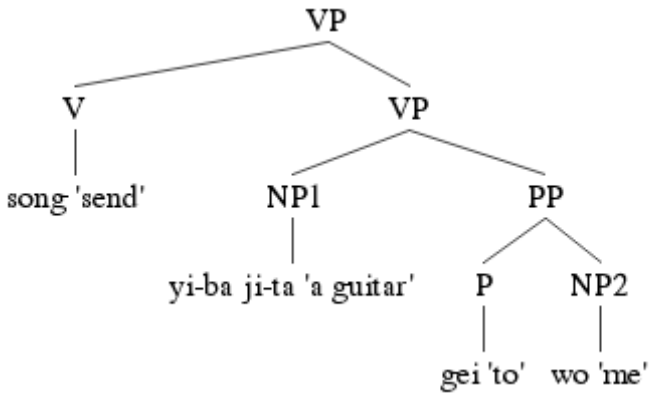
b. wo reng gei le ta yi-ge qiu.
I throw give TAM him NUM-CL ball
'I threw him a ball.'

4.4 Ditransitivity of V and syntactic category of *gei*

Table 3 in section 4.1 suggests that the prepositional usage of *gei* ('to') does not appear until the Ming dynasty. It is assumed that the DOC [V NP_1 gei_P NP_2] is derived from a base structure similar to that of [V NP_1 gei_V NP_2], with the difference being that the most deeply embedded shell is a PP,not a VP. Thus, the derivation of a DC such as (59) proceeds with a series of merge, as shown in (60).

(59) ma-li song le yi-ba ji-ta gei wo.
Mary send TAM NUM-CL guitar to me
'Mary sent a guitar to me.'

(60) Derivation of (59)

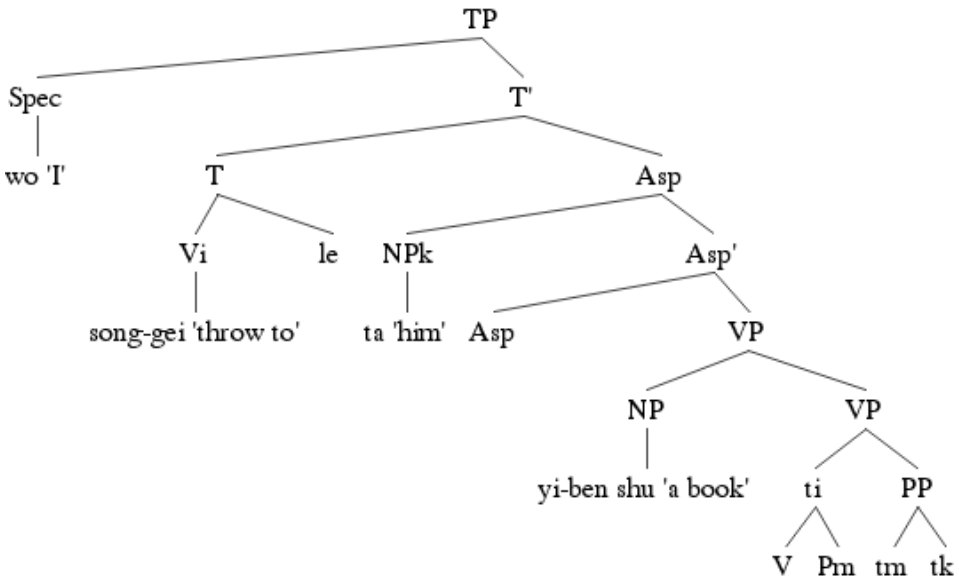


As can be seen from (61), in contrast to the DC structure [V NP_1 gei_V NP_2] in which there are two verbs V and *gei* ('give') (see (53)), *gei* in (61) is a preposition functioning as a goal marker.

It is assumed that the DOC structure [V gei_P NP_2 NP_1] is derived from the base structure of DC [V NP_1 gei_P NP_2]. The derivational process of the former is very similar to that of the DOC structure [V gei_V NP_2 NP_1], with the difference being that in the latter, *gei* ('give') is a verb but not a preposition. Therefore, to derive a DOC like (61), three movement operations are involved.

(61) wo song (gei) le ta yi-ben shu.
I send to TAM him NUM-CL book
'I gave him a book.'

(62) Derivation of (61)



The first movement is the raising of P *gei* (‘to’) to the node V to check the S-feature of the main verb and form a $[VP]_V$ compound. After that, the $[V\ gei_P]_V$ compound moves to T to check its D-feature. A simple past DOC is hence formed. Then, NP_2 *ta* (‘him’) raises to the specifier position of Asp. With this movement, NP_1, which carries the new information, is placed in sentence-final position.

The derivational processes of the two DOC structures $[V\ gei_V\ NP_2\ NP_1]$ and $[V\ gei_P\ NP_2\ NP_1]$ are similar to that of $[VP]_V$ compounds. The feasibility of the second step of movement has been justified in Chapter 4, so it will not be discussed in detail here. What is notable with respect to $[V\ gei]_V$ compounding is how the incorporation of the verb/preposition *gei* (‘give/to’) checks the S-feature of the main verb. According to the discussion in Chapter 4, in the formation of $[VP]_V$ compounds, PI checks this feature by highlighting the result-orientation of the main verb. It is assumed that in the derivation of the $[V\ gei]_V$ compounds, the movement of the verb/preposition *gei* (‘give/to’) checks the S-feature of the main verb in a similar way. The verb *gei* (‘give’) signals an event of transfer in which an entity (NP_1) is moved from a source to a goal (NP_2). Thus the incorporation of the verb *gei* (‘give’) checks the S-feature of the main verb by contributing the

meaning of transfer to the main verb. Derived from the verb, the meaning of the preposition *gei* (‘to’) is closely related to that of the verbal *gei*. It must occur with a verb that denotes some sort of transfer (C. N. Li & Thompson, 1981). Thus the incorporation of the preposition *gei* (‘to’) checks the S-feature of the main verb by marking the goal of the transfer.

The implication is that the predicate in a DOC must explicitly denote the meaning of transfer and hence be ditransitive. This could be the reason why the verb *gei* (‘give’) is obligatory in the DOC structure while the preposition *gei* (‘to’) is optional. As discussed in section 3.1.1, some verbs, such as *tui* (‘push’), *ti* (‘kick’), *zu* (‘rent’), or *ban* (‘move’), must co-occur with the verbal *gei* in the DOCs; some verbs, such as *huan* (‘return’), *fu* (‘pay’), *jie* (‘lend’), or *pei* (‘compensate’), can function as the predicate in the DOCs by themselves. A significant difference between the two groups of verbs is that the verbs in the second group are ditransitive while those in the first group are not. In order to appear in a DOC, the non-ditransitive verbs in the first group must co-occur with a ditransitive verb that can contribute the meaning of transfer and hence result in a ditransitive predicate. As for the verbs in the second group, since they themselves are ditransitive, they do not necessarily co-occur with the preposition *gei* when functioning as the predicate in a DOC. In other words, after the first step of phrasal movement in (63), the preposition *gei* may not move into the main verb but may instead be deleted. In this case, the main verb itself moves into T to check its D-feature.

5 The prosody of [V *gei*]$_V$ compounds

The analysis in the preceding sections claims that: (a) a [V *gei*]$_V$ compound is formed through the head movement of *gei* (either VI or PI) in the derivational process of a DOC; and (b) a [V *gei*]$_V$ compound agrees with its syntactic counterpart in ordering. This is consistent with the findings on the linearization of

the constituents in NI and PI, which are discussed in Chapters 3 and 4 respectively. Thus, word order in the [V *gei*]$_V$ compounds should also be determined in the syntax.

A distinctive prosodic property of the NI and PI constructions is the enforcement of FTBIN. So far, all of the DCs from which the DOCs are derived contain a monosyllabic V. Therefore, all of the [V *gei*]$_V$ compounds discussed are also made up of binary feet. The challenge is whether a DOC can derive a binary-footed verbal compound when V is disyllabic.

According to the discussions in Chapters 3 and 4, when the constituents forming a NI or a PI contain more than two syllables, FTBIN is satisfied either through syllable deletion (for NI) or tone deletion (for PI). As discussed in Chapter 4, the reason why FTBIN of [VN]$_V$/[NV]$_V$ compounds is not achieved through tone deletion is because syllable deletion is already determined in the syntax. In addition, having a neutral tone is a main feature of function words in Mandarin, and the words involved in NI are both content words which presumably have specified tones. When the incorporated constituent is a function word, such as P, satisfaction of FTBIN can be achieved through tone deletion in P. Therefore, if [V *gei*$_P$]$_V$ is constrained by FTBIN when V is composed of two syllables, P *gei* ('to') needs to undergo tonal change from tone 3 to the neutral tone, which, according to Huang (2012), lacks a phonological tonal specification in Mandarin. This assumption is verified in the following example.

(63) *gei* ('to') Tone: 3

ta	zeng-song	gei	xue-xiao	san-bai-ben	shu.	Tone:0
he	give as a present	to	school	NUM-CL	book	

'He gave 300 books to the school as a present.'

In Chapter 4, it is demonstrated that the head P of the post-verbal PP complement can be elided in some cases. In the formation of [V gei_P]$_V$ compounds, besides a tonal change, the syntax sometimes adopts the strategy of P-drop to guarantee that FTBIN is satisfied, shown in (64).

(64) ta zeng-song (gei) xue-xiao san-bai-ben shu.
he give as a present (to) school NUM-CL book
'He gave 300 books to the school as a present.'

Since the constituents involved in the formation of [V gei_V]$_V$ are both content words, if [V gei_V]$_V$ is constrained by FTBIN, the binary foot should be derived through syllable deletion. However, the examples in (65) and (66) show that when V is composed of two syllables and *gei* is a verb, a variety of structures is possible.

(65) a. gong-si fen-pei gei le ta yi-dong geng da-de fang-zi.
company allocate give TAM him NUM-CL even big house
'The company allocated him a bigger house.'

b. gong-si fen gei le ta yi-dong geng da-de fang-zi.
company allocate give TAM him NUM-CL even big house
'The company allocated him a bigger house.'

(66) a. ma-li chuan-di gei le tang-mu yi-ge huo-ju.
Mary pass give TAM Tom NUM-CL torch
'Mary passed Tom a torch.'

b. ma-li chuan gei le tang-mu yi-ge huo-ju.
Mary pass give TAM Tom NUM-CL torch
'Mary passed Tom a torch.'

In (65a) and (66a), both the [V gei_V]$_V$ compounds *fen-pei gei* (allocate-give, 'allocate somebody something') and *chuan-di gei* (pass-give, 'pass something on to somebody') consist of three syllables, with the constituent V being disyllabic. In (65b) and (66b), both the [V gei_V]$_V$ compounds *fen gei* (allocate-give, 'allocate

somebody something') and *chuan gei* (pass-give, 'pass something on to somebody') consist of two syllables, with one of V's syllable deleted. Do the exceptions in (63) and (64) challenge the constraint of FTBIN on the verbal compounds formed through incorporation then? This question can be answered with the following two points.

First, the relation between the verb and the incorporated *gei* is different from that of the verbs and the incorporated constituent (N or P). In a NI construction, the incorporated noun is the verb's internal argument, such as theme, instrument, and so on. Hence the verb and the noun form a kind of inclusion relation. When the noun incorporates into the verb, the verb takes it as an internal part, and meets FTBIN by dropping a syllable. In the PI constructions, although the incorporated preposition itself is not the verb's internal argument, as a function word, the preposition can satisfy this prosodic constraint through tone deletion. In the case of the [V *gei*]$_V$ compounds, however, *gei* is neither an internal argument of the main verb nor a function word. This word denotes an action that occurs after the event designated by the main verb. This is why Li (1990) terms the DOCs as serial verb constructions. Its relation with the verb therefore is not as close as the relation between the verb and its internal constituents. Therefore, in the derivation of a DOC, there are two possible results: (a) *gei* incorporates into the verb to form a trisyllabic verbal compound as shown in (65a) and (66a); or (b) the FTBIN constraint deletes a syllable of the main verb as shown in (65b) and (66b).

Second, the number of counter-examples like (65) and (66) is very low and most verbs that can enter the [V *gei*]$_V$ compounding structure as V consist of only one syllable (See C. N. Li & Thompson, 1981). It seems that the DOC structure [V *gei* NP_2 NP_1] itself tends to repel disyllabic verbs. Through a search for *fen-pei* ('allocate') and *gei* in the CCL corpus, 1,007 examples containing the two words in a sentence were retrieved, of which only 34 are DOCs. A similar result was

found for *chuan-di* ('pass') and *gei*. A search in the CCL corpus returned 570 examples, of which only 10 are DOCs. In the rest of the examples, most sentences take the structure [ba NP_1 fei-pei gei NP_2] or [ba NP_1 chuan-di gei NP_2], as in (67) and (68).

(67) ta ba cai-chan ping-jun fen-pei gei le liang-ge er-zi.
he BA property average allocate give TAM NUM-CL son
'He allocated his property equally to his two sons.'

(68) biao-yan-zhe ba zhe-zhong qing-xu chuan-di gei le
performer BA this emotion pass give TAM

guan-zhong.
audience
'The performer conveyed this emotion to the audience.'

The discussion in Chapter 4 suggests that the *ba* construction topicalizes NP_1 by moving it to the pre-verb position. The application in (67) and (68) changes the DOC into another structure in which the verb is followed by only one complement.

In view of the two reasons discussed above, this thesis proposes that the FTBIN constraint on verbal compounds formed through incorporation still holds. Just as Traugott (2001, p. 3) puts, "If one is of the opinion that a single counterexample is enough to refute a linguistic universal…then there is at some level nothing to talk about."

6 Conclusion

The structural system of DOCs in Mandarin is more complicated than in English. While there exist one DC and one DOC structure in English, two DC structures and three DOC structures are identified in Mandarin. The complexity of the structures requires a particular perspective in the analysis of DOCs in Mandarin.

Unlike the literature that mainly examines DOCs through the properties of the main verb, this thesis takes the properties of *gei* ('to/give') into consideration, too.

To better account for the co-existence of the various DOC structures, this thesis resorts to the diachronic evidence. It is revealed that the co-existence of the three DOC structures— [gei_V NP_2 NP_1], [V gei_V NP_2 NP_1], and [V (gei_P) NP_2 NP_1]— can be attributed to the historical evolution of Chinese syntax.

In a similar way to the formation of $[VN]_V$ compounds and $[VP]_V$ compounds, a $[V\ gei]_V$ compound is also produced through head movement in the derivation of DOCs. Unlike the first two types of verbal compounds that are strictly constrained by FTBIN, $[V\ gei]_V$ compounds exhibit a slightly different property. When V is composed of two syllables and *gei* is a preposition, FTBIN is satisfied by either tone deletion or P-drop. When V is composed of two syllables and *gei* is a verb, [V gei_V]$_V$ compounds permit trisyllabicity. Given the limited number of idiosyncrasies, this thesis holds that the FTBIN constraint is still generally satisfied in $[V\ gei]_V$ compounds.

Chapter 6 Conclusion

1 Introduction

This thesis began with a critical review of different approaches to the definition and classification of Mandarin compounds, based on which the possibility of categorizing compounds according to the different ways of derivation was explored. Verbal compounds formed through incorporation (or head movement) are the focus of this thesis. From Chapter 3 to Chapter 5, the derivational processes of these compounds, their prosodic properties, and related syntactic structures were investigated in detail. This concluding chapter summarizes the most important assumptions and findings of this study and suggests possible directions for future research.

2 Findings and summaries

2.1 Foot binarity and incorporation

It was found in Chapter 2 that a binary foot effect holds in Mandarin verbal compounds formed through either reduplication or merge, whereas this constraint is violable in nominal compounds. Chapter 3 extends the analysis of Chapter 2 and examines the third type of verbal compounds, which are formed through incorporation (or head movement). It was demonstrated that $[VN]_V$/$[NV]_V$ compounds formed through noun incorporation exhibit a strong binary foot effect as well. This binary foot effect is a result of the characteristics of noun incorporation, which generally involves a verb root and a noun root (Gerdts, 1998). Thus, when the derived compounding structure is sent to PF for interpretation, the phonology deletes the excess syllables if there are any. Syllable deletion, however, is not determined by the constituents' phonological properties

but by syntactic headedness; namely, it is always the root or the base of the constituent that is selected to surface.

Chapter 4 extends the analysis of Chapter 3 and examines $[VP]_V$ compounds that are formed through preposition incorporation. $[VP]_V$ compounds also exhibit a binary foot effect. However, in contrast to $[VN]_V$/$[NV]_V$ compounds where syllable deletion is employed as an obligatory strategy to satisfy FTBIN, when the verbal constituent of a $[VP]_V$ compound contains two syllables, one of two strategies can be employed: syllable deletion or tone deletion. The latter produces a trisyllabic $[VP]_V$ compound with a toneless P, which, according to Huang (2012), is metrically inert and does not count in the computation of the binary foot. The existence of trisyllabic $[VP]_V$ compounds argues strongly for feet in Mandarin being tonal in nature. In other words, the optimal foot in Mandarin word structure is based on tonal syllables.

Chapter 5 discusses [V *gei*]$_V$ compounds produced in the derivational process of double object constructions. It was shown that when *gei* ('to') is a preposition, FTBIN is satisfied by syllable deletion, tone deletion, or P-drop. When *gei* ('give') is a verb, there are two possible results: (a) the FTBIN constraint deletes a syllable of the main verb, or (b) *gei* incorporates into the verb to form a trisyllabic verbal compound. Given the limited number of idiosyncrasies, this thesis holds that the FTBIN constraint is still generally satisfied in [V *gei*]$_V$ compounds.

2.2 Linearization

It was shown in Chapters 3, 4, and 5, that the word order of verbal compounds formed through incorporation, namely, $[VN]_V$/$[NV]_V$ compounds, $[VP]_V$ compounds, and $[VV]_V$ compounds (represented by [V *gei*]$_V$), is determined in the syntax. Specifically, these compounds are systematically compatible with their

syntactic counterparts in word order. Therefore, in Mandarin, verbal compounds formed through head movement violate the Mirror Principle.

2.3 Pseudo incorporation

So far, research on pseudo incorporation mainly focuses on NP movement, that is, pseudo noun incorporation. This phenomenon has been identified in various languages such as German (Frey, 2015), Hindi (Dayal, 2011), Hungarian (Farkas & De Swart, 2003), Niuean (Massam, 2001), and Spanish (Dobrovie-Sorin, Bleam, & Espinal, 2006). One focus of these studies is to set a clear boundary between NI and PNI, which, to date, is still a matter of debate (Dayal, 2015). The discussion of pseudo incorporation has the following theoretical as well as empirical contributions.

First, it was shown in Chapter 3 that NI and PNI are different syntactic operations: (a) the moved nominal constituents are different: N for NI and NP for PNI; (b) the triggers for the movement are different: NI is semantically motivated by discourse-related information, but PNI is syntactically motivated; and (c) the products are different: NI produces word structures (i.e., $[VN]_V$/$[NV]_V$ compounds in Mandarin), but PNI produces phrasal structures (i.e., breakable $[VN]_V$ constructions). These findings provide empirical evidence for the categorization of NI and PNI.

Second, it was demonstrated in Chapters 4 and 5 that in Mandarin, not only NP, but also PP and VP incorporate. The discussion in the two chapters indicates that although NP incorporation, PP incorporation, and VP incorporation can all be labeled pseudo incorporation, they are slightly different from each other in their properties. For example, in a PNI construction, the incorporated NP is generally non-referential; while in a PPI construction, the incorporated PP can be either generic or specific in reference. Another implication is that even though the

constructions from various languages can be categorized as the same type of pseudo incorporation, they can have different language-specific characteristics. For example, PPI constructions in Mandarin and Greek exhibit some different properties concerning the deletion of P. In Mandarin, the deletion of P in a PPI construction does not affect the following NP; whereas in Greek the omission of P is accompanied by the deletion of D in the following NP (Gehrke & Lekakou, 2012; Ioannidou & den Dikken, 2009).

2.4 Boundedness

It was demonstrated in Chapters 2 and 3 that verbal compounds are bounded; namely, further compounding with a verbal compound results in a nominal compound. For example, consider the complex word *hu-dong ke* (interact-class, 'interactive lecture'). This is a compound containing a verbal compound formed through merge. The structure of this compound is $[[A_dV]_VN]_N$. As can be seen from the structure, although its constituent $[A_dV]_V$ (i.e., *hu-dong* ('interact')) is a verbal compound, the larger compound as a whole is nominal. Similar examples were found in verbal compounds formed through incorporation as well. Consider the nominal compound *zhuang-xiang ji* (pack-machine, 'packing machine'). Its inner constituent, the $[VN]_V$ structure *zhuang-xiang* (pack-box, 'pack') is a verbal compound derived through NI; however, the larger compound, which is formed through merging the verbal compound *zhuang-xiang* (pack-box, 'pack') and the nominal root *ji* ('machine'), is not verbal, but nominal. The boundedness of verbal compounds proves from another perspective that verbal compounds are subject to FTBIN.

2.5 Linguistic typology

It was shown in Chapters 3, 4, and 5 that, in Mandarin, a certain type of incorporation always has a parallel pseudo incorporation operation (e.g., NI vs.

PNI and PI vs. PPI). This finding makes a typological contribution in the sense that it gives some insights into studies on compounding in other language systems. Researchers may explore the possibility of finding similar parallelism in other language systems so as to test whether this is a universal phenomenon.

3 Future research

The data and the analysis provided in this thesis are by no means a comprehensive approach to Mandarin compounds. Further research is needed in at least three areas.

First, although the binary foot effect exhibited in verbal compounds derived through incorporation has been discussed in great detail in this thesis, it did not examine the reasons why verbal compounds formed through reduplication and merge target an optimal foot (binary foot) as well. Further research is needed so that a comprehensive understanding of verbal compounds in Mandarin can be achieved.

Second, although it was found in Chapters 2 to 5 that verbal compounds in Mandarin are subject to FTBIN, it was shown in Chapter 2 that this constraint is violable in nominal compounds. However, the reasons why nominal compounds can be composed of more than two syllables and are not subject to FTBIN were not discussed. Further research on this respect is needed so as to draw a complete picture of Mandarin compounds.

Third, as has been mentioned above, in Mandarin, a type of incorporation always has a parallel pseudo incorporation operation. Further research is needed to test whether such parallelism exists in other language systems and whether this is a universal phenomenon.

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