

STRUCTURE OF NOUN PHRASES - LEFT OR RIGHT?*

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ABSTRACT

This paper builds on Y.-H. A. Li (2013) and claims that different structures for [Num + Cl (+*de*) + NP] should be recognized - left-branching structures for the constructions with Num+Cl functioning like modifiers (relative clauses) describing the properties of the following NPs (property-reading in Y.-H. A. Li 2013) and right-branching structures for the others (entity-reading and quantity-reading in Y.-H. A. Li 2013). The property-reading construction requires *de* to be base-generated between the modifying phrase and the modified NP. *De* is part of the grammatical structure and licenses NP-ellipsis. If *de* appears in the quantity-reading construction, it is the result of phonological insertion and does not affect the grammatical structure or license NP-ellipsis. The structures in question are as stated regardless of the types of classifiers. It is the interpretation or function of Num+Cl that determines the grammatical structure, rather than the type of classifiers. The presence of *de* cannot be the criterion for determining structures, either, because different types of *de* need to be recognized. There have been challenges raised in the literature against consistent right-branching structures for non-property reading constructions [Num + Cl (+*de*) + NP]. It will be shown that these challenges either do not really exist or actually favor the analysis advocated in this work.

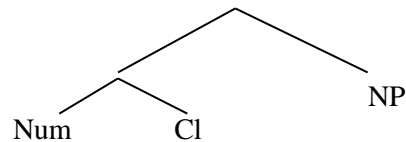
Keywords: Number+Classifier structure, left-branching, right-branching, *de*, NP ellipsis, phonological insertion

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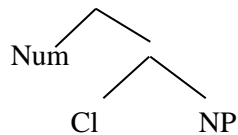
1. INTRODUCTION

The structure of noun phrases in Chinese containing Number and Classifier expressions with or without the "modification" or "associative" marker *de* [Number + Classifier (+ *de*) + NP] (Number abbreviated as Num and Classifier as Cl below) has been controversial.¹ Three main points have been in contention: (i) should Cl form a constituent with Num first or with NP? (ii) should different structures be distinguished according to interpretations or the types of Cl involved? and (iii) does the presence or absence of *de* affect syntactic structures? The structure of Num and Cl forming a constituent as in (1) has been referred to as a "left-branching structure". If Cl and NP form a constituent first, serving as the complement of Num, as in (2), it is a "right-branching structure" (for variations in the labelling of these structures, additional functional heads etc., see Her 2012b, Hsieh 2008, Jiang 2008, 2012: proceeding 3, Jin 2012, Y.-H. A. Li 1998, 1999, 2012, 2013, Liu 2013:chapter 2, Tang 1990a, b, 2005, Zhang 2013:chapter 6, among others).

(1) left-branching structure



(2) right-branching structure



¹ Many different analyses have been proposed for *de*. See Y.-H. A. Li (2008, 2012) for some recent reviews.

Among recent works that extensively discuss the structures of Num + Cl,² there have been proposals which adopt a consistent left-branching structure (e.g., Greenberg 1990/1972, Li & Thompson 1981:105, Paris 1981:105-117, Huang 1982, Croft 1994:151, Krifka 1995:400, Lin 1997:419, Hsieh 2008, Her 2012b, R. Yang 2001:58, Tang 1990a for a double-headed structure; and see Fukui & Takano 2000, for example, for Japanese classifier structures), or a unified right-branching structure (such as Tang 1990b:413, 2005, Cheng & Sybesma 1998, 1999, Borer 2005, Watanabe 2006), or a split analysis (e.g., Y.-H. A. Li 2013, X. Li 2013, Liu 2013:chapter 2, Zhang 2013:chapter 5). Among those advocating for a split analysis, some take the types of classifiers as the distinguishing criteria. For instance, Zhang (2013:156) suggests a left-branching structure for expressions with container and standard measures, partitive and collective classifiers, and a right-branching structure for those with individual, individuating, and kind classifiers³ (she also suggests a type of *de* as a phrasal boundary marker). X. Li (2013) makes a distinction between counting and measuring functions of classifiers.⁴ The counting and measuring functions of classifiers are semantically distinct and the different semantic functions are associated with different syntactic structures. X. Li discusses two accounts of the semantics of classifiers as in Krifka (1989, 1995) and Rothstein (2009, 2010) and argues that, when a classifier has a measuring function, *de* can co-occur, but that it can not when a classifier has a counting function. That is, the occurrence of *de* is correlated with the said functions (also see Sybesma 1992, Cheng & Sybesma 1998, 1999). Accordingly, the

² The label "Num + Cl" is used in this work for convenience to refer to the Number and Classifier words/expressions. It is not intended to mean that Num and Cl form a constituent structurally. As will be shown later in the text, Num and Cl form a grammatical unit (left-branching structure) only when they occur in the property reading construction.

³ See Zhang (2013) for the distinction of these different types of classifiers and the motivations for the distinction.

⁴ The counting function of classifiers and the measure/counting ambiguity of classifiers have been discussed in many works, such as Greenberg (1990/1972), Chao 1968, Paris (1981), Croft (1994), Tai & Wang (1990), Bisang (1993, 1999), Cheng & Sybesma (1998, 1999), Chierchia (1998a, b), Landman (2004), Hsieh (2008), Rothstein (2009), Zhang (2012), among many others.

presence or absence of *de* offers clues as to what the structures should be. However, there are also proposals arguing that *de* may have different functions and therefore different structural properties (Tang 1990, 2005, Jiang 2008, 2012, Jin 2012, Y.-H. A. Li 2013, Liu 2013).

This work argues for a split analysis. It shows that both left and right branching structures are available. However, the choice is not free. It is correlated with interpretation (function), as well as with the (im)possibility of a null NP following *de*. In the split analysis that is advocated for in this work, both right-branching and left-branching structures exist and the choice is determined by the functions of Num+Cl. The left-branching structure as in (1) is for the construction where Num + Cl expressions function as modifiers to the following NP. In this construction, *de* is obligatory and the NP following *de* can be null. *De* is a head that takes the modified NP as its complement. It can license the NP to be null (cf. Rubin 2003, Simpson 2003, Sio 2006, Y.-H. A. Li 2008, among others), although a null NP is not always possible due to independent reasons (types of modifying phrases, see Aoun & Li 2003:chapters 5-6, Y.-H. A. Li 2003).⁵ In contrast, the right-branching structure as in (2) is for the construction whose form is [Num + Cl + NP] (where the NP can be null) or [Num + Cl + *de* + NP] with an information focus on quantity (where the NP cannot be null). Types of classifiers do not matter. Challenges that have been raised against such a right-branching structure, including issues related to scope, selection and constituency structures of Num, Cl and NP, will be addressed.

This paper is structured as follows. Section 1 briefly presents the arguments for distinguishing two *de*'s and two structures for [Num + Cl + *de* + NP], which would allow us to naturally capture the (im)possibilities of a null NP after *de* (cf. Jiang 2008, 2012:chapter 3, Jin 2012, X. Li 2013, Y.-H. A. Li 2005, 2007, 2012, 2013, Liu 2013, Tang (1990a, b, 1993, 2005, Tsai 2011, Zhang 2013, among others). The two structures established will be left-branching structures for modification

⁵ The "modification" structure here is used in a very broad sense - any adjectival phrase or clause preceding the NP is referred to as a modifying phrase because of the identical structure [XP *de* NP] (where XP is an adjectival phrase or a clause). The XP can even be a phrase/clause of the type that is commonly known as the complement of a noun such as 'the news/rumor that...'. .

constructions and right-branching for the others, including [Num + Cl + *de* + NP] for quantity and all the cases of [Num + Cl + NP]. Section 2 discusses the challenges that have been raised in the literature against the consistent right-branching structure for non-property reading constructions and shows that the relevant questions are either irrelevant or actually favor the structures proposed in this work.

2. DISTINGUISHING TWO *DE*'S AND TWO STRUCTURES FOR [NUM + CL + *DE* + NP]

As partially noted or extensively discussed in Jiang (2008, 2012), Jin (2012), X. Li (2013), Y.-H. A. Li (2009, 2012), Tang (1990a, b, 1993, 2005), Tsai (2011), Liu (2013), Zhang (2013) etc., [Num + Cl + *de* + NP] can have a quantity/measure reading or a property/modification reading:

- (3) san-bang-de putao
three-pound-de grape

The Num + Cl in (3) can have two interpretations: one expresses the quantity of grapes - three pounds of grapes; the other describes the property or the kind of grapes - three-pound grapes (see, for instance, Schwarzschild 2006). Following Y.-H. A. Li (2013), let us for convenience refer to the former as the quantity reading and the latter as the property reading. A very important feature distinguishing the two is that only the latter allows the NP following *de* to be missing. The examples given below, where NP following Cl is null (regardless of being base-generated as null or derived by movement), all have the property reading only:

- (4) a. xigua, ta yao san-ge/bang de, wo yao
watermelon he want three-CL/pound DE I want
wu-ge/bang de *-property reading*
five-CL/pound DE
'Watermelons, he wants three-count/pound ones, I want five-
count/pound ones'

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b.wo, xigua yao san-ge/bang de. *-property reading*
 I watermelon want three-CL/pound DE
 'I, watermelons, want three-count/pound ones.'

c. xigua, ba san-ge /bang de mai-wan de ren
watermelon BA three-CL/pound DE sell-finish DE people
bu duo. *-property reading*
not many
'Watermelons, the people that sold off three-count/pound
ones were not many.'

Under the quantity reading, the NP in [Num + Cl (+ *de*) + NP] can be null only if *de* does not appear:

(5) ta yao san-ge/bang de xigua, wo yao wu-ge/bang.
 he want three-CL/pound DE watermelon I want five-CL/pound
 ‘He wants three/three pounds of watermelons, I want five/five pounds.’

Y.-H. A. Li (2013) argues from the tonal behavior in Taiwan Southern Min (abbreviated as TSM) that the property-reading construction is just like any other noun phrases with a relative clause modifier. The main points are summarized here very briefly (readers are referred to the cited work for more detailed empirical generalizations and analysis). Comparing with the Mandarin *de*, the TSM counterpart *e* can have two occurrences, *e*_{0-e7/5}, in the property-reading construction, just like the cases of relative clauses modifying NPs in this language.⁶ That is, evidence from the tonal behavior in TSM supports the analysis according to which [Num + Cl] is a relative clause modifying the

⁶ *De* in Mandarin is always in the neutral tone. The counterpart *e* in TSM can be in the neutral tone *e*₀, or in the full tone, which may be *e*₇ (or *e*₃ in some other varieties of TSM) in the non-final position of a VP or NP or *e*₅ when it is at the end of such phrases. See Y.-H. A. Li (2012, 2013) for the tonal behavior of *e* revealing the complex structures of noun phrases containing *e*.

following NP. Mandarin and TSM are identical in structures and interpretations in this regard. Therefore, as in all of the cases of modification within noun phrases in Mandarin and TSM, *de* or *e* is required between the modifying relative clause and the modified phrase. This *de* can license the modified noun phrase to be empty. Li further shows that the abilities of *de* in Mandarin to mark a modifier and to license a null NP are due to the fact that *de* is the combination of two *de*'s, corresponding to the two *e*'s in TSM. In other words, just like relativization constructions, the structure for the property reading construction should be $[[\text{Num} + \text{Cl} + de_N] + de_C + \text{NP}]$, where de_N nominalizes a relative clause (Zhu 1961, Huang 2006) and de_C links (conjoins) the modifier and the modified (with only one *de* surfacing). The modifier is in the Specifier position of the head de_C and the modified, in its complement position (Munn 1993 for the asymmetric structural analysis of conjunction). Because Mandarin Chinese does not distinguish the two *de*'s in any visible manner, I will simply use one *de* to represent the relevant markers in Mandarin noun phrases.

In short, Num + Cl in the property-reading construction should form a constituent with and modify the following NP, just like all modifying clauses/phrases (relative clauses, adjectival phrases). *De* is base-generated and required to be present. It also licenses NP-ellipsis, i.e., the NP following *de* can be empty.

In contrast to the *de* in modification constructions, Y.-H. A. Li (2013) argues that *de* in the quantity reading construction is phonologically inserted. Generally, $[\text{Num} + \text{Cl} + \text{NP}]$ in the unmarked case denotes entities - referred to as the entity reading. In addition, the information focus can fall on Num + Cl. When the information focus⁷ is on Num + Cl, *de* can be inserted phonologically. The phonological insertion of *de* is a phonological phrasing strategy to encode focus - to separate $\{\text{Num} + \text{Cl}\}$ from $\{\text{NP}\}$, which is to be distinguished from the unmarked $\{\text{Num} + \text{Cl} + \text{NP}\}$ (curly brackets representing phonological

⁷ Focus here can be presentational focus or contrastive focus or any other type of focus, the exact nature of which is irrelevant in this work.

phrases⁸) (see Pierrehumbert & Bekman 1988, Kanerva 1990, Downing et al. 2004, Koch 2008, among others, for phonological phrasing marking focus; see Y.-H. A. Li 2013 for details of the application of phonological phrasing in Mandarin and Taiwanese).⁹ In other words, an entity reading and a quantity reading differ only in where the information focus lies. In the unmarked case when the information focus falls on the final NP (cf. Cinque 1993, Rinehart 2006 for instance), expressions of the form [Num [Cl [NP]]] denote individuals or entities – the entity reading. If the information focus is on Num and Cl in the form [Num [Cl [NP]]], then the quantity is the focus – the quantity reading. *De* can be phonologically inserted to create appropriate phonological phrasing reflecting focus. That is, the following pairs of sentences are the same syntactically; they may only differ in information focus. The (a) cases do

⁸ The term "phonological phrase" in this work is a convenient label for the unit formed as a result of the strategy of phonological phrasing reflecting focus. It is not used to contrast with other prosodic units such as intonational phrase, intermediate intonational phrase, etc. (see, for instance, Pierrehumbert 1980, Beckman & Pierrehumbert 1986). The exact status of such a unit for the purpose of focus-marking phonological phrasing is irrelevant in this work.

⁹ In Y.-H. A. Li (2013), the separation of two phonological phrases {Num + Cl} {NP} can encode information focus on {Num + Cl} (deviating from the norm {Num + Cl + NP}, see Feng & Li 2013). In addition, if {NP} is to be singled out as focus, such as contrastive focus, excluding {Num + Cl}, the same mechanism of phonological phrasing may be used as well, such as in the following case with a contrastive focus on the NP:

(i) ta shi kan-le liang-ben de xiao xiaoshuo, bu shi liang-ben de da zhuanji.
he be read-LE two-CL DE small novel, not be two-CL DE big biography
'He did read two novelettes, not two big biographies.'

(ii) wo yikouqi chile san-da-ge de xigua, bu shi san-da-ge de donggua.
I one.breath ate three-big-CL DE watermelon not be three-big-CL DE winter.melon
'I ate three big watermelons in one sitting, not three big winter melons.'

The use of *de* is possible in these instances because the function of *de* is to create two phonological phrases and a strategy to place a contrastive focus on the NP is to make it an independent phonological phrase.

not specially mark focus. The occurrence of *de* in (b) can mark the information focus on Num + Cl (quantity):¹⁰

(6)a. wo xiang he yi-bei shui.
I want drink one-cup water
'I want to drink a cup of water.'

b. wo xiang he yi-bei de shui.
I want drink one-cup DE water
'I want to drink a cup of water.'

(7)a. wo dei kan san-dao-wu-pian wenzhang.
I have.to read three-to-five-CL article
'I have to read three to five articles.'

b. wo dei kan san-dao-wu-pian de wenzhang.
I have.to read three-to-five-CL DE article
'I have to read three to five articles.'

¹⁰ See the previous note. In Beijing Mandarin, different strategies are available to encode focus - stress, pause and insertion of *de*. In addition, it is possible that none of the strategies are used and a Num+Cl+NP expression can be uttered without any pause or stress on any part of the phrase to express an entity or quantity. For instance, the following expressions can be read without any stress or pause, even though it is clear from the context that the quantity reading is intended:

(i) yi-da-ping shui shi ji-bei shui?
one-big-bottle water be how.many-cup water
'How many cups of water are there in a big bottle of water?'

(ii) zhe-da-xiang pingguo shi ji-ge pingguo?
this-big-box apple be how.many-CL apple
'How many apples are there in this big box of apples?'

(iii) yi-ge xiaohai he-le yi-bei niunai.
one-CL child drink-LE one-cup milk
'A child drank a cup of milk.'

The two constructions have the same syntactic structure of [Num [Cl [NP]]] and *de* is inserted phonologically in the quantity-reading construction. To argue for the phonological insertion of *de* in the structure [Num [Cl [NP]]], Y.-H. A. Li (2013) shows that TSM and Beijing Mandarin are identical in regard to the possibilities of interpretation and grammatical behavior of [Num + Cl (+ *de/e*) + NP]. The only difference between them is that TSM generally does not use stress to encode focus (see note 10) and has tonal properties that reveal more about the nature of the relevant constructions. Briefly, an expression of the form [Num + Cl + NP] in TSM must form a tonal group: {Num + Cl + NP}. In the tonal group, every syllable must be in the combination (non-final) tone except the last one in the NP. As tonal grouping in TSM reflects syntactic structures, the formation of the tonal group {Num + Cl + NP} indicates that the syntactic structure is [Num [Cl [NP]]], where Cl is a head taking the following NP as its complement. In addition, the head-complement relation between Cl and NP makes NP-deletion possible. This is why (5) is acceptable. Moreover, the fact that the head Cl must be in the combination tone (indicating that another tone must follow immediately) makes it impossible to have a pause after Cl, i.e., between Cl and NP. Therefore, the only way to encode focus on Num + Cl via the strategy of phonological phrasing is to insert *e* phonologically. The insertion allows the Cl to take the isolation tone and {Num Cl} can be a tonal group without the following NP.¹¹

Such a phonologically-inserted *de* behaves quite differently from a base-generated *de* in regard to the licensing of NP-ellipsis. If the NP in [Num + Cl + NP] is empty, i.e., it is not present phonologically, {Num + Cl} already is a phonological phrase without the following NP. The phonological insertion of *de* would not apply due to the lack of phonological motivation (Zubizarreta 1998 on phonologically-motivated

¹¹ A reviewer asks if it would be better to just analyze Num and Cl as a unit syntactically (left-branching structure) if they are a unit phonologically (phonological phrasing for the purpose of encoding focus). Note that if Num and Cl are a unit syntactically, they take the Specifier of NP position. The Specifier of an NP can constitute a tonal group itself in TSM and would not require the insertion of *e* to create two units according to the strategy of phonological phrasing. The tonal behaviour of the constituents within noun phrases in TSM indicates that the structure should be right-branching.

movement as a last resort operation, like other movement processes (the Minimalist Program, Chomsky 1995); also see Nunes' 2009 economy condition that enforces faithfulness between the lexical items present in the numeration and the lexical items present in the PF output). This means that the apparent failure of the *de* in the quantity-reading construction to license NP-ellipsis is actually the failure to phonologically insert *de* because the NP is not present phonologically.

The advantage of this approach is that it captures without stipulations the ability of *de* licensing NP-ellipsis in the property reading construction and the apparent failure of *de* licensing NP-ellipsis in the quantity reading construction. The two structures available to [Num + Cl + *de* + NP] are distinguished in a straight-forward manner. Note that this analysis is built on the claim that the quantity reading [Num + Cl + *de* + NP] and the construction without *de* [Num + Cl + NP] have right-branching structures [Num + [Cl + NP]], supported by the tonal behaviour of the relevant constructions in TSM. *De* is inserted phonologically, which does not affect grammatical structures. The right-branching structure disallows the phrase from having two separate phonological phrases to encode the quantity as focus, unless the phonological insertion of *de/e* takes place. Crucially, the tonal behavior and structure described so far apply to all of the instances of [Num + Cl + NP], regardless of the types of classifiers.

Briefly summarizing, to determine the structures for [Num + Cl + NP], what is important is the distinction between the property reading vs. the non-property quantity reading and entity reading. Classifier types are irrelevant. These points are supported by the tonal behaviour in TSM and the possibilities of NP ellipsis.¹² The property-reading construction has the left-branching structure as in (1) because Num + Cl expressions are simply modifiers modifying the following NPs. Just like all modification structures in noun phrases in Chinese, a modifying phrase is left-adjoined to the modified phrase. In contrast, [Num + Cl + NP] can have an entity or quantity reading. The two only differ in where the information focus lies. Crucially, they have the same right-branching structures. *De* is only inserted phonologically as a means to encode focus.

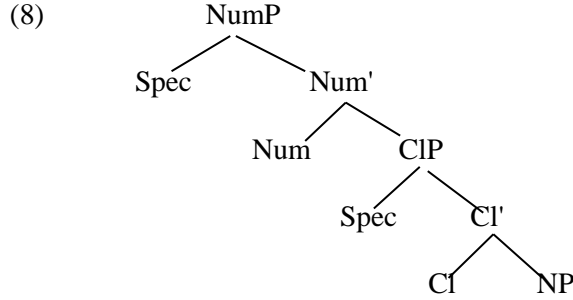
¹² This also captures the fact that *de/e* is obligatory in the property-reading construction but optional in the quantity-reading structure; see Y.-H. A. Li (2013).

It does not affect the syntactic structure. The phonological insertion of *de* fails to apply when the NP is empty, making it appear that *de* in the quantity-reading construction fails to license NP-ellipsis.

The claim that both entity and quantity-reading noun phrases should consistently have the right-branching structure [Num [Cl [NP]]] regardless of classifier types is in direct contrast with the proposals in the literature that take different positions. For instance, as noted earlier, there have been analyses that postulate different structures according to the types of classifiers - such as a left-branching structure for those with container and standard measure words, partitive and collective classifiers vs. a right-branching structure for those with individual, individuating, and kind classifiers (e.g., Zhang 2013). Her (2012) summarizes the pros and cons for both left and right-branching structures and eventually adopts a unified left-branching structure. As just described, this work follows the arguments in Y.-H. A. Li (2013) and takes the opposite position. The next section will review the major issues against a consistent right-branching structure across classifier types and show that the challenges either are not real problems or actually favor the right-branching structure.

3. RIGHT-BRANCHING STRUCTURE

Let us first summarize the major points. First, property reading (modification) constructions have left-branching structures, which are just like the cases with relative clauses or adjectival phrases modifying NPs. The modification marker *de* is base-generated and licenses NP-deletion. In contrast, non-modification constructions consistently have right-branching structures, with or without *de*. Right-branching structures can be represented as in (8) below.



For a phrase like *san-bang putao* 'three-pound grape' or *san-ge putao* 'three-Cl grape', the measure classifier *bang* 'pound' or the count-classifier *ge* occupies the CI head position. Number expressions like *san* 'three' may occupy the Num head position or the Specifier of CI position and then move up to the Specifier of Num position (Borer 2005, Cheng & Sybesma 1999, Jiang 2012, Li 1998, 1999, Tang 1990, among others).¹³ Regardless of the options chosen, it holds that the major distinction between the so-called right-branching and left-branching structure should be in whether Num and CI form a constituent (left-branching) or CI and NP form a constituent (right-branching). This work proposes that modification constructions (the property reading) have left-branching structures $[[\text{Num} + \text{CI}] + \text{de} + \text{NP}]$ and the quantity or entity-reading constructions, right-branching $[\text{Num} [\text{CI} [\text{NP}]]]$. Types of classifiers are not a factor in deciding on the structures.

Major issues that have been raised against such a proposal are discussed in the following subsections.

¹³ For Li (1998, 1999), when the Num expression occupies the Num head position, the noun phrase is a quantity-denoting expression, in contrast to an individual-denoting expression where the Num head is occupied by a plurality feature (+/-) and the Num expression occupies the Specifier of Num position. Note that the quantity-reading construction discussed in this work not only includes quantity-denoting expressions as defined in Li (1998) but also an individual-denoting expression with the information focus on the quantity expressed by Number+Classifier. The latter is clearer in cases containing a demonstrative: *zhe san-da-ben (de) shu* 'these three big books' ('three-big' focused).

3.1. Scope of adjectival modifiers

An argument that has been made for the relevance of classifier types and against a consistent right-branching structure for non-modification structures concerns the scope of adjectival modifiers, illustrated below:

- (9) a. yi-**da**-xiang xigua
one-big-box watermelon
'one big box of watermelon'
- b. yi-**da**-ge xigua
one-big-CL watermelon
'one big watermelon'
- (10) a. zhongzhong-de yi-**da**-xiang xigua
heavy-heavy-DE one-big-box watermelon
'one heavy big box of watermelon'
- b. zhongzhong-de yi-**da**-ge xigua
heavy-heavy-DE one-big-CL watermelon
'one heavy big watermelon'

According to Her & Hsieh (2010), Her (2012b), Zhang (2011, 2013), among others, a measure classifier is opaque and a count classifier is transparent in the sense that an adjective can scope over a count classifier and the NP following it while the scope of an adjective is only over a measure classifier and does not reach the following NP. That is, an adjective before a measure classifier only modifies the measure classifier; but an adjective before a count classifier modifies the NP as well. Some of the relevant examples are:

- (11) a. yi da ke pingguo = (a') yi ke da pingguo
one big CL apple one CL big apple
Both: 'one big apple'

b. san xiao pian shuye = (b') san pian xiao shuye
three small CL leaf three CL small leaf
Both: 'three small leaves'

(12) a. yi xiao he kouzi ≠ (a') yi he xiao kouzi
one small box button one box small button
'one small box of buttons' ≠ 'one box of small buttons'

b. yi da dui maozi ≠ (b') yi dui da maozi
one big pile hat one pile big hat
'one big pile of hats' ≠ 'one pile of big hats'

Examples like those in (11) have been used in the works cited to illustrate the scope transparency of count classifiers - an adjective before the classifier is interpreted as having scope over the NP following the classifier. Those like (12) demonstrate the opaqueness of measure classifiers - an adjective before the classifier cannot scope across the classifier to reach the following NP.

Nonetheless, such a claim is not adopted by some others. For instance, Liu (2013) argues that the different readings in (11) and (12) follow from right-branching structures in a straightforward manner, if one simply interprets the relevant elements according to the hierarchical order of right-branching structures. She states that "In [11a], the adjective *da* 'big' modifies the Cl *ke*. When *da ke* "big CL" merges with the noun *pingguo* 'apple', it *picks out* the individual apples that are big (presumably there are different sizes of apples in the denotation of the NP *pingguo*). In the case of *yi ke da pingguo*, *da* 'big' modifies *pingguo* 'apple', but at this point, the denotation of the NP *da pingguo* 'big apples' is still ambiguous. The Cl *ke* then disambiguates the NP by picking out atomic individuals (in this case, there are no small apples to be *picked out*. In different ways, [11a] (i.e., one big unit of apples) and [11a'] (i.e., one unit of big apples) achieve the same semantics – in both cases a big apple is picked out. On the other hand, when the Adj.-M head *xiao he* 'small box' merges with the noun *kouzi* 'buttons' in [12a], the 'small-box' creates a measurement and picks out the NP in the corresponding level in the denotations of *kouzi* 'buttons'. The quantity or

the size of the individual *buttons* in the small boxes is not specified since M does not pick out individual atoms. Therefore, the buttons in the small boxes can have different sizes. In [12a'], the NP *kouzi* 'button' is merged with the adjective *xiao* 'small' first, and the denotation of the NP *xiao kouzi* is ambiguous until the M *he* 'box' is merged. The level of the counting is by box, and the size of the buttons is exclusively small. As a result, the semantics of [12a] and [12a'] cannot be the same." (pp.26-27).

In a word, according to Liu, the scope of adjectives is the same in the cases involving both (11) and (12). Their interpretations can be derived straightforwardly from right-branching structures.

Along similar lines although differing in details, X. Li (2013) also suggests that the speaker's evaluation should be considered and that the evaluation takes into account both the classifier and the NP. Essentially, in structural terms, pre-classifier adjectives should have scope over both classifiers and NPs regardless of classifier types. That is, such an adjective should modify the unit that contains both the classifier and the NP – which would follow from the right-branching structure. X. Li argues that a pre-classifier adjective does not solely modify the classifier or the noun. That it does not modify the classifier only can be demonstrated by the following acceptable example:

(13) *The stewardess in the airplane handed each passenger a bowl of rice:*

a. na-ge san-sui de xiaohai gangcai chi-le yi-da-wan fan.
that-CL three-years DE kid just.now eat-LE one-big-bowl rice
'That three-year-old kid ate a big bowl of rice just now.'

b. na-ge lanqiu yundongyuan zhi chi-le yi-xiao-wan fan.
that-CL basketball athlete only eat-LE one-small-bowl rice
'That basketball player only ate a small bowl of rice.'

According to X. Li, "if pre-classifier adjectives modify the classifier as a concrete container, then there should be a big bowl in [13a] and a small bowl in [13b]. But this is not the case. If pre-classifier adjectives modify the classifier as an abstract volume, then the two bowls should contain different quantities of rice, a large quantity for the kid, a small quantity for the basketball player. This is also not the case. What the relevant

expressions, *yi da/xiao wan fan* ‘a big/small-bowl rice’ in [13] mean is that the rice served in the bowl is a large/small quantity for the relevant eater in view of his/her consumption ability in the context. This kind of quantity information is independent of the actual size or volume of the container as expressed by the classifier." (p.161).

Similarly, the fact that the following example is possible shows that the adjective does not modify only either the classifier or the noun.

- (14) *wo gei-le ta yi-da-wan fan, keshi dui ta lai shuo*
I give-LE him one-big-bowl rice, but to him come say
zhi shi yi-xiao-wan.
only be one-small-bowl
'I gave him a big bowl of rice; but (it) was only a small bowl
(of rice) to him.'

A pre-classifier adjective modifies the combination of Cl and N (according to the speaker's perspective), rather than just Cl or just N. In other words, the scope of a pre-classifier adjective should be over both the classifier and the NP, regardless of the classifier type. This scope property follows from the right-branching structure, which allows both the classifier and the NP to be c-commanded by the adjective. A left-branching structure would fail to derive the reading because a pre-classifier adjective cannot c-command the NP and its modification scope would only be restricted to the classifier. Nor do the classifier and NP form a constituent for the adjective to modify them. Similar arguments can apply to all of the issues related to modification, such as those discussed in Zhang (2013, chapter 5), including the "left-peripheral adjectives" in her section 5.2.1, the effect of modifier association in section 5.2.2, and the order of size and shape classifiers in section 5.2.4.

3.2. Selection

An issue closely related to the scope property discussed in the previous section involves the selection relation between verbs and classifiers/nouns and between classifiers and nouns.

Consider first the relation between verbs and classifiers/nouns. Her (2012b:1225) argues that verbs select nouns rather than classifiers according to examples like the following ones.

- (15) a. zhe san tiao/wei yu dou hai huo-zhe ni xiang yang ma?
the 3 CL/CL fish all still alive-ASP you want raise Q
'The three fish are all still alive, so do you want to raise them?'
- b. zhe san gongjin/xiang yu dou hai huo-zhe ni xiang
the 3 kilo/box fish all still alive-ASP you want
yang ma?
raise Q
'The three kilos/boxes of fish are all still alive, so do you
want to raise them?'

Her argues that, because nouns are selected by verbs, they should not be dominated by other heads within noun phrases so that they can be directly related to verbs and the selection relation between verbs and nouns can be established straightforwardly. That is, left branching structures should be adopted.

Nonetheless, such selection concerns have been addressed and are not regarded as problems in proposals adopting the notion of extended projection as in Grimshaw (2000) and her earlier works. After the adoption of DPs as the structure for noun phrases in argument positions, instead of NPs (see Abney 1987 for instance), much attention was turned to the question of how the selection relation between verbs and their object nouns could be captured. The solution is that the notion of extended projection is necessary and it serves the purpose. Lexical heads and their related functional heads form extended projections. Nouns can be c-commanded by layers of functional heads within noun phrases (D, Num, Cl for instance). Verbs can bear selection relations with the nouns inside the extended nominal projection (DP).

Further note that it is also possible that verbs select classifiers, or the combination of classifiers and nouns and such possibilities are expected by right-branching structures, as noted in Liu (2013, chapter 2). She shows that the verb in the sentences below can either select the head

noun *binggan* ‘cookie’ as in (16a) or the noun and the measure classifier *tong* ‘box’ as in (16b). In (16c), the verb only has a selection relation with the measure classifier *tong* ‘box’.

- (16) a. ta **chi-le** san tong **binggan**
he eat-LE three box cookie
'He ate three boxes of cookies.'
- b. ta **zhuang-huai-le** san tong **binggan**
he hit-broken-LE three box cookie
'He broke three boxes of cookies.'
- c. ta **kai-le** san tong binggan
he open-LE three box cookie
'He opened three boxes of cookies.'

A right-branching structure fares better in being able to capture the flexibility of the verb selection in these cases, as Liu observed.

Next, consider the selection relation between nouns and classifiers. This has also been well discussed by Liu (2013), while reviewing the argument presented by Zhang (2011, 2013) that only count classifiers (individual and individuating classifiers) bear semantic selection relations with the associated nouns, not the measure classifiers. The contrast is demonstrated by the different degrees of flexibility in the use of count classifiers vs. measure classifiers (two main types, which may contain finer-distinguished sub-types).¹⁴ For instance the noun *ma* ‘horse’ occurs with the count-classifier *pi*; and *niu* ‘cow’, with the count-classifier *tou* ‘head’ or *zhi* (classifier for some animals). The available options are quite limited. In contrast, a measure classifier such as *xiang* ‘box’ can occur with many different nouns, either count or non-count. Accordingly, Zhang claims that count classifiers are heads selecting the more restricted set of nouns and measure classifiers do not bear a head-complement relation with the nouns and therefore no selection relations

¹⁴ Zhang (2013) makes finer distinctions of classifier types. The distinction that is relevant here is simply between the type that has a stricter selection relation with the following noun and the other with more flexibility in the kinds of co-occurring nouns.

exist between measure classifiers and nouns. However, Liu observes that measure classifiers can also show selectional restrictions. For example, the standard measure classifier *sheng* 'liter' strongly prefers a head noun that is liquid; the group *ban* 'class' may select the human noun *xuesheng* 'students', but not animals like *yang* 'sheep'. Therefore, Liu suggests that a selection relation also exists in the cases of measure classifiers. There is no reason to assume different structures for different classifiers. Indeed, we may say that there is always a selection relation between classifiers and nouns (just differing in the range of items allowed) and that the right-branching structure is more adequate to capture the observed selection relations than the left-branching structure.¹⁵

3.3. Constituency

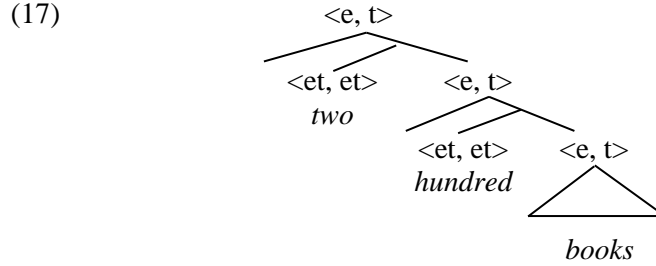
Another line of argument against right-branching structures is built on a semantic relation between Num and Cl as proposed in Her & Hsieh (2010) and Her (2012a) (also see Au Yeung (2005) - Num and Cl "can be seen as *multiplier* and *multiplicand*." (Her 2012b:1214).¹⁶ Num is the multiplier and Cl is the multiplicand. Therefore, according to Her, the two must form a constituent, which means the left branching structure should be adopted.

Nonetheless, it is not clear why the multiplier-multiplicand relation between Num and Cl requires the two to form a constituent, excluding the following NP (left branching structure). Indeed, Ionin & Matushansky (2006) propose that a multiplier-multiplicand relation holds between expressions like 'two' and 'hundred' or 'ten' and 'thousand' in expressions such as 'two hundred' and 'ten thousand'. Specifically, an expression like 'two hundred books' has the structure below, where the

¹⁵ The difference in the flexibility of co-occurrence possibilities is also found in the selection relation between verbs and object nouns. Some verbs can occur with many different types of objects while some others are much more restricted. For instance, verbs like *take* or *hit* in English can accept many more different types of nominal objects than verbs such as *say* or *utter*. The latter set is probably restricted only to *words*, or nouns related to *utterances*; whereas there is a wide range of possibilities for the former.

¹⁶ In Her & Hsieh (2010) and Her (2012a), a count classifier is a multiplicand of 1 and a mass classifier, anything but 1.

multiplier-multiplicand relation is captured by a head-complement structure.



In other words, adopting the analysis by Ionin & Matushansky, we can still accommodate the multiplier-multiplicand relation for Num and CI with right-branching structures proposed in section 1. The head-complement structure suggested by Ionin & Matushansky is in line with the right-branching structure. This means that, even when we follow the proposal in Au Yeung (2005), Her (2012a), Her & Hsieh (2010) and accept that the relation between Num and CI is that of multiplier-multiplicand, we are not forced to adopt left-branching structures.¹⁷

In fact, Ionin & Matushansky's analysis of complex number expressions allows for the possibility of a consistent right-branching structure in Chinese and solves other potential problems raised in the literature. First, consider complex numbers like 'twenty-three' or 'a hundred and ten'. Ionin & Matushansky suggest that these expressions have conjunction structures. They note that an overt conjunction word is not used in some constructions in some languages – the notion of *asyndetic coordination* (the phenomenon where the semantics of coordination is obtained in the absence of an overt conjunction).

¹⁷ A reviewer notes that Ionin & Matushansky's (2006) state 'We will not attempt here the discussion of the syntax of cardinals in classifier languages' (p. 328, fn.14). That is, their account does not entail that they be committed as to whether CI forms a constituent with Num or N first. Nonetheless, the point made in this present work is that a multiplier-multiplicand relation between Num and CI does not mean that a head-complement structure cannot be adopted, as demonstrated by Ionin & Matushansky in their analysis of English complex number expressions.

Regardless of whether an overt conjunction is found,¹⁸ they argue that the conjuncts should contain the relevant NPs. That is, 'twenty-three apples' should have the conjunction structure of 'twenty apples and three apples'. It is further shown that asyndetic coordination is also attested in the domain of measurements, as illustrated by (18a) below (from Gawron 2002), which is truth conditionally equivalent to (18b).

- (18) a. six feet six inches of finest silk
b. six feet and six inches of finest silk

cf.

- (19) a. two dollars (and) seventy-five cents
b. two dollars (*and) seventy-five

According to the syntax and semantics of complex cardinals proposed by Ionin & Matushansky, each coordinated cardinal in an expression like *two hundred and twenty books* must contain an instance of the NP *books*: *two hundred books and twenty books*. In order to derive the surface form *two hundred and twenty books*, they suggest that either of the two options is available: right-node raising or PF-deletion of the NP in the first conjunct. Some languages use right-node raising, others use PF-deletion, and still others utilize both strategies.

This analysis provides an answer to an important challenge against a consistent right-branching structure that has been raised in works such as Hsieh (2008), Her (2012b), Zhang (2011, 2013) regarding the distribution and interpretation of certain quantity expressions. Specifically, these authors note that *ban* 'half' and *duo* 'more' can follow classifiers (fractions can also be included), illustrated below:

- (20) a. si-shi mi duo/ban bu ($40 < x < 41$)
four-ten meter more/half cloth
'more than forty meters (less than forty-one meters)/forty

¹⁸ According to Ionin & Matushansky (2006, 349), complex cardinals differ in regard to whether they use asyndetic or overt coordination, within the same language, as well as across languages. For instance, in English, *twenty-two* disallows an overt *and*, while *one hundred and one* requires it, and in *three hundred (and) fifty*, it is optional. The examples in (18) and (19) are more illustrations of the same point.

and a half meters of fabrics'

- b. shi-ge-duo/ban pingguo
ten-CL-more/half apple
'ten and more (more than 10 but less than 11)/ten and a half
apples'¹⁹

¹⁹ Lü et al. (1999: 184) claim that *duo* 'more' may follow a measure word, but not a count classifier in general. However, it is possible to find classifiers with *duo*, including the generic classifier *-ge* (google search on August 10, 2013).

- (i) 寶寶 10 個多月未長牙

<http://tw.knowledge.yahoo.com/question/question?qid=1613081904388>

baobao shi-ge-duo yue wei zhang ya.

baby ten-CL-more month not grow teeth

'The baby has not grown teeth at 10 months and more. (more than 10, less than 11 months)'

- (ii) 揭秘半個多世紀前的北京 <http://ftb.cnfxj.org/html/wsxs/2013-8/17/103003859.html>

jie mi ban-ge duo shiji qian de Beijing

reveal secret half-CL more century before DE Beijing

'Reveal secrets of Beijing more than half a century ago'

- (iii) 排隊 1 個多小時

http://big5.xinhuanet.com/gate/big5/news.xinhuanet.com/fortune/2013-08/20/c_125209717.htm

paidui yi-ge duo xiaoshi

queue one-CL more hour

'Queue for more than an hour.'

- (iv) 只剩下三張多 <http://www.businesssociety.com.tw/article-content-80441-4969>

zhi sheng san-zhang duo

only leave three-CL more

'Only three and a bit more (less than 4) sheets are left'

Nonetheless, it should be expected that *duo* is more commonly used with measure words than count classifiers because of the fraction possibilities. For instance, news items of one plus more *yi-tiao-duo xinwen* would be strange because it is not easy to imagine what the nature of some fraction of one news item might be. The same concern holds with many other combinations of nouns and count classifiers such as *yi-ge-duo ren* 'one person and more (less than two people)', *yi-zhi-duo niao* 'one bird and more (less than two birds)'. However, if birds have been cooked and I have eaten one of the cooked birds and a bit more (less than two), then it is possible to say *wo chi-le yi-zhi-duo* 'I ate one and some more'.

In these cases, *duo* 'more' or *ban* 'half' is conjoined with the preceding numbers, as indicated in the translation. This close relation between *duo/ban* and the preceding numbers has been used to argue for a left-branching structure so that [Num Cl *ban/duo*] can be a constituent and together function as a quantifier. According to Her (2012b, 1238), the right-branching structure [Num [Cl N]] does not allow [Num Cl-*ban/duo*] to form a constituent and would fail "to account for the mathematics in this construction". However, as we just saw in the discussion of Ionin & Matushansky, the interpretation can be properly represented by a conjunction structure shown in (21)-(22) below. PF deletion or right node raising applies to derive the surface form, as suggested by Ionin & Matushansky:²⁰

- (21) a. shi-mi ~~bu~~ (~~you~~) ban-mi bu
 ten-meter cloth and half-meter cloth
 'ten meters of cloth and half a meter of cloth'

²⁰ The distinction in the interpretation of *duo* between (i) below and those in (20) in the text follows from the conventions of the language (Ionin & Matushansky, sections 3.1.2. and 4.2.1.). *Ji* replaces the single digit; *duo* adds more to the subsequent digit(s).

- (i) a. shi-duo/ji-ge pingguo
 ten -CL apple
 'ten plus apples (more than 10 less than 20)'
 b. liang-bai-duo-ge pingguo
 two-hundred-more-CL apple
 'two hundred plus apples (more than 200 less than 300)'

Duo in *shi-duo-ge* in (ia) adds a single digit following the tens (ten plus any digit from 1-9), as it occupies the position for the single digit. The *duo* in *shi-ge-duo* in (20b) adds more to the quantity of 10 apples - 10 apples and (a bit) more of apples. Conventional understanding would supply the information as to what this "more" is. It does not seem to be always a fraction of one. In an example like (ii) below, native speakers I consulted with report a reading of 100 apples and more with the quantity of the "more" being vague. Crucially, it does not have to be a fraction of one.

- (ii) yi-bai-ge-duo pingguo
 one-hundred-CL-more apple

- b. shi-mi ~~bu~~ (~~you~~) duo (~~yidian~~) bu²¹
ten-meter cloth and more slightly cloth
'ten meters of cloth and a bit more (of a meter of cloth)'
- (22) a. shi-ge pingguo (~~you~~) ban-ge pingguo
ten-CL apple and half-CL apple
'ten apples and half an apple'
- b. shi-ge pingguo (~~you~~) duo (~~yidian~~) pingguo
ten-CL apple and more slightly apple
'ten apples and a bit more (of an apple)'

The following examples illustrate the same point: the occurrence of *duo*, *ban* or others, such as fractions, can be analyzed as a conjunction structure to which PF-deletion/right node raising applies (also see Liu 2013). The conjunction word can appear overtly.

- (23) a. wo chi-le shi-ge (pingguo) you sanfenzhiyi-ge (pingguo).
I eat-LE ten-CL apple and one.third-CL apple
'I ate ten apples and one-third (of an apple) more.'
- b. wo mai-le yi-chi (bu) you shi-cun (bu).²²
I buy-LE one-foot cloth and ten-inch cloth
'I bought a foot and 10 inches of cloth.'

Our analysis predicts that *de* can be inserted phonologically after such quantity expressions and that this *de* cannot license NP-ellipsis. This is true, which is demonstrated by the acceptability of *de* when the NP is overtly present but not when the NP is null:

²¹ *Duo* in Chinese does not occur by itself. Therefore *yidian* 'a bit' is added.

²² Either occurrence of the NP is allowed but not both. Having both sounds redundant.

- (24) a. wo mai-le shi mi duo/ban (de) bu; ta mai-le
I buy-LE ten meter more/half DE cloth he buy-LE
er-shi mi duo/ban (*de) ____
two-ten meter more/half DE
'I bought ten meters and a bit more/half a meter more of
fabrics; he bought twenty meters and a bit more/half a meter
more'
- b. wo chi-le shi-ge-ban (de) pingguo; ta chi-le wu-ge you
I eat-LE ten-CL-half DE apple he eat-LE five-CL and
sanfenzhiyi (*de) ____
one-third DE
'I ate ten and a half apples; he ate five and a third.'

In short, the semantic arguments reviewed in this subsection for taking Num + Cl as one constituent excluding the following NP do not hold if the analysis of complex numbers by Ionin & Matushansky (2006) is adopted. The multiplier-multiplicand relation between Num and Cl can be captured by right-branching structures. The constituency of [Number + Classifier + 'half/more/fraction] again is not an issue when the expressions are analyzed as involving the type of conjunction structures proposed in Ionin & Matushansky.

Briefly summarizing, section 2 demonstrates that the facts that have been used to argue for left-branching structures are also captured by an approach that adopts right-branching structures.²³ Above all, some of the generalizations for left-branching structures follow more straightforwardly from right-branching structures.

²³ Zhang (2013, 176) discusses the argument in Saito et al. (2008: 260) that Num-Cl can be separated from the NP in Japanese and not Chinese. Accordingly, Num-CL is a constituent in Japanese, not Chinese. This distinction argues for left-branching structures for Japanese noun phrases, and right-branching for Chinese (see, for instance, Watanabe 2010 for more discussion on the syntax of Japanese CL constructions). Such an argument seems to favor right branching structures. Nonetheless, it cannot apply to Chinese, because, independently, Chinese does not allow movement of constituents from within noun phrases to outside them (see Y.-H. A. Li 2013, note 18). In addition, regardless of classifier types, Num-Cl cannot be separated from the NP in Chinese.

4. CONCLUSION

This paper builds on the analysis of [Num + Cl + *de* + NP] in Y.-H. A. Li (2013), according to which the interpretation or function of Num + Cl is indicative of how the *de* is derived. If the Num + Cl expression describes the property of the following NP (property reading), similar to the modifier *three-pound* in *two three-pound watermelons* in English, the *de* is base-generated and licenses NP-ellipsis. The other function of Num + Cl expressions is to carry the information focus of the noun phrase - quantity reading. In this case, *de* can be inserted phonologically as a phonological phrasing strategy to encode focus on Num + Cl. The phonological insertion of *de* does not apply when the following NP is null, making it look like such a *de* failing to license NP-ellipsis. The quantity reading only differs from the entity reading in where the information focus lies. Structurally, they both have right-branching structures [Num [Cl [NP]]], regardless of the types of classifiers. The phonologically inserted *de* does not affect syntactic structures.

The adequacy of such a consistent right-branching structure for non-modificational [Num + Cl + (*de* +) NP] across classifier types has been controversial in the literature. Major challenges raised against such an analysis were reviewed in this paper. It was shown that the facts used to argue for left-branching structures were quite compatible with or even favored right-branching structures. Therefore, it can be concluded that regardless of the type of classifiers, Chinese nominal structures containing [Num + Cl + NP] are consistently right-branching [Num [Cl [NP]]]. For [Num + Cl + *de* + NP] expressions, the structure depends on whether they have property or quantity readings - left-branching for the property reading construction and right-branching for the quantity reading construction. The marker *de* is not counted grammatically when it is inserted phonologically in the quantity reading construction.

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名詞組結構：向左分支？向右分支？

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本文建基於李艷惠（2013）對【數+量+(的)+名】的分析，提出【數+量+(的)+名】的語法結構是由它們不同的語義功用來決定的。當數+量具修飾功用，描述名詞的性質時(性質義)，數+量就像一般名詞前的修飾語如關係子句，數詞和量詞形成一個結構單位來修飾右邊的名詞(向左分支結構)。其他情況(個體義和數量義)則都是向右分支結構。性質義結構中的“的”一定得出現，就像其他修飾結構應該要有這個修飾記號一樣。而且同其他修飾結構一樣，性質義中的“的”可以允許右邊的名詞省略。數量義的“的”則是語音上為了顯示焦點而嵌入的。如果名詞不存在，就沒有嵌入的必要，因此結果是數量義的“的”看似不允許名詞省略。本文所提向右分支結構涵蓋所有的量詞，不拘量詞的類別。然而文獻上有的分析依量詞類別區分向右或向左分支結構，甚或採取一致性的向左分支結構。本文指出支持向左分支結構的語料實際上也可由向右分支結構來解釋，甚至有些看似支持向左分支結構的語料其實更正確的分析應該是支持向右分支結構的。

關鍵字：數詞+量詞結構、向左分支、向右分支、的、名詞組省略、語音嵌入