A Unified Account to Measure Words in Mandarin

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1 Introduction

Since Cheng and Sybesma (1998, 1999), the syntax, headedness and semantic distinction of measure words have aroused great discussion. In this paper, I argue that a simplified right-branching structure alone accounts for the syntax of measure words in Mandarin.

The measure words discussed in this paper refer to lexical items that serve as a unit or measurement of nouns for measuring or counting purposes, e.g., *ben* 'CL' and *xiang* 'CL.box' in (1).[1]

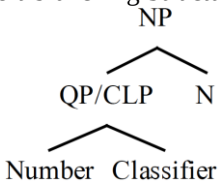
(1) a. liang **ben** shu
two CL book
'two books'

b. san **xiang** shu
three CL.box book
'three boxes of books'

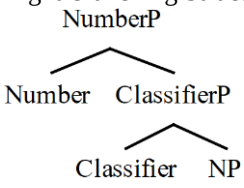
According to Cheng and Sybesma (1998), such measure words can be distinguished semantically with respect to the noun that they are associated with. Count nouns refer to entities "which present themselves naturally in discrete, countable units," and mass nouns are "substances which do not present themselves" in specific units. Based on this, measure words are divided into two types: those in (1a) are referred to as "classifier," and those in (1b) are referred to as "massifier."

Various structures have been proposed to account for Mandarin nominal expressions containing a measure word: a unified left-branching structure as in (2) (e.g., Huang 1982, Tang 1990, Hsieh 2008, and Her 2012), a unified right-branching structure as in (3) (e.g., Tang 1990, Cheng and Sybesma 1999, Borer 2005, and Huang, Li and Li 2009), and non-unified accounts that usually propose a structure like (2) for massifier and a structure like (3) for classifier (e.g., Zhang 2011, 2013, Li 2011, Li and Rothstein 2012). In this paper, I argue for a different and simplified right-branching structure that explains Mandarin measure words through a unified account.

(2) Left-branching Structure



(3) Right-branching Structure



2 Background

There are facts suggesting the uniformity of massifiers and classifiers from a syntactic perspective. To begin, it is well known that different types of measure words (i.e., classifiers and massifiers) cannot co-occur. The examples in (4) show that the classifier and massifier cannot co-occur, indicating that these measure words may compete for the same syntactic position.

(4) a.*liang **ben** **xiang** shu
two CL CL.box book

b.*liang **xiang** **ben** shu
two CL.box CL book

Moreover, it has been pointed out in Hsiech (2008), Her (2012) and Shi (2013) that both classifi-

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[1] The abbreviations used in examples are: CL, measure word; DE, marker of modifiers of nominal expressions; PERF, perfective aspect marker; EXP, experienced aspect marker.

ers and massifiers are compatible with so-called "*de*-insertion," which was originally used by Cheng and Sybesma (1999) to differentiate massifiers and classifiers.[2]

(5) a. yi da **tiao** de yu
one big CL DE fish
'one big fish'

b. yi da **xiang** de yu
one big CL.box DE fish
'one big box of fish'

Zhang (2011, 2013) and Her (2012) also show that both classifiers and massifiers license NP ellipsis. The examples in (6) demonstrate this point.

(6) a. Ta you san ben shu, wo you si **ben** ~~shu~~.
He have three CL book I have four CL
'He has three books, I have four.'

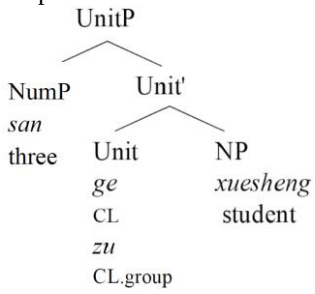
b. Ta you san xiang shu, wo you si **xiang** ~~shu~~.
He have three CL.box book I have four CL.box
'He has three boxes of books, I have four boxes.'

The above examples show that classifiers and massifiers share the same syntactic behavior. Although there are semantic differences that could be identified among the measure words at issue, such as the count-mass distinction (Cheng and Sybesma 1998, 1999), or interpretations of container, partitive, collective, and individuating functions (Zhang 2011, 2013), in the next section, I argue that a simplified right-branching structure better explains the syntax of Mandarin measure words.

3 The Proposal: Unit Phrase

I propose that measure words at issue serve as the head of a Unit Phrase (hence UnitP), dominating noun phrase (hence NP) and taking numeral phrase (hence NumP) as its specifier, i.e., (7).

(7) Proposal: Unit Phrase



I argue that the occurrence of the Unit head changes the semantic core of the whole nominal expression, and that the projection UnitP is independent of and dominates the complement NP.

The first piece of evidence comes from the distribution of modifiers within a nominal expression, showing that modifiers have to respect this structure (7). Given the DP hypothesis proposed for Mandarin (Tang 1990, Li 1998, Hsieh 2005, and Huang et al. 2009), we see that a relative clause can occur before a DP (e.g., (8a)), between a demonstrative and a UnitP (e.g., (8b)), or between a Unit and an NP (e.g., (8c)). However, a relative clause never occurs between a number phrase and a Unit, as shown in (9).

[2] Following Tang (1990), I assume that the sequence of number-classifier-de, e.g., (i), is analyzed as a modifier phrase (ModP) on a par with other modifiers of nominals (e.g., adjectives and relative clauses), which is different from the typical classifier structure that is discussed in this paper, e.g., (ii), i.e., UnitP proposed in this study.

(i) [ModP liang bang de] [NP rou]
two pound DE meat
'meat that is sorted in accordance with two pounds'

(ii) [UnitP liang bang rou]
two pound meat
'two pounds of meat'

(8) a. [$_{DP}$ **[**$_{RC}$ **meiren yao de]** *na* shi ben shu]
nobody want DE *that* ten CL book
'those ten volumes of books, which nobody wants'
b. [$_{DP}$ *na* [$_{UnitP}$ **[**$_{RC}$ **meiren yao de]** *shi ben* shu]]
that nobody want DE ten CL book
'those ten volumes of books that nobody wants'
c. [$_{DP}$ na [$_{UnitP}$ shi *ben* [$_{NP}$ **[**$_{RC}$ **meiren yao de]** *shu*]]]
that ten CL nobody want DE book
'those ten volumes of books that nobody wants'

(9) *[$_{DP}$ na [$_{UnitP}$ *shi* **[**$_{RC}$ **meiren yao de]** *ben* [$_{NP}$ shu]]]
that ten nobody want DE CL book
'those ten volumes of books that nobody wants'

Assuming that a modifier may uniformly be introduced to the left-periphery of a phrase in Mandarin (see Huang 1982), I argue that each such phrase (i.e., DP, UnitP, and NP) functions in (8) and (9) as the interpretive scope of modifiers, and that since a numeral is the specifier of UnitP, modifiers cannot sit between the numeral and Unit' (e.g., (9)). The distribution of adjectives demonstrates the same point (see the contrast between (10a-c) vs. (10d)).

(10) a. [**$_{DP}$** [**hen gui** **de**] **na** shi ben shu]
very pricy DE that ten CL book
'those ten volumes of books, which are pricey'
b. [**na** [**$_{UnitP}$** [**hen gui** **de**] **shi** ben shu]]
that very pricy DE ten CL book
'those ten pricy volumes of books'
c. [na [shi **ben** [**$_{NP}$** [**hen gui** **de**] **shu**]]]
that ten CL very pricy DE book
'those ten volumes of books that are pricey'
d.* [na [**NumbP** **shi** [**hen gui** **de**] **ben** shu]]
that ten very pricy DE CL book
'those ten volumes of books that are pricey'

The second piece of evidence is based on the phenomenon of nominal coordination. Aoun and Li (2003) point out that coordinators in Mandarin exhibit categorial restriction. Coordinators that are relevant to nominal expressions are summarized in (11).

(11) a. ***jian*** 'and': coordinates two NPs
b. ***he*** 'and': coordinates two DP

The example in (12) shows that when two phrases lower than the UnitP (their classifier) are coordinated, *jian* 'and' is used, but not *he* 'and'.

(12) Wo xiang zhao yi ***ge*** [**$_{NP}$** [**$_{RC}$** fuze yingwen de] [**$_{NP}$** mishu]]
I want find one CL charge English DE secretary
jian/*he [**$_{NP}$** [**$_{RC}$** jiao xiaohai de] [**$_{NP}$** jiajiao]].
and teach kid DE tutor
'I want to find a person who can be a secretary that takes care of English (matters) and can be the kids' tutor.'

Nonetheless, when two conjuncts both have demonstratives, only *he* 'and' is allowed, e.g., (13).

(13) Wo xihuan [**$_{DemP}$** [**$_{RC}$** fuze yingwen de] [**$_{DP}$** ***na*** yi ge mishu]]
I like charge English DE that one CL secretary
jian/he** [**$_{DP}$** [**$_{RC}$** jiao xiaohai de] [**$_{DP}$** ***na yi ge jiajiao]].
and teach kid DE that one CL tutor
'I like the secretary who takes care of English (matters) and the tutor that teaches kids.'

Based on the proposed structure (7), one may predict that UnitPs can be coordinated. Example (14) shows that the relative clauses signal that the maximal UnitP are coordinated by *he* 'and'.

(14) Wo xihuan ***na*** [$_{\text{UnitP}}$ [$_{\text{RC}}$ fuze yingwen de] [$_{\text{UnitP}}$ san wei mishu]]
I like that charge English DE three CL secretary
jian/he [$_{\text{UnitP}}$ [$_{\text{RC}}$ jiao xiaohai de] [$_{\text{UnitP}}$ liang wei jiajiao]].
and teach kid DE two CL tutor
'I like those three secretaries who take care of English (matters) and those two tutors that teach kids.'

Notice that no matter which coordinator is used, two numeral phrases cannot be the conjuncts.

(15) *Wo xihuan na [$_{\text{NumP}}$ [$_{\text{RC}}$ fuze yingwen de][$_{\text{NumP}}$ san]
I like that charge English DE three
jian/he [$_{\text{umP}}$ [$_{\text{RC}}$ jiao xiaohai de] [$_{\text{NumP}}$ liang wei mishu]].
and teach kid DE two CL secretary
'I like those three secretaries who take care of English (matters) and those two tutors that teach kids.'

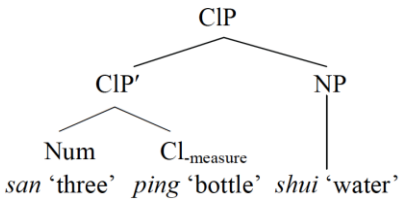
The data about modifiers and coordination show that UnitP is syntactically dominating NP but the NumP is structurally different from other phrases within a nominal expression and is better analyzed as the specifier of UnitP as proposed. Structures similar to (7) can be found in analyses taking a non-unified approach, such as Cheng and Sybesma (1998), Zhang (2011, 2013), Li (2011), and Li and Rothstein (2012). Independently, Zhang (2013) proposes the same UnitP structure but only proposes it for measure words that express individual or individuating interpretation. I depart from these proposals and will show in the following sections that the proposed UnitP in (7) alone explains the syntactic behaviors of measure words in a simpler and unified way.

3.1 Problems in Left-Branching Analyses

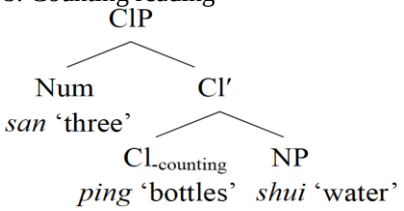
In this section, I show that a left-branching structure is neither plausible nor required, and therefore, the non-unified approach and left-branching analyses are not tenable. In turn, I show that the proposed right-branching structure (7) provides a straightforward and unified explanation to the syntax of Mandarin measure words.

Following Li (2011), Li and Rothstein (2012) claim that a "measure" vs. "counting" difference corresponds to two different syntactic structures of measure words. They argue that the "measure" reading of measure words is expressed by a left-branching structure (i.e., (16a)) and the "counting" reading is expressed by a right-branching structure (i.e., (16b)).

(16) a. Measure reading



b. Counting reading



Li and Rothstein (2012:709-710) propose that a classifier may carry either a measure reading or a counting reading. When it expresses a measure reading, the classifier and the numeral form "a complex classifier" that combines with NP through a left-branching structure (i.e., (16a); see also Tang 1990). Therefore, the numeral within the complex classifier is obligatory (e.g., (17a)). If a classifier expresses a counting reading (e.g., (17b)), it heads a right-branching structure (16b) taking NP as its complement and the numeral as an optional modifier.

(17) a. Measure reading

Ta-de	jiuliang	shi	*(yi)	**ping**	hong-jiu.
his	drinking-ability	be	one	CL.bottle	red-wine

'His drinking-ability is one bottle of red wine.'

b. Counting reading

Ta	zuo-shou	na	le	(yi)	**ping**	hong-jiu.
he	left-hand	take	PERF	one	CL	red-wine

'He is crrying a bottle of red wine in his left hand.'

Nonetheless, there are problems in this analysis. The first problem concerns their proposed structure. Li and Rothstein (2012) do not specify how the complex classifier in (16a) combines with the NP. According to X. Li (2011), the complex classifier "modifies" the NP, but the structure (16a) presents the whole constituent as a Classifier Phrase.

The second problem is that their claim of complex classifiers in (16a) is not empirically supported: a numeral expression in such "complex classifiers" can be as large as a phrase that normally does not undergo head incorporation (e.g., *chaoguo yi* 'more than one' in (18)).

(18)

Ta-de jiuliang	juedui	shi chaoguo	yi	**ping**	hong-jiu.
his drinking-ability	definitely	be more.than	one	CL.bottle	red-wine

'His drinking-ability is definitely more than one bottle of red wine.'

The third problem concerns the NP ellipsis. Zhang (2013) points out that according to Li (2011), the numeral-classifier sequence in (16a) modifies the noun, and thus, the modified NP cannot be deleted, unlike (16b) where the noun is the complement and can be deleted. Zhang indicates that, however, even under a measure reading, the so-called modified noun can still be deleted, as in (19) (see also (6)). The above examples show that the analysis (16) is not plausible.

(19)

Baoyu yao	mai san	**bang** yingtao,	Daiyu	yao	mai	wu	**bang**	~~yingtao~~.
Baoyu want	buy three	pound cherry	Daiyu	want	buy	five	pound	

'Baoyu wants to buy three pounds of cherries, and Daiyu wants to buy five pounds.'

Proposing a different non-unified account, Zhang (2013) argues that measure words expressing "individual, or individuating" readings head a Unit Phrase (i.e., UnitP in (7)) and move to a higher Spec,QuantP. Words expressing standard measurements, collective, container, or partitive readings require a left-branching structure (similar to (2) or (16) above). The motivation behind this non-unified account is essentially based on the fact that sometimes the modifiers of measure words can contradict modifiers of the noun. An example is shown in (20).

(20)

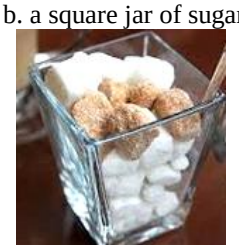
yuanyuan-de	yi	guan	**fang**	tang
round-DE	one	CL.jar	square	sugar

'a round jar of sugar cubes'

In (20), the modifier of the measure word (*yuanyuan-de* 'round') contradicts the modifier of the noun (*fang* 'square'). Zhang argues that a left-branching structure is required in order to block such modifiers from c-commanding the NP, so that the scope of the left-peripheral modifier excludes the NP. However, unlike Zhang's proposal, I believe examples like (20) are exactly the supporting evidence for UnitP being an independent projection dominating NP. I argue that the occurrence of Unit head changes the semantic core of the whole nominal expression. Examples like (20) require the NP to be interpreted under the scope of the measure word *guan* 'jar'. That is, the sugar cubes in (20) have to be organized and referred as a unit of "a round jar", as exemplified in (21a), rather than other types of units (e.g., (21b)). Also notice that a reading like "round-jar-shaped sugar cubes" is never available in expressions like (20) (if we assume a left branching structures).

(21) a. a round jar of sugar cubes

b. a square jar of sugar cubes



Unlike Zhang's proposal, I argue that it is because UnitP dominates NP and expresses the semantic core of the whole nominal expression, the structure allows the modifiers of UnitP to be semantically contradict the modifiers of NP.[3] This idea is not novel, just as TP is relevant to and is extended from *v*P/VP, and TP structurally c-commands *v*P/VP, but sentential adverbs only target TP; same as the relation between a transitive verb and its object NP, where the semantic evaluation of the VP modifiers is semantically independent of its complement NP. It is true that sometimes there is a correlation between the substance/individual and the unit/group of the substance/individual. When it is the case, we may find the modification of Unit extends to its following NP. I suppose that such semantic effects can also be explained under the current analysis (7) through c-command. Thus, I propose that the UnitP alone can also account for the same range of facts without complicating the syntax of measure words. Given the current proposal, one may predict that adjectives that only modify NP cannot modify UnitP. The prediction is borne out.

(22) a. [$_{\text{UnitP}}$ san jian [$_{\text{NP}}$ **shiqian-de** guwu]]
three CL prehistoric-DE antiquity
'three pieces of prehistoric antiquities'

b.?* [$_{\text{UnitP}}$ **shiqian-de** san jian [$_{\text{NP}}$ guwu]]
prehistoric-DE three CL antiquity

In sum, I argue that left-branching structures do not straightforwardly account for the phenomenon at issue. In the next section, I compare the widely adopted right-branching analysis with my simplified right-branching structure. I will show that UnitP is syntactically and phonologically motivated, and that the current proposal naturally accounts for other related phenomena.

3.2 A Simplified Right-Branching Analysis: UnitP

3.2.1 Number Phrase Parasitic on Unit: Against NumP > UnitP

In the literature, proposals for a unified right-branching structure usually analyze Number Phrase (NumP) as an independent projection dominating Classifier Phrase (CLP), and CLP dominates NP (see Tang 1990, Cheng and Sybesma 1999, Li 1999, Borer 2005, and Huang, Li and Li 2009).

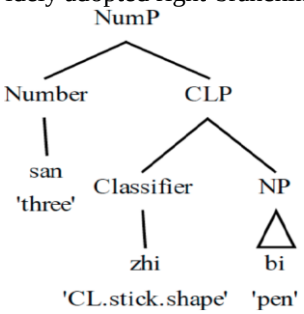
[3]In this paper, I do not consider examples like (i). It is known that examples with adjectives immediately precede classifier are rare; usually only size adjectives, *da* 'big' and *xiao* 'small', can occur in that position. I assume that such expressions are real complex classifiers formed morphologically before entering syntax.

(i) liang da-pian xiao binggan
two big-CL.piece small cookie
'two big-pieces small cookies'

Note that the adjective in the complex classifier does not perform like an adjective phrase. That is, it cannot be realized with the *de*-marker (e.g., (iia)), and it cannot be modified by adverbs like *hen* 'very' (e.g., (iib)).

(ii) a.*liang da-**de**-pian xiao binggan b.*liang **hen**-da-pain xiao binggan
two big-de-CL.piece small cookie two very-big-CL.piece small cookie

(23) Widely adopted right-branching structure



However, the structure (23) faces some empirical problems. To begin with, a noun may occur alone or with a Unit, but a noun cannot be accompanied by a numeral alone.

(24) a. Wo jian-guo [$_{N}$ **gou]**.
I see-EXP dog
'I have seen dogs/a dog.'

b. Wo jian-guo [$_{Unit}$ **zhi**] [$_{N}$ **gou**].
I see-EXP CL dog
'I have seen a dog.'

c. *Wo jian-guo [$_{Number}$ **san**] [$_{N}$ **gou**].
I see-EXP three dog
'I have seen three dogs.'

The contrast between (24a-b) and (24c) is not expected under the structure (23), if we assume that number, Unit, and noun are heads of individual projections, and it is not clear why only the numeral behaves differently. Notice that demonstratives can also co-occur with noun alone, like Unit.

(25) Wo jian-guo [$_{Demonstrative}$ **na**] [$_{N}$ **gou**].
I see-EXP that dog
'I have seen that dog.'

In fact, a numeral must co-occur with a Unit within a nominal expression. The examples in (26) and (27) show that the grammaticality with or without Unit is consistent in both indefinite and definite expressions.

(26) a. *Wo jian-guo ***san*** gou.
I see-EXP three dog
'I have seen three dogs.'

b. Wo jian-guo ***san*** **zhi** gou.
I see-EXP three CL dog
'I have seen three dogs.'

(27) a. *Wo jian-guo na ***san*** gou.
I see-EXP that three dog
'I have seen those three dogs.'

b. Wo jian-guo na ***san*** **zhi** gou.
I see-EXP that three CL dog
'I have seen those three dogs.'

If one postulates that Number Phrase dominates Unit (classifier) and noun, it is difficult to explain why the occurrence of the numeral always relies on the occurrence of classifier, a constraint not observed in other heads within nominals. Instead, the current analysis shows that Unit and N are head elements whereas number phrase is the specifier of UnitP. It structurally suggests that head elements can each co-occur with a noun, but number is less independent.

3.2.2 The Third-Tone Sandhi: Against NumP> UnitP

The phenomenon of the third tone sandhi also indicates that the proposed structure (7) is preferred. In Mandarin, the third tone [214] must undergo tone sandhi and become the second tone [35] when the syllable carrying [214] is followed by another syllable carrying [214], e.g., (28).

(28) Mandarin Third tone sandhi:

	lao.shu ‘mouse’
a. Underlying tone:	**214**.214
b. Surface tone:	**35**.214

In addition to words and compounds, the third tone sandhi rule also applies within phrases and sentences. The generalization reported in the phonology literature is that when the structure is left-branching, only one sandhi pattern is observed, but when the structure is right-branching, more than one pattern is available (see Duanmu 2005 and the references therein). While there is no consensus on the domain of application in phonology literature, interesting, if we pay closer attention to the syntactic structure of the data reported in Duanmu (2005), we find that among the right-branching examples, the sandhi rule applies optionally between a head and its complement, however, if a phrase serves as a specifier/modifier of a head, the sandhi rule applies obligatorily. For instance, adverbs are generally analyzed as specifier/modifier of the head adverb or the head verb in an Adverb Phrase or a Verb Phrase, respectively. The examples in (29) show that adverbs and their head always form a prosodic unit, and the third tone sandhi rule always applies.

(29) a. [$_{VP}$ [$_{AdvP}$ [$_{AdvP}$ hen] hao] yang] ‘very easy to raise’

	very	good	raise
Underlying tone:	214	214	214
Surface tone:	**35**	**35**	214

b. [$_{VP}$ [$_{AdvP}$ gan.jin] mai] ‘buy hurriedly’

	hurriedly	buy
Underlying tone:	214.214	214
Surface tone:	**35.35**	214

Similarly, assuming that adjectives are specifier/modifier of the head noun, we find examples like (30) showing that the same tone sandhi phenomenon is observed between adjectives and nouns, i.e., the third tone sandhi rule is applied obligatorily.

(30) a. [$_{NP}$ [$_{AdjP}$ hao] jiu] ‘good wine’

	good	wine
Underlying tone:	214	214
Surface tone:	**35**	214

b. [$_{NP}$ [$_{AdjP}$ jue mei] jing.guan] ‘splendid view’

	exceptionally	beautiful	landscape
Underlying tone:	35	214	214.55
Surface tone:	35	**35**	214.55

When we test the third tone sandhi rule within nominal expressions, it shows another interesting argument supporting (7), but against (23). (31) shows that the third tone sandhi rule always applies between the numeral (*wu bai* ‘five hundred’) and the Unit (*dang*), although it can be optionally applied between the classifier (*dang*) and the noun (*ying.pain* ‘movie’) (cf. (31b) vs. (31c)).

(31)

		wu.bai	*dang*	*ying.pian* ‘five hundred movies’
		five.hundred	CL	movie
a.	Underlying tone:	214.214	214	214.51
b.	Surface tone:	**35.35**	**35**	214.51
	Syntax structure: [$_{UNITP}$			]
c.	Surface tone:	**35.35**	214	214.51
	Syntax structure: [$_{UNITP}$			[$_{NP}$]]

Following the generalization reported in the phonology literature, the two acceptable tonal patterns (31b) and (31c) indicate that the phenomenon at issue involves "right-branching structure", since more than one tonal pattern is available. Now, one may wonder why the third tone sandhi rule only optionally applies between Unit and NP. According to Cinque's (1993) Null Theory of Phrase Stress, when a complement is present, the complement is the stress bearer, rather than the head and the specifier, and specifiers/modifiers are always weak. Given the Mandarin data presented so far, I hypothesize that Cinque's proposal on phrasal stress assignment may be applied to the phenomenon of third tone sandhi within the phrasal domain in Mandarin. That is, the third tone sandhi rule obligatorily applies between the numeral and the classifier (e.g., (31b) and (31c)) since the numeral is the specifier of UnitP. The sandhi rule, however, has an option between the Unit and the NP: the sandhi rule can apply because two third tones are adjacent (e.g., (31b)), but it does not have to apply (e.g., (31c)) because NP is syntactically the complement of Unit.

Following the same line of reasoning, if one analyzes NumP taking a classifier phrase as its complement (as (24)), this analysis would wrongly predict that the sandhi rule could be optionally apply between the numeral and the Unit, contrary to the fact (e.g., (31) above vs. (32) below).

(32)		*wu.bai*	*dang*	*ying.pian* 'five hundred movies'
		five.hundred	CL	movie
a.	Underlying tone:	214.214	214	214.51
b.	*predicted tone:	**35.** 214	214	214.51
c.	Syntax structure: [$_{NUMP}$	[$_{CLP}$		[$_{NP}$]]]

4 Syntax-Semantics Correlations

The current proposal suggests that a nominal expression in Mandarin may be realized as a phrase of distinct size (e.g., DP, UnitP, NP). I have shown that a nominal expression in Mandarin may appear as Noun alone or as Noun accompanied by one or both of Demonstrative and Unit. However, Number appears only contingently on the introduction of Unit, as expected under the proposed analysis in (7). I argue that measure words should be analyzed as the head of UnitP and that its occurrence changes the semantic core of the whole nominal expression. The realization of UnitP syntactically expresses quantity and or measurement of a defined unit of nouns.

Given the proposal, one may infer that when the UnitP is projected as the highest projection of a nominal, such an expression only denotes quantity of a unit, and that such an expression would not be referential. The conjecture is borne out. Example (33) shows that a quantity-denoting adverb, *yigong* 'altogether', is not compatible with a referential DemP, but only with UnitP.[4]

(33) a.	Ta	***yigong***	mai-le	[$_{UnitP}$	wu	ben	shu].
	he	**altogether**	buy-PERF		five	CL	book
	'His purchasing of books totaled 5 volumes.'						
b.	#Ta	***yigong***	mai-le	[$_{DP}$	zhe wu	ben	shu].
	he	**altogether**	buy-PERF		this five	CL	book
	'He bought altogether these five books.'						

Moreover, it is known that a nominal expression containing only number-Unit-Noun is not referential, unlike a nominal expression containing a demonstrative. That is, UnitP cannot co-refer with or bind a pronoun, but a DP can, as shown in (34).

(34) a.	*[$_{UnitP}$	**San**	**ge**	**ren**$_i$]	tai-bu-qi	liang	jia ni	gei	**tamen**$_i$-de	gangqin.
		three	CL	man	lift-not-up	two	CL you	give	them -DE	piano
	'Three people cannot lift two (of the) pianos that you gave to them.'									
	(from Huang et al. 2009:290, modified with the proposed structure)									

[4] The sentence in (33b) may become acceptable when the speaker is pointing at five books that are physically present. The pragmatic effect involved is outside of the scope of the current study, so I leave the explanation for future study.

b. [$_{DP}$ **Na san ge ren**$_i$] tai-bu-qi liang jia ni gei **tamen**$_i$-de gangqin.
that three CL man lift-not-up two CL you give them -DE piano
'Those three people cannot lift two (of the) pianos that you gave to them.'

5 Concluding Remarks

In this paper, I proposed that UnitP should be identified as a distinct projection dominating NP in Mandarin. Unlike the non-unified accounts (Li 2011, Li and Rothstein 2012, and Zhang 2011, 2013) and the unified left-branching analyses, I argued that measure words should be syntactically analyzed as the head of UnitP taking NumP as specifier, and NP as complement. I showed that the realization of UnitP changes the semantic core of the whole nominal expression and that its complement NP has to be perceived and interpreted under the scope of UnitP. I had also shown that quantity denoting adverbs are only compatible with UnitP, and that when UnitP is projected as the highest projection of an expression, it is not referential, unlike DP. The proposed structure directly and correctly predicts the realization of the third tone sandhi, the nominal coordination and nominal internal ellipsis, and it avoids and explains problems in the previous analyses.

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