

# Interdependencies in Chinese Noun Phrases

Kersti Börjars

The University of Manchester

Christopher Hicks

The University of Manchester

John Payne

The University of Manchester

Proceedings of the LFG'18 Conference

University of Vienna

Miriam Butt, Tracy Holloway King (Editors)

2018

CSLI Publications

pages 109–128

<http://csli-publications.stanford.edu/LFG/2018>

Keywords: Classifiers, Noun phrase structure, Chinese

Börjars, Kersti, Hicks, Christopher, & Payne, John. 2018. Interdependencies in Chinese Noun Phrases. In Butt, Miriam, & King, Tracy Holloway (Eds.), *Proceedings of the LFG'18 Conference, University of Vienna*, 109–128. Stanford, CA: CSLI Publications.



## Abstract

In this paper, we propose a novel LFG analysis of the structure of Chinese noun phrases involving quantifiers and classifiers or measure words. The analysis accounts for the interdependencies between noun-phrase internal categories and the types of modifier they license by postulating a c-structure involving a spine of co-heads (D - Q - Class - N). This structure is more complex than the c-structure typically assumed for noun phrases in a variety of languages within LFG, but motivated specifically for Chinese both by the rigid ordering restrictions between these elements and the different categories of modifier permitted at each level. We argue, however, that the mutual interdependence of quantifiers and classifiers, and the (partial) complementary distribution between different types of classifier is a consequence of the f-structure features assigned to these. The analysis therefore exploits to the full the LFG distinction between a syntactically motivated c-structure and an independent level of f-structure.

## 1 Introduction

LFG generally takes a restrictive approach to functional categories in assuming that they are only warranted when a particular functional feature is associated with a structural position, such as for instance the finiteness of verb-second languages (see for instance (Kroeger, 1993) and Börjars et al., 1999). Based on these assumptions, D tends to be the only functional category used in noun phrases. However, in this paper, we will argue that the interdependencies between quantifiers and classifiers in Mandarin must be accounted for structurally through a spine of functional categories D – Q – Class – N in the noun phrase.

## 2 Classifiers and measure words

In Mandarin Chinese, a noun cannot combine directly with a numeral, other quantifier or demonstrative, but the noun must first combine with some element, as illustrated in (1) to (3) (grammatical examples from Her & Hsieh, 2010, 528).

- (1) \**yi shu*  
one book
- (2) *yi ben shu*  
one CL book  
'one book'
- (3) *yi xiang shu*  
one MW<sub>BOX</sub> book  
'one box of books'

---

<sup>†</sup>We are grateful for comments made by two anonymous reviewers and the LFG2018 audience.

We follow Tai & Wang (1990, 38) and many others in making a distinction between CLASSIFIER (2) and MEASURE WORD (3) (other terms for the same distinction are Sortal classifier vs Mensural classifier (Lyons, 1977, 463) and Classifier vs Classifier (Cheng & Sybesma, 1998)). Measure words themselves fall into a number of subtypes. In addition to the container subtype illustrated in (3), there are also at least standard measures (e.g. *gongjin* ‘kilo’), collections (e.g. *pian* ‘group’) and kinds (e.g. *lei* ‘type’). For a full heuristic classification, see Li (2013). In this paper, we will limit our discussion to the container subtype, leaving an analysis of other subtypes for future work.

These elements do not occur except when there is a numeral, quantifier or demonstrative, as the ungrammaticality of the examples in (4) and (5) illustrate. Hence there is a mutual dependency.

- (4) \*ben shu  
CL book
- (5) \*xiang shu  
MW<sub>BOX</sub> book  
‘one box of books’

Following Zhang (2013), we will use UNIT WORDS to refer collectively to classifiers and measure words. Measure words generally denote a quantity of the entity named by a noun and exist in all languages in some form. As noted above, though, when we refer to measure words in this paper we intend the discussion to apply specifically to the container subtype. Classifiers are elements which categorise a class of nouns by picking out some key property associated with entities named by the class of nouns. Classifiers uniquely set apart a number of Southeast Asian languages, indigenous languages of western Americas, and Sub-Saharan African languages (Nichols, 1992, 200).

The use of elements with a classifier function in Chinese dates to over 3,300 years ago (see for instance Erbaugh, 1986; Peyraube, 1991; Wang, 1994). The estimates of the number of classifiers vary greatly, partly because the distinction between measure words and classifiers is not always made, or not made along the same lines (for different estimates, see for instance Erbaugh, 1986; Hu, 1993; McEnery & Xiao, 2010). Prescriptively, there is one “correct” classifier for most nouns, for instance *zhi* with animals or *zhang* for flat things, or more specialised ones such as *pi* for horses and *ben* for books. However, usage varies greatly and *ge*, which can be used with all countable nouns, is used with increasing frequency; in a corpus study McEnery & Xiao (2010, 50) show that *ge* accounts for 38.8% of all unit word tokens in the texts they examined.

### 3 Interaction between classifiers and measure words

As pointed out by Her & Hsieh (2010), classifiers and measure words seem at first sight to be mutually exclusive and hence to occupy the same slot:

- (6) yi ben shu  
one CL book  
'one book'
- (7) yi xiang shu  
one MW<sub>BOX</sub> book  
'one box of books'
- (8) \*yi xiang ben shu  
one MW<sub>BOX</sub> CL book
- (9) \*yi ben xiang shu  
one CL MW<sub>BOX</sub> book

However, a numeral immediately preceding a unit word affects the two types differently; in the case of a classifier, it counts units of the main noun itself, whereas a pre-measure word numeral independently counts units of the measure word. Hence the two can co-occur in contexts where both the noun and the measure word are counted, as in (10) (from Her & Hsieh, 2010, 536).

- (10) yi xiang shi ke pingguo  
one MW<sub>BOX</sub> ten CL apple  
'one box of ten apples'

Measure words can be stacked, as illustrated in (11), but classifiers cannot (12). If there is a classifier, there can only be one and it must be the lowest unit word; compare (10) and (13) (from Her & Hsieh, 2010, 536)

- (11) yi xiang shi bao pingguo  
one MW<sub>BOX</sub> ten MW<sub>PACK</sub> apple  
'one box of ten packs of apples'
- (12) \*yi ge shi ke pingguo  
one CL ten CL apple
- (13) \*yi ge shi bao pingguo  
one CL ten MW<sub>PACK</sub> apple

### 3.1 Attributive modification

In general noun-phrase internal modifiers must be marked by *de* in Chinese. In (14) we see a *de*-marked relative clause and in (15) a possessive pronoun (Li, 2013, 62).

- (14) wo mai de shu  
I buy DE book  
'the book(s) that I bought'
- (15) ta de shu  
he/she DE book  
'his/her book(s)'

In (16) we see *de* used with a disyllabic adjective, with co-ordinated adjectives in (17) and with a modified adjective in (18) (Zhang, 2012, 127). These are generally argued to be the adjective types that obligatorily require *de*. However, Paul (2010, 121–122) shows with reference also to earlier literature that this generalisation is not accurate; there are some more complex adjectives and adjective phrases that can also occur without *de*.

- (16) congming de haizi  
clever DE children  
'clever children'
- (17) chang erqie cu de xianglian  
long and thick DE necklace  
'long and thick necklace'
- (18) hen chang de xianglian  
very long DE necklace  
'very long necklace'

Structurally, adjectives that can occur attributively without *de* can also occur with it (though see Paul (2010) for semantic implications that render some combinations infelicitous). The distinction between *de* modification and *de*-less modification will be relevant to us, but the exact membership of each type will not since only a small number of *de*-less adjectives are of relevance to us.

When a noun is preceded by a classifier, the standard position for attributive adjectives is immediately preceding the noun, whether it is *de* or *de*-less modification as in (19) and (20).

- (19) yi ke da pingguo  
one CL big apple  
'one big apple'
- (20) yi ke hen da de pingguo  
one CL very big DE apple  
'one very big apple'

Classifiers cannot be preceded by any kind of *de* modifier, but a restricted set of simple “dimensional” adjectives are acceptable in pre-classifier position. However, semantically, pre-classifier modifiers still modify the main noun as shown in (21) (Li, 2013).

- (21) yi da ke pingguo = yi ke da pingguo  
one big CL apple      one CL big apple  
'one big apple'      'one big apple'

Measure words behave in a similar way to classifiers structurally in that only the same small set of dimensional adjectives can precede them. However, they differ from classifiers in that the preceding adjective semantically modifies that measure

word, as it would a noun (Her & Hsieh, 2010, 537).

- (22) yi da xiang pingguo  $\neq$  yi xiang da pingguo  
one big MW<sub>BOX</sub> apple      one MW<sub>BOX</sub> big apple  
'one big box of apples'      'one box of big apples'

Adjectival modifiers marked by *de*, but not simple adjectives, are also permitted in pre-quantifier position (see Li, 2013, 174). This is referred to by Zhang (2012) as the left-peripheral position. It is illustrated in (23).

- (23) hen da de yi ge xigua  
very big DE one CL watermelon  
'one very big watermelon'

There appears to be little, if any, semantic difference between the adnominal and left-peripheral positions.

Modifiers marked by *de* are generally assumed to be phrasal (see for instance Fan, 1958; Huang, 1989; Tang, 1990), but there is some argument about the status of *de*-less modification. Sproat & Shih (1988, 1991) and others argue that the adjective forms a compound with the noun, but Paul (2010) argues against this position, and describes the combination as phrasal. We do not take a view on *de*-less modification in general, but we will assume that the small set of adjectives that can precede unit words are non-projecting adjectives.

## 4 Previous analyses

Previous analyses of classifiers and measure words outside LFG are typically torn between two difficult-to-reconcile requirements. Firstly, in order to account for the fact that classifiers and measure words are mutually exclusive in basic noun phrases consisting of a numeral and a noun, it is necessary to assume that they occupy the same slot, i.e. that they form a unitary formal category of unit words. On the other hand, in order to account structurally for the transparency of classifiers, but not measure words, to modification, it is necessary to assume a split analysis in which classifiers occur in a right-branching structure while measure words occur in a left-branching structure. Her (2012) provides an extensive review of how prior proposals address (or fail to address) this basic problem, as well as the first and only LFG analysis to our knowledge. Here we briefly discuss two more recent analyses, one split and one uniformly right branching, before turning to Her's uniformly left-branching proposal.

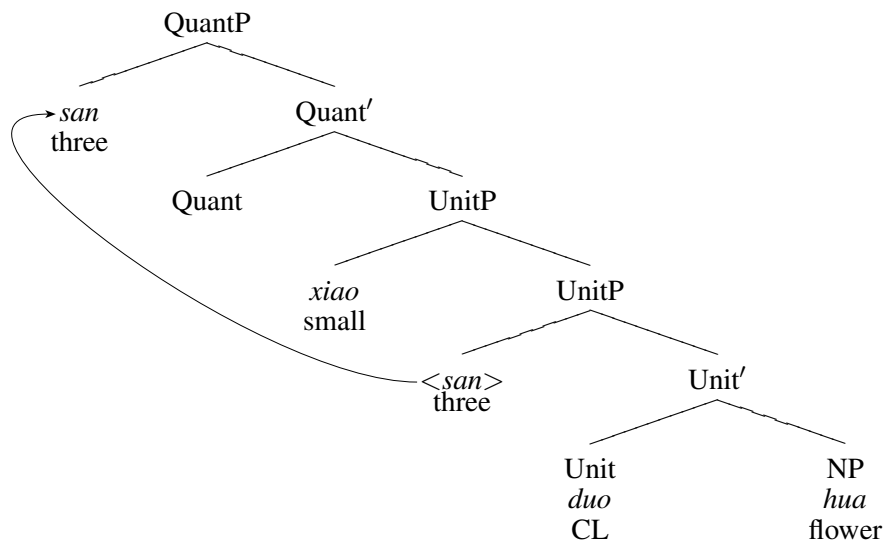
### 4.1 Zhang (2013)

Zhang (2013) proposes a complex split analysis which nevertheless attempts to maintain unit words as a unitary category. Classifiers and measure words are both Unit heads, although measure words start as noun heads which subsequently move

to the Unit head. Numerals originate structurally as the specifiers of the functional projection UnitP, later moving to the specifier of QuantP. In this framework UnitP then represents numerability, whether a noun can combine directly with a numeral. Dimensional adjectives which intervene between the numeral and the classifier then appear as adjuncts of UnitP.

(24) Right-branching structure for classifiers (Zhang, 2013, 233, ex (470b))

'three small flowers'

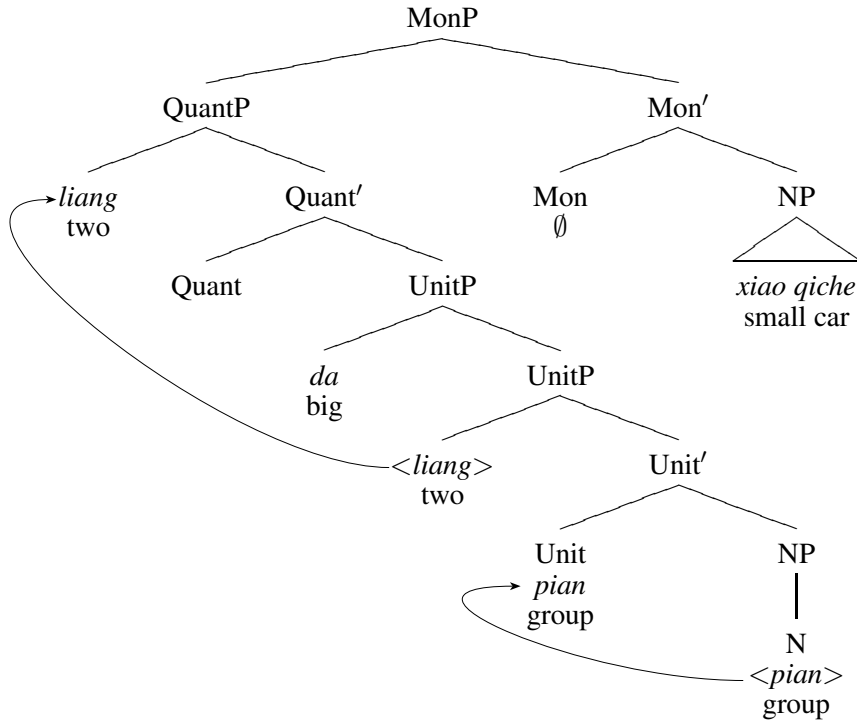


Any adjective in this structure, whether above or below the function head Unit, would c-command NP and thus scope over the NP below it.

By contrast, measure words are assumed by Zhang (2013) to occur in a (considerably more complex) left-branching structure as indicated in (25). The measure word used by Zhang to illustrate this structure belongs to the collection subtype, i.e. *pian* 'group', but container measure words are explicitly stated to have the same behaviour.

(25) Left-branching structure for measure words (Zhang, 2013, 235, ex (475b))

‘two big groups of small cars’



In this structure, the numeral and measure word sit inside the QuantP projection as before, but QuantP itself sits on a left branch of the main nominal projection (here represented by MonP, for "monotonicity phrase"). Ignoring the complexities of this analysis, which involves not only movement of the numeral but also the measure word, we see that any adjective within the QuantP branch of the tree is intended to apply to the measure word rather than NP. It is not clear, however, how this left-branching structure could account for examples in which measure words themselves are stacked.

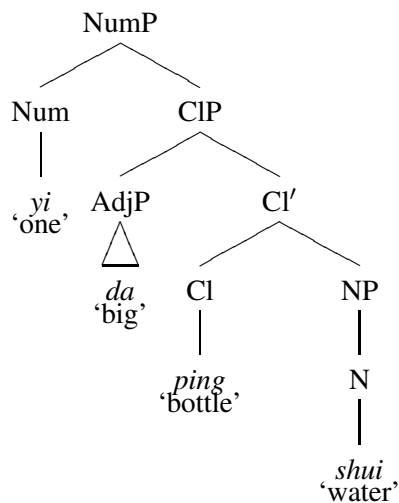
## 4.2 Li (2013)

Li (2013) proposes that unit words belong to a unitary category called Cl, distinguishing between subcategories as [ $\pm$ Count,  $\pm$ Measure]. In this system, classifiers are categorised as [+Count, -Measure] and the container subtype of measure word is [+Count, +Measure]. Other subtypes of measure word illustrate the remaining feature combinations, e.g. standard measures [-Count, +Measure] and kinds [-Count, -Measure]. The latter two will not concern us here, although we note that Li allows container measure words to function ambiguously as standard measure words when they denote the quantity associated with the container rather than the container per se, e.g. "six bottles of wine" when "six" does not literally count bottles, but the measure associated with bottles. For standard measures, Li adopts



a left-branching analysis. What we discuss here is the [+Count, +Measure] (container per se) reading, for which Li adopts the right-branching analysis given in (26).

(26)



Here, the projection CIP is headed by the classifier, and the CIP can itself be a complement of a higher functional category Num. Although Li does not explicitly give the tree structure for classifiers, it is claimed to be identical. That is, both classifiers and measure words belong to the same category Cl, and the structure assumed is uniformly right-branching.

Assigning classifiers and measure words to the same category has the advantage, as noted above, that these appear in complementary distribution in basic examples. As opposed to the split analyses, a uniform right-branching structure also has the advantage that in principle it might permit stacking of unit words as in examples (10) and (11). However, assuming that the NP in (26) does not branch further and cannot itself contain NumP, this structure as it stands does not permit any kind of stacking.

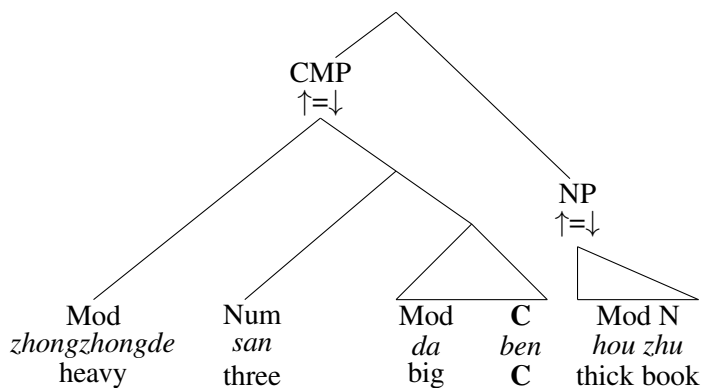
The uniform right-branching structure cannot also as it stands account structurally for the differences between classifiers and measure words with respect to adjectival modification. Li (2013, 184) addresses this issue by suggesting that the adjective in both the classifier and the measure word case applies to the constituent Cl + NP as a whole, rather than to the classifier itself. We agree that this is in principle correct. In the measure word case, Li adduces examples like *yi xiao bei putaojiu* (one small glass<sub>mw</sub> wine) ‘a small glass of wine’, where a possible interpretation is that the glass itself is big (on a scale of glass sizes) while the quantity of wine it contains is actually small (on a scale of amounts of wine). One puzzle is why Li does not think that this is a standard measure use of *putaojiu* ‘glass’, rather than the container use. The fact that an actual glass is involved, whatever its size, might then simply be a matter of pragmatic inference. Be that as it may, we note

that flexibility in the interpretation of scalar adjectives in container expressions is not exclusive to Chinese, but applies equally well to English which lacks classifiers and where containers are clearly denoted by nouns. The treatment of classifiers and measure words as belonging to the same category also obscures the basic distinctness of their contributions to the semantics. When a measure word is present, the scale implicit in the scalar adjective is in the first instance, in Chinese as in English, the size of the container, and in this respect measure words are clearly distinct from classifiers. Whether or not the contents of the container also form an appropriate scale depends very much on the nature of the contents: in the case of wine, there is a degree of pragmatic plausibility to the quantity of wine being an appropriate scale since units of alcohol are a prominent social concept. But a similar interpretation does not so naturally arise in examples like (26), where the content is water, or (22), where the contents are apples: ‘one small box of apples’ does not imply that the apples are small.

### 4.3 Her (2012)

Her (2012) crucially shows that within an LFG approach it is not necessary to account structurally for the differences between classifiers and measure words with respect to transparency to modification. He adopts a uniform left-branching approach in which classifiers and measure words belong to a unitary category CM. Both classifiers and measure words head CMPs which are sisters of NP, but classifiers are distinguished by being co-heads of N, while measure words have their own PRED value and head CMPs which function as an f-structure QUANTIFIER. Her does not indicate the category of the higher phrase to which CMP and NP belongs in each case. The two structures are shown schematically in (27) and (28) for classifiers and in (29) and (30) for measure words. It is the f-structure representation therefore that is split (Her, 2012, 1244-5). We would argue that the similarity between the c-structure trees in fact masks the fundamental difference between the two types: in effect, because of the significant difference in f-structure annotation (co-head vs non-co-head) CM is not really a unitary category.

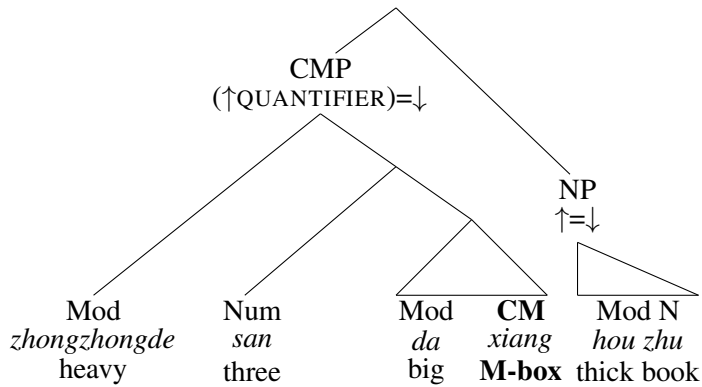
(27) Annotated left-branching tree for classifier



(28)

PRED	‘BOOK’
PROFILED	BEN
PROFILABLE	{ BEN, CE }
CARD	3
ADJUNCTS	$\left\{ \begin{array}{l} [ \text{“HEAVY”} ] \\ [ \text{“BIG”} ] \\ [ \text{“THICK”} ] \end{array} \right\}$

(29) Annotated left-branching tree for measure word



(30)

ADJUNCTS	$\left\{ \begin{array}{l} [ \text{“THICK”} ] \end{array} \right\}$						
PRED	‘BOOK’						
PROFILABLE	{ BEN, CE }						
QUANTIFIER	<table style="border: 1px solid black; padding: 5px;"> <tr> <td style="padding: 2px 10px;">PRED</td> <td style="padding: 2px 10px;">‘BOX’</td> </tr> <tr> <td style="padding: 2px 10px;">CARD</td> <td style="padding: 2px 10px;">3</td> </tr> <tr> <td style="padding: 2px 10px;">ADJUNCTS</td> <td style="padding: 2px 10px;"> <math>\left\{ \begin{array}{l} [ \text{“HEAVY”} ] \\ [ \text{“BIG”} ] \end{array} \right\}</math> </td> </tr> </table>	PRED	‘BOX’	CARD	3	ADJUNCTS	$\left\{ \begin{array}{l} [ \text{“HEAVY”} ] \\ [ \text{“BIG”} ] \end{array} \right\}$
PRED	‘BOX’						
CARD	3						
ADJUNCTS	$\left\{ \begin{array}{l} [ \text{“HEAVY”} ] \\ [ \text{“BIG”} ] \end{array} \right\}$						

It is immediately clear that any modifier in the classifier structure will be a member of the ADJUNCT set of the NP as a whole, while any modifier in the measure word structure will be in the ADJUNCT set of the QUANTIFIER. That is, “heavy” and “big” apply to “book” in (a) and “box” in (b).

We will exploit Her’s insight that classifiers should be analysed as co-heads in our own analysis below. We note however two difficulties with Her’s analysis. One

is conceptual: the fact that classifiers and measure words belong to a single category CM and both project to CMP requires the use of complicated implications to enforce a match between unit word type and CMP type. Without these there would be nothing to stop a measure word with a PRED value from occurring in a CMP with an  $\uparrow=\downarrow$  annotation and a clash of PRED values with the PRED of the head noun. The necessity for such a manoeuvre arises from the postulation of a "hybrid" category, at once functional and lexical. Ideally we would like to avoid such categories. The second difficulty is more serious, and concerns the inability of the analysis to encompass structures such as (11) in which multiple unit words occur. As already pointed out with respect to Zhang's (2012) analysis, these are difficult to reconcile with a left-branching structure. There is no place within a CMP for another CMP. And if, in order to account for examples like (11) with stacked measure words, we were to allow two CMPs each headed by a measure word on a separate branch within a single NP, this would project two QUANTIFIER attributes in the corresponding f-structure, violating the principle of functional uniqueness.

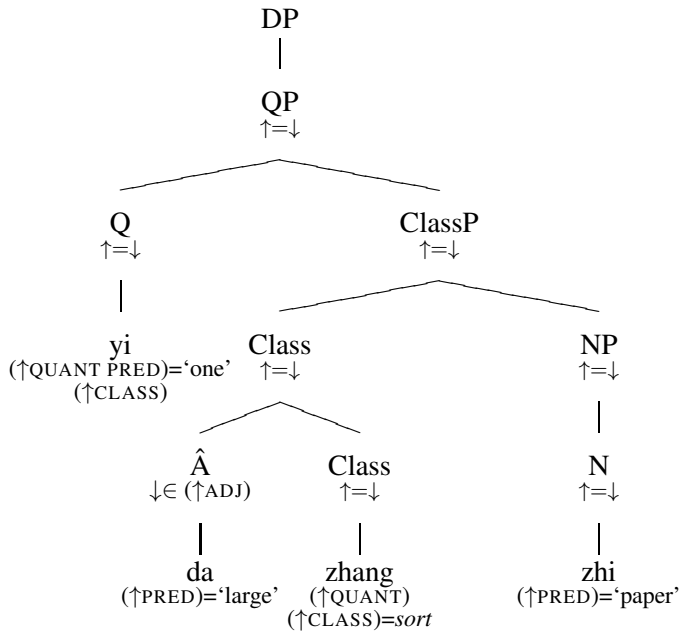
## 5 Our proposal

As suggested above, we adopt from Her (2012) the notion that classifiers should be treated as functional co-heads while measure words have their own PRED value. This accounts for the transparency of classifiers to modification. In order to account for unit word stacking, we adopt a uniform right-branching analysis, as proposed in a number of earlier structural analyses (for instance Cheng & Sybesma, 1998). Once the f-structure differences between classifiers and measure words are recognised, there is no fundamental barrier to a uniform right-branching analysis. Arguments for constituency which are based purely on the scoping of adjectival adjuncts lose their force. The requirement that classifiers are co-heads and measure words have their own PRED value entails however that they do not fundamentally belong to the same category. In our analysis, classifiers will belong to the functional category Class, while measure words will be (non-prototypical) nouns. The similarity between classifiers and measure words and their mutual incompatibility in basic structures will be treated as an f-structure characteristic.

### 5.1 Classifier c-structure

The structure we assign to classifiers is given in (31), using the example 'one large sheet of paper'.

(31)



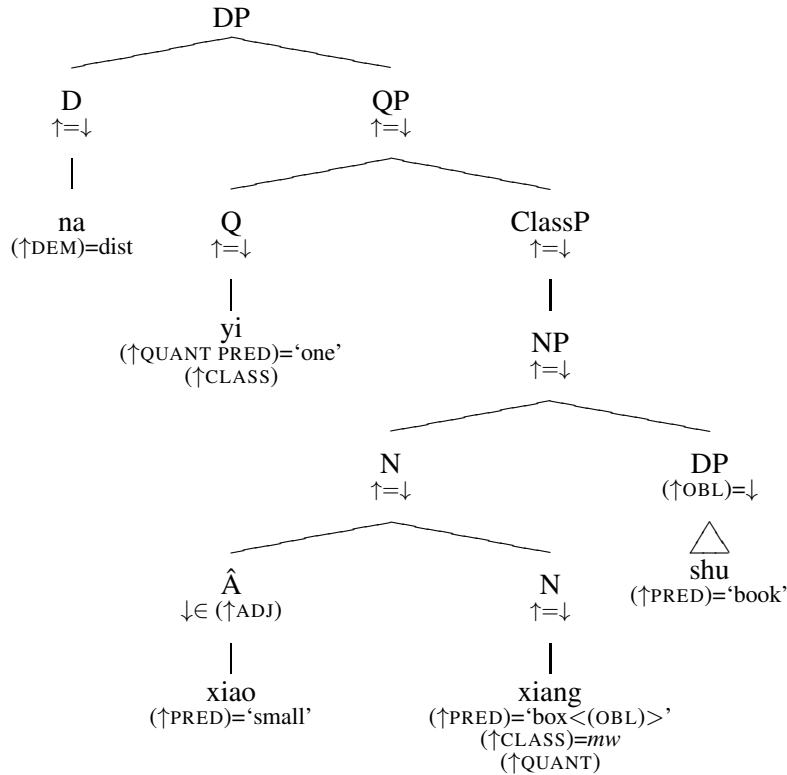
We assume for Chinese a richer hierarchy of functional categories than is typical for noun phrase analyses in LFG (and indeed for Chinese noun phrases within a minimalist framework, see Bošković (2013)). For illustrative purposes this hierarchy will include a DP projection which houses demonstratives. The hierarchy is justified not just by the strict ordering which is predicted (D - Q - Class - N), but also by the strikingly different modification possibilities at each level. As we have seen, NP modification, following the classifier, is the most varied, potentially consisting not just of single adjectives but also *de*-marked adjective phrases and relative clauses. The modification of a classifier is by contrast highly restricted: in effect it is a closed class of non-projecting mono-syllabic adjectives belonging to specific semantic subclasses. In line with the standard treatment of non-projecting categories in LFG Toivonen (2003), we assign these to the non-projecting category  $\hat{A}$  rather than the general category A (see also Sadler & Arnold, 1994). There is a further modification possibility associated with QP, as noted above and further illustrated in (23). This must be a *de*-marked adjective.

The mutual dependency between Q and CLASS is enforced by the f-structure annotations on these. The numeral is annotated (↑CLASS), an existential requirement that it occur within an f-structure where the value of CLASS is provided. The presence of a classifier satisfies this constraint, being annotated (↑CLASS) = *sort*. Conversely, a classifier, annotated (↑QUANT), requires the presence of a quantifier. Since Class (and Q) are co-heads, any modifier will be a member of the ADJUNCT set of the whole DP.

## 5.2 Measure word c-structure

The measure word structure is given in (32):

(32)

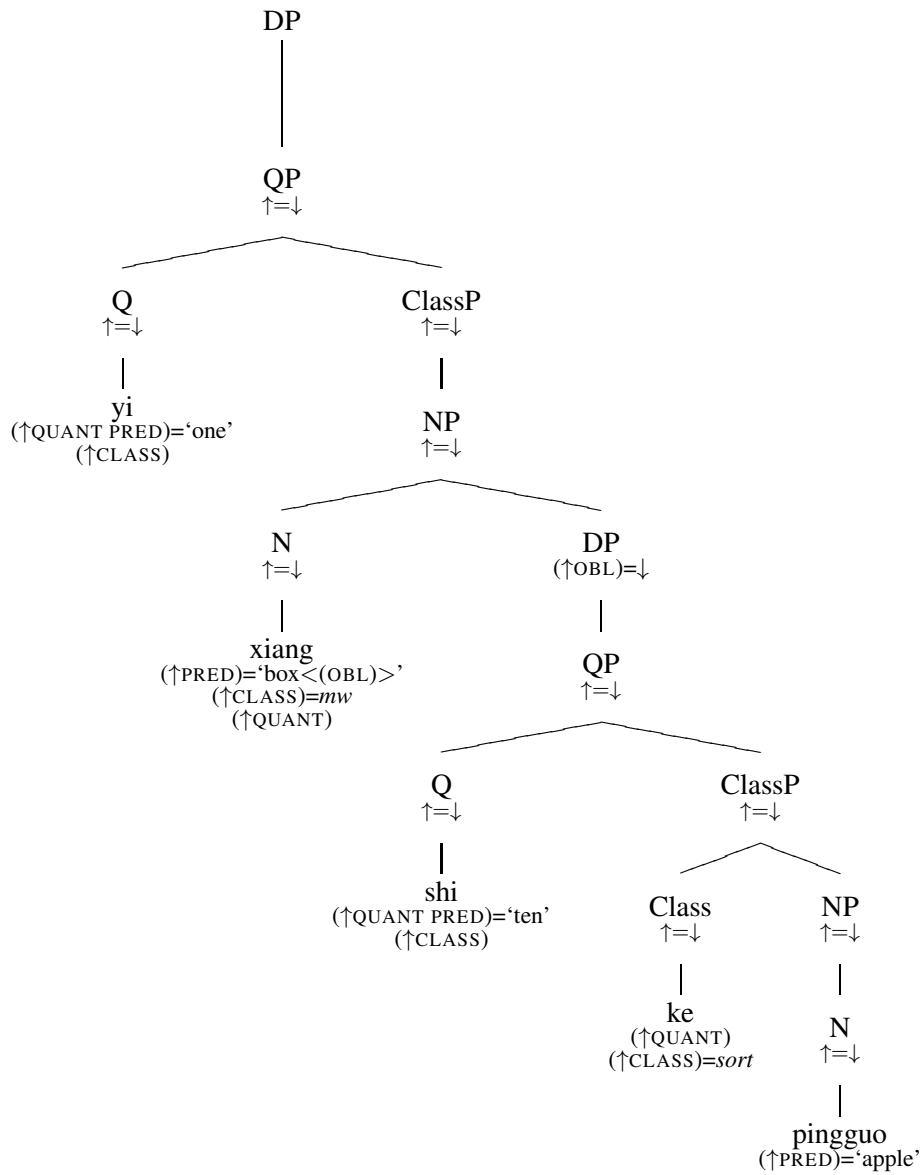


In this structure, the measure word is of category N and has its own PRED value. The similarity of measure words to classifiers is essentially captured by the f-structure annotation  $(\uparrow\text{CLASS}) = mw$ . Just as with classifiers, this annotation allows quantifiers to have their requirement for a unit word satisfied, and the different values of  $(\uparrow\text{CLASS})$  ensure, through functional uniqueness, that classifiers and measure words cannot co-occur within the same simple f-structure. There is no longer a need for them to occupy the same structural slot for this mutual incompatibility to be enforced.

Crucially, this PRED value assigned to measure words and which allows us to distinguish them lexically also allows us to specify an argument structure. In other words, a measure word, just like any relational noun, takes an argument. We assign this argument the relation OBL, similar to that of an English *of*-PP (although it could also appropriately be assigned the specifically noun-phrase role of NCOMP (Chisarik & Payne, 2001)). Structurally, this argument is potentially a full DP (including a demonstrative), and this straightforwardly permits the stacking of unit words that we have seen in (10) and (11). If a classifier occurs in such a DP,

predictably it will be the last unit word in the structure since the DP cannot simultaneously contain a measure word with its own new argument. In (33) and (34) we provide the c- and f-structure for (10) and in (35) and (36) for (11).

(33)

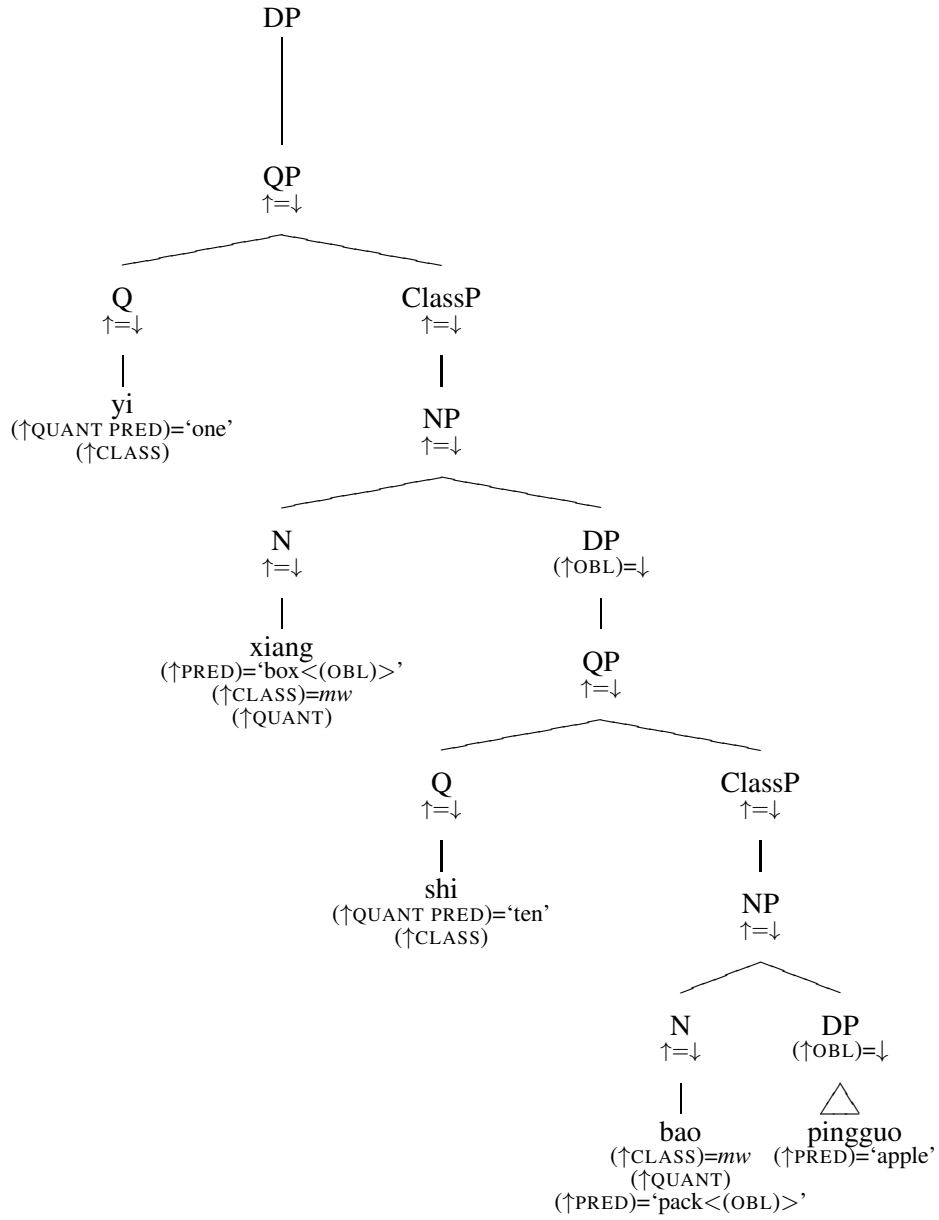


(34)

[	PRED	'BOX<OBL>'	]		
	CLASS	MW			
[	QUANT	[	PRED	'ONE']	]
	OBL	[	PRED	'APPLE'	
CLASS		SORT			
QUANT		[	PRED	'TEN']	



(35)





## References

- Börjars, Kersti, Erika Chisarik & John Payne. 1999. On the justification for functional categories in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG99 Conference*, Stanford, CA: CSLI Publications.
- Bošković, Željko. 2013. On NPs and clauses. In Günther Grewendorf & Thomas Ede Zimmermann (eds.), *Discourse and grammar: from sentence types to lexical categories*, 179–246. De Gruyter Mouton.
- Cheng, Lai-Shen Lisa & Rint Sybesma. 1998. Yi-wangtang, yi-getang: classifiers and massifiers. *Tsing-Hua Journal of Chinese Studies* New Series XXVIII(3). 385–412.
- Chisarik, Erika & John Payne. 2001. Modelling possessor constructions in LFG: English and Hungarian. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG01 Conference*, Stanford, CA: CSLI Publications.
- Erbaugh, Mary S. 1986. Taking stock: the development of chinese noun classifiers historically and in young children. In Colette G. Craig (ed.), *Noun classes and categorization: Proceedings of a symposium on categorization and noun classification, Eugene, Oregon, October 1983*, 399–436. Amsterdam & Philadelphia: John Benjamins.
- Fan, Jiyan. 1958. Xing ming zu he jian ‘de’ zi de yufa zuoyong [the grammatical function of *de* in the adjective-noun combination]. *Zhongguo Yuwen* 71. 213–217.
- Her, One-Soon. 2012. Structure of classifiers and measure words: A lexical functional account. *Language and Linguistics* 13(6). 1211–1251.
- Her, One-Soon & Chen-Tien Hsieh. 2010. On the semantic distinction between classifiers and measure words in Chinese. *Language and Linguistics* 11(3). 527–551.
- Hu, Qian. 1993. *The acquisition of Chinese classifiers by young Mandarin-speaking children*: Boston University Graduate School dissertation.
- Huang, Chu-Ren. 1989. *Mandarin chinese NP de – a comparative study of current grammatical theories*: Cornell University 1987 dissertation.
- Kroeger, Paul R. 1993. *Phrase structure and grammatical relations in Tagalog*. Stanford, CA: CSLI Publications.
- Li, XuPing. 2013. *Numeral classifiers in Chinese. The syntax-semantics interface*. Berlin, Boston: De Gruyter Mouton.
- Lyons, John. 1977. *Semantics*, vol. II. Cambridge: Cambridge University Press.

- McEnery, Tony & Richard Xiao. 2010. *Corpus-based contrastive studies of English and Chinese*. London: Routledge.
- Nichols, Johanna. 1992. *Linguistic diversity in space and time*. Chicago: University of Chicago Press.
- Paul, Waltraud. 2010. Adjectives in Mandarin Chinese. The rehabilitation of a much ostracized category. In Cabredo Hofherr Patricia & Ora Matushansky (eds.), *Adjectives formal analyses in syntax and semantics*, Amsterdam: John Benjamins.
- Peyraube, Alain. 1991. Some remarks on the history of Chinese classifiers. In Patricia M Clancy & Sandra A Thompson (eds.), *Santa Barbara paper in linguistics, vol 3: Asian discourse and grammar*, 106–126. Department of Linguistics, University of California, Santa Barbara.
- Sadler, Louisa & Douglas J Arnold. 1994. Prenominal adjectives and the phrasal/lexical distinction. *Journal of Linguistics* 30(1). 187–226.
- Sproat, Richard & Chilin Shih. 1988. Prenominal adjectival ordering in English and Mandarin. In *Proceedings of the North Eastern Linguistic Society meeting 18*, 465–489. Amherst, MA : GLSA.
- Sproat, Richard & Chilin Shih. 1991. The cross-linguistic distribution of adjective ordering restrictions. In Carol Georgopoulos & Roberta Ishihara (eds.), *Interdisciplinary approaches to language: essays in honor of S-Y Kuroda*, 565–593. Dordrecht: Kluwer.
- Tai, James & Lianqing Wang. 1990. A semantic study of the classifier *tiao*. *Journal of the Chinese Language Teachers Association* 25(1). 35–56.
- Tang, Chih-Chen Jane. 1990. *Chinese phrase structure and the extended X'-theory*: Cornell University dissertation.
- Toivonen, Ida. 2003. *Non-projecting words: a case study of Swedish particles*. Dordrecht: Kluwer.
- Wang, Lianqing. 1994. *Origin and development of classifiers in Chinese*: Ohio State University dissertation.
- Zhang, Niina Ning. 2012. Numeral classifier structures. Manuscript. National Chung Cheng University.
- Zhang, Niina Ning. 2013. *Classifier structures in Mandarin Chinese*. Berlin, Boston: De Gruyter Mouton.