Positions of Mandarin classifiers in and out of compounds: implications for distinctness, selection, and projection

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1. Introduction

The patterning of classifiers in Mandarin Chinese has played a key role in approaches to nominal syntax and semantics (Tang 1990, Cheng and Sybesma 1999, Li 1999, Hsu 2013, Zhang 2013, a.o.). While much of the existing literature focuses on properties of *pre-nominal classifiers*, which occur between numerals and head nouns (1), we focus in this paper on the relation between pre-nominal classifiers and *noun-classifier compounds* (henceforth N-Cl compounds) like (2), which has received less attention in the generative literature, with the exception of Zhang (2013). For presentational clarity, in all subsequent examples pre-nominal and compound-internal classifiers are shown in bold text.

(1) zheli you [san di shuil (2) zheli you [shui-di] here have three CL.DROP water here have water-CL.DROP 'there are three drops of water here.' 'there are water drops here.'

Our investigation leads us to several claims about the structure of nominal expressions. In Section 2, we review and adopt Zhang's (2013) argument that N-Cl compounds are generated by head movement of the noun. However, we depart from her claim that this movement targets a projection that occurs only in compounds; we instead propose that N-Cl compounds involve movement to a head of the same type of Classifier Phrase (ClP) projection that hosts pre-nominal classifiers, based on the observation that classifiers in both structures participate in identical s-selectional relations involving delimitability.

We then turn to a puzzle involving the distribution of classifiers in Mandarin. First, we discuss structures like (3), in which N-Cl compounds are preceded by a pre-nominal classifier, in relation to the fact that the same combinations of classifiers cannot occur in a pre-nominal position (4). If all classifiers are Cl heads with the same selectional properties, why is Cl co-occurrence only grammatical in (3)?

- (3) san {chuan /zhong /tong} shui-di three CL.STRING /CL.KIND /CL.BUCKET water-CL.DROP 'three {strings/kinds/buckets} of water drops'
- (4) *san {chuan /zhong /tong} di shui three CL.STRING /CL.KIND /CL.BUCKET CL.DROP water *Intended*: 'three {strings/kinds/buckets} of drops of water'

More generally, one must explain why the distribution of N-Cl compounds resembles that of simplex nouns, but not pre-nominal Cl+N sequences, which is at first unexpected if all classifiers are Cl heads.

While the patterns at first glance seem to support a lexicalist approach to compounds, we argue that they are more parsimoniously accounted for in a theory where compounds are generated in the syntactic

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derivation. We propose that key properties of pre-nominal and compound-internal classifiers are predicted by the interaction of general principles of the structure of phases (Chomsky 2000, et seq.). In Section 3.1, we show that the distributional difference between pre-nominal and compound-internal classifiers is captured by *phase extension* (Den Dikken 2007), the claim that head movement of a phase head extends its phase domain to include the target projection. In brief, assuming that the highest projection of the head noun is a phase head (Simpson and Park 2019), N-to-Cl movement extends its phase boundary from NP to ClP. The distributional similarity of N-Cl compounds to simplex Ns follows from the fact that both constituents correspond to an NP phase. In Section 3.2, we propose an account of the classifier co-occurrence pattern in (3). We claim that nominal expressions in Mandarin can contain multiple ClP projections (see also Liao and Wang 2011), contra the common assumption that all classifiers occupy a single position. The restriction of classifier co-occurrence to expressions that contain an N-Cl compound is explained by phase extension in conjunction with Richards' (2010) *distinctness condition*, which bans the linearization of sufficiently similar items within a phase. ClP recursion with head-adjacent pre-nominal classifiers violates distinctness, while the violation is obviated by the head movement that generates N-Cl compounds, which places the two ClPs in separate phases.

2. Pre-nominal and compound-internal classifiers in Mandarin

2.1. The structure of noun-classifier compounds

N-Cl compounds in Mandarin consist of a noun immediately followed by a classifier. As shown in examples (5)-(9), N-Cl compounds can be formed with most types of classifiers; we adopt the classifications of Zhang (2013), and refer the reader to that work for their definitions. N-Cl compounds can be productively formed with classifiers belonging to any of the types below, though with somewhat less productivity with *individual* classifiers. Classifiers of each type can occur either in an N-Cl compound (examples in a.), or as a pre-nominal classifier with the same head noun (examples in b.), with no difference in the type of object that the full expression refers to.

- (5) Individual classifier
 - a. hua-**duo** flower-CL.FLOWER 'flower'

b. san **duo** hua three CL.FLOWER flower 'three flowers'

- (6) Individuating classifier
 - a. shui-tan water-CL.PUDDLE 'water puddle'

b. san **tan** shui three CL.PUDDLE water 'three puddles of water'

- (7) Collective classifier
 - a. yang-qun sheep-CL.GROUP 'sheep flock'

b. san **qun** yang three CL.GROUP sheep 'three flocks of sheep'

- (8) Partitive classifier
 - a. xigua-pian watermelon-CL.SLICE 'watermelon slice'
- b. san **pian** xigua three CL.SLICE watermelon 'three slices of watermelon'

¹ The relative resistance of individual classifiers to occurring in compounds (ex. ?ren-ge 'person'-CL.HUMAN) is perhaps due to the fact that they do not themselves denote an entity distinct from the 'natural unit' of the noun.

² Standard measure classifiers (ex. *gongjin* 'kilogram') and container measure classifiers (ex. *bei* 'cup') pattern differently. Standard measure items cannot occur in compounds (ex. *xigua-gongjin, lit. 'watermelon-kilogram'), while compound-internal container measure items seem to pattern as nouns. For instance, while *bei* has a measurement reading as a pre-nominal classifier (ex. *yi bei kafei* lit. 'one cup coffee,'), it loses this reading in a compound (ex. *kafei-bei* lit. 'coffee-cup', a container that need not have coffee in it). Intuitively, it seems that these classifier types cannot occur in N-Cl compounds because measure items must occur in a counting structure, whereas N-Cl compounds can occur in the absence of counting. See Peng (2021) for additional discussion.

- (9) Kind classifier
 - a. shu-zhong tree-CL.KIND 'tree species'

b. san **zhong** shu three CL.KIND tree 'three species of trees'

Despite the surface similarity between N-Cl compounds and noun-noun compounds, there are reasons to analyze the second member of the compounds above as classifiers rather than nouns. First, many classifiers cannot occur in the distributional contexts that characterize nouns. For example, none of the classifiers in (5)-(9) can occur in the context in (10a), which otherwise freely admits nouns (10b).

- (10) a. *zheli you {duo /tan /qun /pian /zhong} here have CL.FLOWER CL.PUDDLE CL.GROUP CL.SLICE CL.KIND Intended: 'There are {flowers/puddles/groups/slices/species} here.'
 - b. zheli you {hua /shui /yang /xigua /shu} here have flower /water /sheep /watermelon /tree 'There is/are {flowers/water/sheep/watermelons/trees} here.'

More significantly, compound-internal classifiers participate in the same s-selectional relations as their pre-nominal counterparts. We adopt Zhang's (2013) proposal that the key selectional restrictions in the nominal domain should be stated in terms of *delimitability features*. In brief, delimitability refers to the ability of a classifier or noun to be characterized in terms of size (ex. big, small), shape (ex. round, triangle), or boundary (ex. part, whole). In Mandarin, [±DEL(IMITABLE)] features occur on both nouns and classifiers, and participate in two types of semantic-selection relations (Grimshaw 1979). First, classifiers can s-select delimitability properties of nouns that they occur with; shown below with the notation [SEL[±DEL]], following Peng (2021). For example, individuating classifiers like *kuai* 'piece' s-select a [-DEL] noun like *mutou* 'wood,' and cannot combine with a [+DEL] noun like *shu* 'tree,' and cannot combine with [-DEL] nouns like *mutou* 'wood' (12).

- (11) a. * [SEL[-DEL]] [+DEL] b. [SEL[-DEL]] [-DEL] yi kuai shu yi kuai mutou one CL.PIECE tree one CL.PIECE wood 'a piece of wood
- (12) a. [SEL[+DEL]] [+DEL] b. * [SEL[+DEL]] [-DEL] yi **pai** shu yi **pai** mutou one CL.ROW tree one CL.ROW wood 'a row of trees'

Crucially, these classifiers show the same s-selectional relations in compounds; individuating classifiers do not combine with [+DEL] nouns (13) and collective classifiers do not combine with [-DEL] nouns (14).

- (13) a. *shu-**kuai**tree-CL.PIECE
 b. mutou-**kuai**wood-CL.PIECE
 'wood piece'
- (14) a. shu-**pai** b. *mutou-**pai** tree-CL.ROW wood-CL.ROW 'row of trees'

In addition to the s-selectional features above, classifiers themselves can have inherent [$\pm DEL$] features (see Section 3.3 for individual classifiers as an exception). This explains restrictions on size adjectives like da 'big,' which must precede a [$\pm DEL$] item. For instance, da cannot occur with shui 'water' alone

because the noun is [-DEL] (15a). In contrast, da can occur with the same head noun if a [+DEL] classifier is present, regardless of whether it occurs in an N-Cl compound (15b) or in a pre-nominal position (15c).

Given their identity in terms of their defining formal features, and the 'one feature – one head' principle of identifying structure (Cinque and Rizzi 2009), we propose that all classifiers instantiate the same functional head Cl. As shown in (16), N-Cl compounds are generated by head-movement of the noun to Cl (see Simpson and Ngo 2018 for a similar analysis for Vietnamese); the absence of movement generates the pre-nominal classifier order (17). We remain agnostic about the internal structure of NP (or nP); all that is crucial is movement of the highest head corresponding to the lexical noun.



Note that there is no clear featural trigger for N-to-Cl movement. Rather, Mandarin appears to permit most Cl heads to occur with two variants; one that compels head movement, and one that does not (the dominant vs. recessive contrast of Hsu 2021). We expand upon the proposed structure for pre-nominal classifiers in the next section, while considering the patterning of N-Cl compounds with numerals.

3. Phase extension and distinctness in classifier co-occurrence

3.1. Phase extension and the distribution of N-Cl compounds

In terms of their distribution, N-Cl compounds occur in the same contexts that admit simplex nouns unmodified by a numeral, quantifier, or demonstrative. In contrast, pre-nominal classifiers typically must occur with a number or quantifier (for one exception, see Cheng and Sybesma 1999). For example, while bare simplex nouns and N-Cl compounds can occur as generic subjects in the context in (18), sequences of a pre-nominal classifier and noun do not. In essence, N-Cl compounds allow speakers to express the grouping and partition readings of classifiers, in the absence of a counting structure.

- (18) a. [shuiguo] hen haochi b. [shuiguo-**pian**] hen haochi fruit very delicious fruit-CL.SLICE very delicious 'Fruit is delicious.'
 - c. *[pian shuiguo] hen haochi
 CL.SLICE fruit very delicious

 Intended: 'Slices of fruit are delicious.'

Although the contrast between (18b) and (18c) is not immediately expected, given our claim that the nominal expressions in both examples contain the same projections, CIP and NP, the difference can be explained by two independent claims about properties of phases (Chomsky 2000). Following Simpson and Park (2019), we claim that the highest lexical projection of the noun, NP (or *n*P), establishes a phase boundary, as distinct from higher nominal phases like DP. Second, we assume that the movement of a phasal head results in the extension of its phase domain to the higher projection (Den Dikken 2007). Abstracting away from head-interal structure, the NP phase edges corresponding to N-Cl compounds and classifier-noun sequences are shown respectively in (19) and (20).

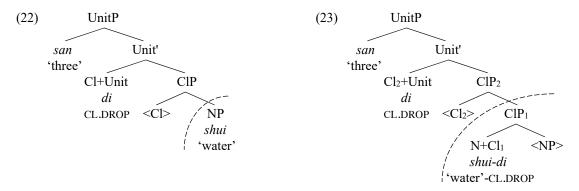


We claim that phase extension explains why N-Cl compounds share the same distribution as non-compound nouns. Even though N-Cl compounds contain more projections than simplex nouns, both items correspond to the same type of constituent, an NP phase. In contrast, pre-nominal Cls are subject to selectional restrictions and well-formedness requirements that hold of the higher phase (presumably DP), giving rise to the distinct distributional properties of non-compound ClPs from N-Cl compounds.

3.2. The distinctness condition and classifier co-occurrence restrictions

Like simplex nouns, N-Cl compounds cannot directly follow a number or quantifier. In this subsection, we present the two basic patterns that arise when N-Cl compounds occur in a counting structure, and their implications. First, all N-Cl compounds can be preceded by the default classifier *ge* or a reduplicated classifier identical to the compound-internal one, as shown in (21). In this pattern, the counted entity is always identical to the entity denoted by the N-Cl compound. In other words, these prenominal classifiers have no effect on the delimitability readings of the full expression. They are expletive-like in that they seem to occur only to fill a position that licenses the numeral or quantifier.

To account for this, we propose that numerals are specifiers of a projection UnitP, which dominates the ClP projection(s) where classifiers are first merged.³ In Mandarin, the specifier position of UnitP is licensed only if the Unit head is filled by a head-moved Cl, as consistent with a common pattern in which the specifier of a functional projection must be licensed by head movement (Den Dikken 2007, Hsu 2021). This analysis of pre-nominal classifiers is shown in (22) with a non-compound noun. We propose that classifier co-occurrence arises from a *recursive ClP* structure in which the noun moves to the lower Cl₁ and the higher classifier Cl₂ licenses the numeral by moving to Unit, as shown in (23).⁴



This analysis, with recursion of the same type of projection, is supported by the previous observations that all classifiers participate in the same s-selectional relations, and that the higher Cl_2 need not provide an independent delimitability reading from the compound-internal Cl_1 in examples like (21). Finally,

³ While the UnitP label is adopted from Hsu (2012) and Zhang (2013), our proposal differs from theirs in that we propose that classifiers are not first merged in this position, but moved there from a lower projection.

⁴ We put aside the question of why N-Cl compounds cannot move as a complex head to Unit, obviating the need for a second Cl to be Merged.

our account captures in structural terms the fact that classifiers in languages like Mandarin, which are obligatory in the presence of numerals, have two separate functions: they specify delimitability properties of the nominal expression, and they license counting elements. Cl heads carry inherent and s-selectional delimitability features, which can be observed independently of counting in N-Cl compounds. The ability to license counting arises from a distinct process: head movement of Cl to a higher Unit head.

In addition to the expletive pattern above, N-Cl compounds in counting structures can be preceded by a classifier of any other class (24), as long as s-selectional properties related to delimitability are satisfied. For example, the classifiers *chuan* 'row,' *zhong* 'kind,' and *tong* 'bucket' are compatible with the [+DEL] compound-internal classifier *di* 'drop.' This is particularly important in relation to the fact that all sequences of pre-nominal classifiers are ungrammatical (25), regardless of the semantic classes that they belong to (individual, individuating, partitive, collective, etc.) and their selectional restrictions.

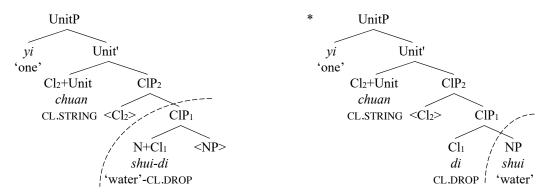
- (24) san {chuan /zhong /tong} shui-di three CL.STRING /CL.KIND /CL.BUCKET water-CL.DROP 'three {strings of/kinds of/buckets} of waterdrops.'
- (25)*san {chuan /zhong /tong} di shui three CL.STRING /CL.KIND /CL.BUCKET CL.DROP water *Intended*: 'three {strings/kinds/buckets} of drops of water'

Crucially, the fact that these pre-nominal classifiers can co-occur with N-Cl compounds shows that the ungrammaticality of pre-nominal classifier sequences like (25) arises from a *structural restriction*, rather than a semantic incompatibility related to delimitability or numerability readings. If all classifiers are instantiations of ClP, and recursion is possible in compounds, what explains this restriction? We claim that the pattern is best explained by phase extension in tandem with Richards' (2010) distinctness condition. In brief, assuming that syntactic structure is spelled out in phases (Chomsky 2000, et seq.), distinctness is a ban on the co-occurrence of sufficiently similar items within the same phase. We claim that the relevant feature for evaluating distinctness in the Mandarin pattern is the category feature [Cl], present on all types of classifier heads.

We account for the co-occurrence of pre-nominal classifiers with N-Cl compounds as follows. When the first Cl is Merged, N-to-Cl movement occurs, extending the NP phase to this ClP. In counting structures, a higher Cl head (an expletive or substantive classifier) is merged, which then moves to Unit. Crucially, even though the full structure in (26) includes two Cl heads, they do not violate distinctness because they occur in separate phases (the NP phase boundary is shown by the dotted line in the figures below). We briefly note that our analysis finds further support from the separate classifier co-occurrence pattern discussed in Liao and Wang (2011), in which two Cls are separated by a DP phase boundary.

(26) No distinctness violation: Cl₁ and Cl₂ in different phases

(27) Distinctness violation: Cl₁ and Cl₂ in the same phase



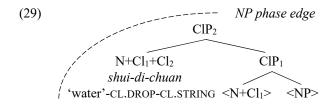
Ungrammatical sequences of pre-nominal classifiers are correctly filtered out by the distinctness condition, even when they contain the same projections as the grammatical co-occurrence structures

with N-Cl compounds. As shown in (27), in the absence of movement that extends the NP phase to the lower Cl₁, the grammar attempts to linearize both Cl heads in the same phase, thus violating distinctness.⁵

While we have focused on N-Cl compounds with one classifier, multiple classifiers can occur in one compound (28), as long as their selectional requirements are satisfied. Such structures can be generated in our analysis as the result of successive head movement to two Cl heads, as shown in (29). Although such structures contain multiple [Cl] features in one extended NP phase, there is substantial evidence that distinctness does not evaluate feature co-occurrence within complex heads (Keine and Bhatt 2016: p. 1475, but see De Clercq and Vanden Wyngaerd 2019 for negation as a counterexample).

(28) a. mu-pian-dui wood-CL.SLICE-CL.PILE 'pile of wood slices'

b. shui-di-chuan water-CL.DROP-CL.STRING 'string of water drops'



3.3. Alternative approaches

We now turn to differences between our analysis and that of Zhang (2013), which also proposes a head-movement analysis of N-Cl compounds. In her account, however, compound-internal classifiers realize the functional head Delimitability, as distinct from the projection that hosts pre-nominal classifiers (Unit, in her terms). For example, her analysis represents a pre-nominal classifier followed by an N-Cl compound with the structure in (30), in contrast to our proposal in (26).

(30)
$$\begin{bmatrix} \text{UnitP} & \text{Unit} & [\text{DelP} & \text{N+Del} & [\dots < \text{N} > \dots] \end{bmatrix} \end{bmatrix}$$

chuan

cl.STRING

water'-CL.DROP

Although Zhang's analysis correctly predicts that pre-nominal classifiers and N-Cl compounds can cooccur, and that N-Cl compounds can occur without counting, we argue that our proposal yields a more parsimonious account of these patterns. Because pre-nominal and compound-internal classifiers have the same delimitability properties, they are better analyzed as being the same type of head, Cl. Second, in order to rule out the possibility of pre-nominal classifiers occurring separately in Unit and Del, as in (25), Zhang's analysis has to stipulate that DelP must trigger head movement. In our analysis, the observed pattern is predicted by two general principles, the distinctness condition and phase extension.

Finally, we adopt Peng's (2021) argument that delimitability is not the *category-defining* feature of classifiers, even though it occurs on most classifier types. The issue is that one type of classifier, the individual classifier, patterns as if it lacks a [±DEL] feature, given its unique patterning with delimitive adjectives, which s-select a [+DEL] item. As shown below, adjectives like *da* can precede a [+DEL] noun like *yang* 'sheep' (31b), but not the [-DEL] kind classifier *zhong* 'kind' (31a). However, in similar structures with an individual classifier *zhi* 'CL.ANIMAL,' changes in adjective placement result in no difference in grammaticality or meaning. The fact that delimitive adjectives can only "skip" individual classifiers is accounted for if these classifiers lack a [±DEL] feature. The upshot is that no pattern suggests the existence of a feature that occurs only on compound-internal but not pre-nominal classifiers.

We abstract away from several aspects of Zhang's analysis that are not crucial to this discussion, such as her proposal that only some types of classifiers are Unit heads, whereas others are specifiers of a higher projection.

⁵ It is important to emphasize that while N-to-Cl movement obviates potential distinctness violations, it occurs independently of whether multiple Cls are present. This differs, for example, from the German verb incorporation pattern discussed by Keine and Bhatt (2016), argued to be a last resort operation triggered to satisfy distinctness.

⁶ We abstract away from several aspects of Zhang's analysis that are not crucial to this discussion, such as her

- (31) a. *yi da **zhong** yang b. yi **zhong** da yang one big CL.KIND sheep one CL.KIND big sheep 'a species of big sheep'
- (32) a. yi da **zhi** yang b. yi **zhi** da yang one big CL.ANIMAL sheep 'a big sheep' 'a big sheep'

4. Conclusion

We have proposed a non-lexicalist head movement analysis of Mandarin N-Cl compounds, in which nouns move to the same type of Cl projection that hosts pre-nominal classifiers. The availability of ClP recursion with N-Cl compounds, but not pre-nominal classifiers, is accounted for in terms of two general properties of phases and their well-formedness: phase extension and the distinctness condition. Furthermore, our account offers a new explanation for a broader puzzle in cartographic theory, which posits a universal, articulated set of functional projections in clauses and nominal expressions (Rizzi 1997, Cinque and Rizzi 2009, a.o.). Namely, why are sequences of *adjacent, overt, non-amalgamated functional heads* rarely attested, even though their projections are universally present? While the question merits further exploration, we suggest that this is because sequences of overt heads in the same phase are typically filtered out the distinctness condition, whereas articulated structures can surface when potential violations are obviated by phase-extending head movements.

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