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The syntax of Mandarin Num-Cl P Num-Cl constructions

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Abstract. Num(eral) P Num(eral) constructions in Indo-European languages have attracted much attention in the generative literature: they are argued to semantically function as a distributive phrase that targets plural participants and syntactically involve a reduplicative head Q bearing a quantity feature. This paper examines their understudied Mandarin counterpart, the adverbial Num-Cl P Num-Cl structure. Having discovered a fine-grained four-way ambiguity of this Mandarin construction, I argue that it is base-generated in the V-complement position, where *de* behaves like a functional head ("concordializer") and forces it to move to its surface pre-VP position to receive Case through Agreement (cf. Larson 2018).

Keywords. reduplication; classifier; adverbial; concord; scope

1. Introduction. Reduplication, conveying a distributive meaning, has been documented in previous studies as NPN constructions, such as *one by one*. These constructions function as event modifiers, based on their adverbial position and targeting either overt or covert plural participants. Such linguistic phenomenon is observed cross-linguistically, spanning European languages to Mandarin. Despite this universality, there exists considerable lexical and morphological variation, contributing to referential ambiguity across different languages. In English, as shown in (1a-b), *one by one* yields two different readings, since it can target either the plural Agent *they* or the plural Patient *apples*. Similarly, its Mandarin counterpart,[1] the Num-Cl P Num-Cl (hereafter NCPNC) construction, demonstrates a parallel pattern (1b). When the phrase targets the plural Agent *tamen* 'they', the sentence intends to express the meaning of "one person after another, in turn, eats a bunch of apples"; when the phrase targets the plural Patient *pingguo* 'apples', the sentence implies that "a group of people, possibly together, eat one apple after another".

(1) a. [They]$_j$ eat [apples]$_i$ [one by one]$_{j/i}$.

b. [tamen]$_j$ [yi-ge jie yi-ge]$_{j/i}$ de chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/i}$ DE eat [apples]$_i$
'[They]$_j$ eat [apples]$_i$ [one by one]$_{j/i}$.'
(i) 'Every single person of them all eat one apple after another.' [SOA-OT]
(ii) 'Every single person of them in turn, all eat apples.' [SOA-ST]
(iii) 'They (possibly together) eat one apple after another.' [MA-OT]
(iv) 'They, one person after another, eat apples in turn.' [MA-ST]

Remarkably, a deictic asymmetry could be found in the above discussed ambiguity: specifically, within the subject-targeted (ST) reading, wherein everyone denoted by *tamen* 'they' consumes apples, this interpretation, though optional, remains plausible. However, under the

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[1] Bare nouns occur freely in languages like Mandarin which lacks inflectional morphology. In (1b) the bare noun *pingguo* 'apples' represents the plural Patient.

object-targeted (OT) reading, the scenario where all apples are eaten up is unattainable. This asymmetry holds true in both English and Mandarin. Depending on the target of universal quantification, the Mandarin NCPNC construction can be interpreted either as a manner adverbial (MA), or as a subject-oriented adverbial (SOA) emphasizing the quality of the subject (Jackendoff 1972; McConnell-Ginet 1982; Ernst 2002; Li et al. 2012; Kubota 2015). Consequently, a single NCPNC construction may exhibit a four-way (2*2) ambiguity, as shown in the English interpretations in (1b).

Moreover, it is observed that the linear order between an NCPNC construction and another quantificational element, e.g. modal or negation, correlates with the availability of the above mentioned four readings. In particular, both [MA-OT] and [MA-ST] are evident when modal/negation scopes over NCPNC (2a), whereas only [SOA-ST] occurs when it scopes over modal/negation (2b):

(2) a. [tamen]$_j$ bixu/meiyou [yi-ge jie yi-ge]$_{j/i}$ de chi [pingguo]$_i$.
[they]$_j$ must/NEG [one-CL following one-CL]$_{j/i}$ DE eat [apples]$_i$
'[They]$_j$ must/didn't eat [apples]$_i$ [one by one]$_{j/i}$.'
(Modal/Neg > *yige jie yige*: [MA-ST] √ [MA-OT] √)

b. [tamen]$_j$ [yi-ge jie yi-ge]$_{j/*i}$ de bixu/meiyou chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/*i}$ DE must/NEG eat [apples]$_i$
'[They]$_j$ must/didn't eat [apples]$_i$ [one by one]$_{j/*i}$.'
(*yige jie yige* > Modal/Neg: [SOA-ST] √ [SOA-OT] ×)

Furthermore, it is crucial to note that despite the surface position in all the Mandarin examples provided, the object at the lowest does not c-command *yige jie yige* 'one by one', the object-targeted reading is still attainable through the referential relationship between the two, which strongly suggests that the surface structure is not sufficient to derive such a referential connection and this reduplication phrase is supposed to undergo reconstruction, obtaining its object-targeted interpretation from Logical Form.

Thus, the puzzles yet to be solved include: where the ambiguity between ST and OT come from; how the asymmetry under the two different referential readings is formed; how the ungrammaticality of OT in situations involving scopal expressions like modal or Neg can be accounted for; and how the binding relationship between the anaphoric phrase *yige jie yige* and its antecedent in object position could be established.

In this paper, having discovered a fine-grained four-way ambiguity of NCPNC based on both its internal syntactic structure and its external syntactic position through native-speaker test and cartographic diagnostics, I adopt Larson's (2004, 2014, 2018) proposal and extend it to NCPNC. I propose that Mandarin NCPNC is base-attached in the V complement position, where AP-*de* functions as a "concordializer", forcing the entire phrase to move to the surface preverbal position. This analysis elucidates how it acquires referential ambiguity through movement and reconstruction and provides an explanation for the asymmetry under the quantificational scopal relationship, considering the epiphenomenon of banning against reverse scope in Mandarin.

Focused on Mandarin NCPNC constructions, section 2 presents its distributional properties. Section 3 provides its internal syntactic structure, which is regarded as a syntactic reduplication of ClP with the reduplicative head Q bearing its quantity feature. Section 4 differentiates its four-way ambiguity and offers a detailed analysis of its external syntactic structure, discussing its scopal interaction with other quantificational elements and its reconstruction effect. Section 5 concludes the paper.

2. The distribution of Num-Cl P Num-Cl. Similar to the English *one by one*, the Chinese Mandarin Num-Cl P Num-Cl exhibits a morphologically symmetrical structure, consisting of two identical parts surrounding a preposition in the middle. It canonically occurs in the preverbal adjunct position, with the adverbializer *de* connecting itself and the verb,[2] functioning as an adverb (1b), which can be questioned by the wh-word *zenme* 'how',[3] inquiring about the manner or state of actions (Yang 2015). Based on the empirical observation, this section discusses the distribution of Mandarin NCPNC, and the three main generalizations are summarized below:

(i) As a typical numeral classifier language, Mandarin requires a matching relationship between classifiers and nominal targets. Here, Mandarin Num-Cl serves as a definite marker for the corresponding nominal head (Yang 2019), ruling out the ambiguity in certain referential relations.[4] For instance, in (3a-b), the classifier *ge* exclusively matches *xuesheng* 'students' and the classifier *pian* pairs with *wenxian* 'paper'. Such interaction between Cl and its nominal targets contributes to the productivity of the Mandarin NCPNC.

(3) a. [xuesheng-men]$_j$ [yi-ge jie yi-ge]$_{j/*i}$ de kan [wenxian]$_i$.
[student-PL]$_j$ [one-CL following one-CL]$_{j/*i}$ DE read [paper]$_i$
'[The students]$_j$ read the [papers]$_i$ [one by one]$_{j/*i}$.'

b. [xuesheng-men]$_j$ [yi-pian jie yi-pian]$_{*j/i}$ de kan [wenxian]$_i$.
[student-PL]$_j$ [one-CL following one-CL]$_{*j/i}$ DE read [paper]$_i$
'[The students]$_j$ read the [papers]$_i$ [one by one]$_{*j/i}$.'

(ii) NCPNC is limited to running-time events, requiring incremental verbs that depict how an individual undergoes changes over the course of an event along a particular dimension. Therefore, it cannot be applied to stative predicates such as *hui* 'know' (4):

(4) * xuesheng-men yi-ge jie yi-ge de hui fayu.
student-PL one-CL following one-CL DE know French
Intended: 'Every student knew French.'

(inspired from Henderson 2009: 65)

(iii) NCPNC needs to target a semantically plural and non-abstract nominal Argument. In Mandarin, nominal targets can take the form of either bare NP or definite NP, both of which should be interpreted as plural (5a). The semantic contribution of target measurement in Manda-

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[2] According to our tests with native speakers, the occurrence of *de* may affect the truth condition: there exists an ambiguity when both Agent *tamen* 'they' and Patient *pingguo* 'apples' are targeted with the presence of *de* (1b); however, if *de* is removed, the interpretation is restricted to "one person after another, sequentially, eats apples", exclusively targeting the Agent (i).

(i) [tamen]$_j$ [yi-ge jie yi-ge]$_{j/*i}$ chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/*i}$ eat [apples]$_i$
'[They]$_j$ eat [apples]$_i$ [one by one]$_{j/*i}$.'

This *de*-issue is not the main focus in this paper, and I assume that all data used is *de*-attached henceforth.

[3] (1b) can be questioned as follow:

(i) tamen zenme chi pingguo?
they how eat apple
'How did they eat apples?'

[4] The ambiguity between ST and OT is one of the major topics this paper discussed, which arises in transitive sentences with an adverbial NCPNC construction when the subject and object share the same classifier. Further details are provided in section 4.1.

rin NCPNC is realized by classifiers, allowing for the inclusion of mass nouns like *water* due to their measurability (5b).[5]

(5) a. (naxie) pingguo yi-ge jie yi-ge de fulan.
(those) apple one-CL following one-CL DE rot
'(Those) apples rotted one by one.'
b. ta yi-bei jie yi-bei de he shui.
he one-glass following one-glass DE drink water
'He drank one glass of water after another.'

It is worth mentioning that the verbal classifiers in Mandarin, measuring the verb of action, could also be used to form NCPNC structures (e.g. *bian* 'time' in (6)), and not all the above-mentioned generalizations apply to these event-targeting verbal NCPNC. This paper does not attempt to examine this type of NCPNC and only focuses on the nominal NCPNC that must have at least one nominal target at an Argument position.

(6) ta yi-bian jie yi-bian de du na-pian wenzhang.
s/he one-CL following one-CL DE read that-CL paper
'S/he read that paper over and over again.'

3. The internal structure of Num-Cl P Num-Cl. The two identical parts in NPN constructions in Indo-European languages have been identified as a syntactic reduplication by several researchers (Travis 2001, 2003; Jackendoff 2008; Müller 2011; Haïk 2013; Pskit 2021),[6] where N1 is the copy of N2. Such word formation can be found cross-linguistically with certain functional similarities. For noun reduplication, typically represented as NPN in Germanic languages, Pi (1995) and Travis (2001) note its use to indicate an iteration of events on the premise of pluractionality (7a). Furthermore, in Telugu (7b),[7] Kannada and Tamil etc., reduplication of an adnominal cardinal numeral gives rise to a distributive reading (Hurch 2005; Balusu 2006).

(7) a. [Student after student] visited the professor on Monday. (Pi 1995)
b. ii pilla-lu [renDu renDu] kootu-lu-ni cuus-ee-ru.
these kid-PL 2 2 monkey-PL-ACC see-PST-3PPL
'These kids each saw 2 monkeys.' (Balusu 2006: 1)

Based on the morphological features and grammatical meaning, i.e. the denotation of distributivity that reduplication brings, I consider Mandarin Num-Cl P Num-Cl as a syntactic reduplication of ClP and propose the following structure depicted in (8), which is extended from Travis (2001, 2003) and Pskit (2021), where the reduplicative head Q, bearing a quantity feature,

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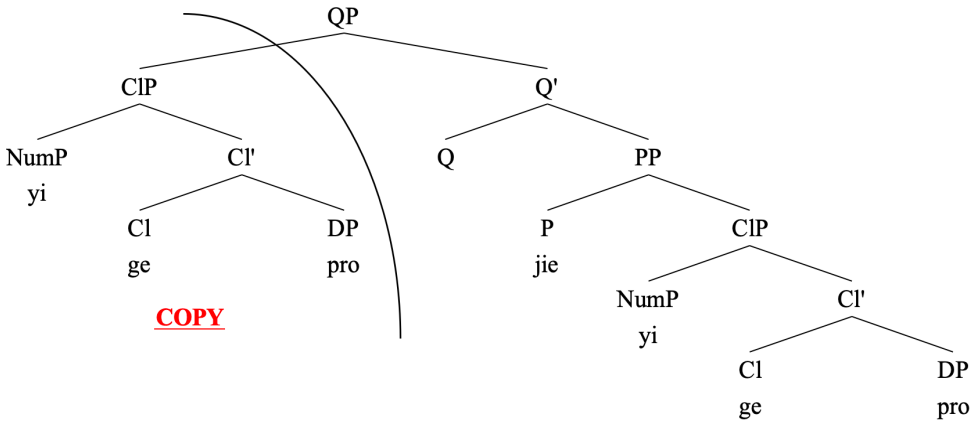
[5] According to Henderson (2009), mass nouns are prohibited in English (i). As reflected in the English translation in (5b), only after quantification by its synonymous phrase, *one after another*, with the classifier and the targeted mass noun inserted and used in the Argument position as a whole, can we express the distributional meaning in its English counterpart.
(i) * John drank water one by one.

[6] Previous studies also classify the certain idiomatic phrases with different N1 and N2 (e.g. *hand on shoulder*, *cheek by jowl*) into NPN construction. What we focus on in this paper is the NPN with the two same parts.

[7] According to Balusu (2006), for (7b) we can have the following three different interpretations, which indicate all in all distributivity:
(i) These kids each saw 2 monkeys. (Participant key reading)
(ii) These kids saw 2 monkeys in each time interval. (Temporal key reading)
(iii) These kids saw 2 monkeys in each location. (Spatial key reading)

takes the PP as its complement and copies the complement of the preposition *jie*, i.e. the ClP. The copy then moves to [Spec QP] without deletion:

(8)



The key advantage of the above structure is that it presents the proximal relationship among the three categories inside the core projection ClP.[8] Building on the hypothesis that the nominal slot serves as the complement of the Cl head, with the classifier obligatorily selecting its matching object, and the NumP as specifier, specifying the cardinality of the partition entity (Zhang 2009; Pan & An 2012; Jin 2019), two additional particularities of the above structure need to be specified: (i) Mandarin *yige jie yige* 'one by one' is incompatible with numerals other than *yi* 'one', which is stipulated in the phrase. Although *yi* is marked as Num in the structure, in this case, it functions more as a marker of indefiniteness, having lost its role as a numeral expression denoting specific numbers (Yip 2018). (ii) I posit the nominal slot as a little pro under DP,[9] as the null content is referential and can be recovered, i.e. lexicalized from the context, as exemplified in (9a-b).[10]

(9) a. [tongxue-men]$_j$ [yi-ge ren jie yi-ge ren]$_{j/*i}$ de chi [pingguo]$_i$.
[student-PL]$_j$ [one-CL person following one-CL person]$_{j/*i}$ DE eat [apples]$_i$
'[Students]$_j$ eat [apples]$_i$ [one by one]$_{j/*i}$.'

b. [tongxue-men]$_j$ [yi-ge pingguo jie yi-ge pingguo]$_{*j/i}$ *(de) chi ~~[pingguo]$_i$~~.
[student-PL]$_j$ [one-CL apple following one-CL apple]$_{*j/i}$ DE eat ~~[apples]$_i$~~
'[Students]$_j$ eat [apples]$_i$ [one by one]$_{*j/i}$.'

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[8] In the mainstream research on Chinese classifiers, a distinction is made between two categories: individual classifier and massifier. Yang's (2019) analysis emphasizes their shared syntactic properties and semantic roles, i.e. creating a unit of measure, as well as their derivation of grammaticalization. In this paper, both categories perform the same reduplication operation in the syntactic construction process and are uniformly projected as ClP.

[9] For determining the empty category, I have excluded PRO, since the preposition *jie* 'following' must govern N2, and it is unclear whether it is a non-Case position. DP-trace is also ruled out because the entire phrase, functioning as an adjunct, is an island, blocking extraction. Additionally, the movement analysis would also violate the theta criterion, as the preposition *jie* 'following' requires two arguments and thus assigns the corresponding theta roles to both N1 and N2, while the potential landing site, either subject position or object position, has already received a structural theta-role. Other possibilities, such as DP ellipsis or NP ellipsis due to Haplology are worth considering, and I leave this open for further exploration.

[10] In (9a), the identical nouns N1 and N2, *tongxue* 'student' are substituted by the noun *ren* 'person'. which has the function of referring to animate objects. (9b) has a more complicated syntactic process, where the post-verbal object must be deleted, possibly due to Haplology, and the adverbializer *de* is obligatorily required. Such disambiguation strategies work because the slot following the Num-Cl in the phrase is filled with the noun it specifically targets.

The morpho-phonologically empty functional head, as least in Mandarin, denoted as Q, determines the quantificational properties of the entire phrase. I will illustrate it and conduct a detailed analysis of this in the next section.

4. The external syntax of Num-Cl P Num-Cl. Recalling the ambiguity arising from the two semantically referential relationships and the deictic asymmetry under the two different readings discussed at the very beginning, Mandarin NCPNC would not be considered suitable to be treated as a VP-adjoined manner adverb phrase in the traditional sense. Instead, this chapter clarifies four different interpretations resulting from the combination of two sets of ambiguity, as well as their availability when interacting with another quantificational element through native-speaker tests and cartographic diagnostics. Based on those observations, I adopt Larson's (2004, 2014, 2018) proposal and argue that Mandarin NCPNC is base-generated in V complement position,[11] form where AP-*de* functions as a "concordializer", forcing the entire phrase to move to the preverbal surface position, thus providing an analysis of how the NCPNC gets its three eligible interpretations through movement and reconstruction, as well as why the ungrammatical one has to be ruled out in view of the epiphenomenon of the ban against inverse scope in Mandarin.

4.1. A 4-WAY AMBIGUITY. As discussed in (1b), when Mandarin NCPNC appears as the adverbial in a sentence where the subject and object of a transitive verb are both plural and share the same classifier,[12] it would be ambiguous between a subject-targeted (ST) and an object-targeted (OT) reading.

Additionally, when zooming out to closely scrutinize the semantic meaning of NCPNC as a whole, native speakers somehow have the intuition that under both readings another ambiguity would emerge from the two different emphases: (i) as a verb-modifier to indicate the event progressed in an individually discrete manner, in (1b) understood as "a group of people lined up, either one person after another eating apples in turn (ST), or they eating one apple after another (OT), but we don't know if everyone all has eaten; what we know is the sequential manner in which they eat"; (ii) as a subject-modifier to describe the plural Agent entirely experienced the event, in (1b) understood as "the whole group of people, from the first to the last, no matter if they eat those apples person by person (ST) or apple by apple (OT), we are sure that everyone has eaten". Such ambiguity discussed above has been reported and studied by several researchers (Jackendoff 1972; McConnell-Ginet 1982; Ernst 2002; Li et al. 2012, Kubota 2015), which is differentiated as manner adverbial (MA) with pure manner interpretation and subject-oriented adverbial (SOA) emphasizing the quality of the subject. The same is found in Mandarin, mentioned by Chen (2021), who also suggests a rough AdvP hierarchy in Mandarin in (10):

(10) evaluative EVA > subject-oriented SOA > frequentive FRA > manner MA

[11] See Alexiadou (1997) and Stroik (1990, 1992a, 1992b) for this analysis.

[12] The environmental constraints have already been discussed in section 2; I assume such restrictions are met at all times in this chapter when discussing ambiguous data.

Hence, it can be concluded that under both SOA and MA interpretations,[13] we may get both ST and OT referential readings respectively due to the ambiguous reference of the pronominal slot, i.e. the little pro inside the phrase. At this point, a single NCPNC construction may show a four-way (2*2) ambiguity in (1b), here (11):[14]

(11) [tamen]$_j$ [yi-ge jie yi-ge]$_{j/i}$ de chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/i}$ DE eat [apples]$_i$
'[They]$_j$ eat [apples]$_i$ [one by one]$_{j/i}$.'
(i)'Every single person of them all eat one apple after another.' [SOA-OT]
(ii)'Every single person of them in turn, all eat apples.' [SOA-ST]
(iii)'They (possibly together) eat one apple after another.' [MA-OT]
(iv)'They, one person after another, eat apples in turn.' [MA-ST]

Moreover, it is observed that the linear order between an NCPNC construction and another quantificational element, e.g. modal or negation, correlates with the availability of the above-mentioned four reading. In particular, only [MA-OT] and [MA-ST] are attested when modal/negation scopes over *yige jie yige* (12a), but only [SOA-ST] when *yige jie yige* scopes over modal/negation (12b):

(12) a. [tamen]$_j$ bixu/meiyou [yi-ge jie yi-ge]$_{j/i}$ de chi [pingguo]$_i$.
[they]$_j$ must/NEG [one-CL following one-CL]$_{j/i}$ DE eat [apples]$_i$
'[They]$_j$ must/didn't eat [apples]$_i$ [one by one]$_{j/i}$.'
(Modal/Neg > *yige jie yige*: [MA-ST] √ [MA-OT] √)

➢ Only MA reading is available: 'According to certain rules, a group of people is only allowed to/didn't eat apples one person after another in turn (ST), or they are only allowed to/didn't eat one apple after another (OT), but we don't know if everyone all has eaten, what we know is the sequential manner in which they eat.'

b. [tamen]$_j$ [yi-ge jie yi-ge]$_{j/*i}$ de bixu/meiyou chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/*i}$ DE must/NEG eat [apples]$_i$
'[They]$_j$ must/didn't eat [apples]$_i$ [one by one]$_{j/*i}$.'
(*yige jie yige* > Modal/Neg: [SOA-ST] √ [SOA-OT] ×)

➢ Only SOA-ST reading is available: 'According to certain rules, the whole group of people, from the first to the last, all have to/didn't eat apples in turn and it must be sure that every one of them has eaten.'

So far, we have seen the mystery in the Mandarin NCPNC ambiguity: is it a pure coincidence that the SOA and MA are just homonyms, or is one a derivative of the other? And how should the ungrammaticality of [SOA-OT] be accounted for when it is under the scope of anoth-

[13] When analyzing these ambiguous truth conditions, an interesting issue regarding the asymmetry is worth noting: the reason why the universal quantification in ST reading can exist is that the subject *tamen* 'they', as a personal pronoun, must be referential and therefore gives rise to the universally quantified meaning; whereas the object of the sentence, *pingguo* 'apples', appears in the form of a bare noun, which might be interpreted as non-referential in certain contexts and therefore is less likely to be interpreted as universally quantified. Such asymmetry of the lexical feature will also affect the judgment of the truth condition. This is similar in English when we conduct the native-speaker test, where the existence of the definite article "the" before the object influences the context, allowing the object to be interpreted as generic or existential, thus affecting the judgment.

[14] The grammaticality of [SOA-OT] in simple transitive constructions like (11) still remains controversy, since it is peculiar for a subject-oriented Adv to target the object. There's no satisfactory answer yet, and the further exploration is needed.

er quantificational element? A closer look is needed at these different interpretations given by the different distributional positions in view of the quantificational scopal relationship illustrated by the cartographic diagnostics.

4.2. THE SURFACE POSITION OF SOA AND MA IN MANDARIN. According to Jackendoff (1975), the ambiguity between SOA and MA is due to the ambiguous syntactic structure. That is to say, when the phrase is located inside the VP, it gives rise to the manner interpretation, a fairly common syntactic assumption. When outside the VP, it should be regarded as SOA. Kubota (2015) follows this assumption and offers a specific syntactic structure for these two from a semantic point of view: MA adjoins to V' while SOA adjoins to T'. Given the preverbal surface position of the Mandarin counterpart, which is its only possible position, I think this analysis could be extended to Mandarin NCPNC constructions.

From the cartographic point of view, the two different syntactic positions of Mandarin SOA and MA become more apparent when inserting a modal verb, here a deontic one, *bixu* 'must'.[15] According to Tsai (2015), deontic modals should be associated with the event structure encoded by IP and located between TP and VP, for which I identify it as an ideal diagnostic to differentiate the positions of SOA and MA. For a more accurate vision, we control the variables ST and OT separately:

Ensuring the ST reading, I use an intransitive verb *likai* 'leave', tested with the modal verb *bixu*, to show the two interpretations in (13a-b):

(13) a. tamen **bixu** [yi-ge jie yi-ge] de likai.
they must [one-CL following one-CL] DE leave
'They must leave in a manner of one by one.'
(Modal > *yige jie yige*: MA √ SOA ×)

b. tamen [yi-ge jie yi-ge] de **bixu** likai.
they [one-CL following one-CL] DE must leave
'One by one, they all must leave.'
(*yige jie yige* > Modal: MA × SOA √)

Ensuring the OT reading, I set a singular subject, also tested with the modal verb *bixu*, but only get one possible interpretation (14a-b):

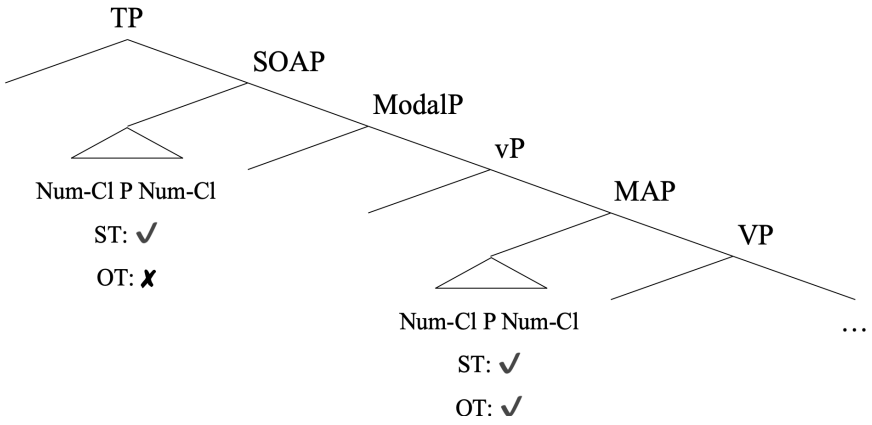
(14) a. wo **bixu** [yi-pian jie yi-pian] de kan wenxian.
I must [one-CL following one-CL] DE read paper
'I must read paper in a manner of one by one.'
(Modal > *yipian jie yipian*: MA √ SOA ×)

b. * wo [yi-pian jie yi-pian] de **bixu** kan wenxian.
I [one-CL following one-CL] DE must read paper
(*yipian jie yipian* > Modal: ungrammatical!)

Based on the above data, an SOA NCPNC construction surfaces above the modal, while an MA NCPNC construction is positioned under the modal. The OT reading would be ruled out only under SOA reading. Thus, a surface structure of those two is schematized in (15):

[15] The prevailing view posits that modals can be effectively treated as quantifiers (Kratzer 1977, 1981, 1991, Butler 2003, among others). This characterization aligns with the inherent nature of modals, contributing to the emergence of their specific scope properties. A similar quantificational nature is attributed to negation, although its syntactic position is recognized to be more intricate. Therefore, in this paper, modal verbs are primarily used for the relative analyses.

(15)



So far, the two different projections of Mandarin NCPNC have been discussed: the universal quantification reading, which states the quality of the subject, should be identified as SOAP above ModalP; while MAP, which is located below ModalP and inside the vP, only emphasizes the sequentially discrete manner of the event. This is consistent with the fact in (1b) that only the subject (*tamen*) could be universally quantified, but not the object (*pingguo*). Moreover, it has been attested in both ambiguous constructions (12a-b) and non-ambiguous situations (13-14) that under quantificational scopal interaction only three readings, i.e. [SOA-ST], [MA-OT] and [MA-ST] are legible, while [SOA-OT] is excluded. That is to say, when *yige jie yige* scopes over the inserted negation/modal, the MA interpretation will be blocked, and the only left interpretation is [SOA-ST], in compliance with the derivation in (15).

The derived surface positions of SOA and MA just as well match our observation of the data, especially those ambiguous one. However, the issue of whether SOA and MA are separate homonyms or not still remains unsolved. Moreover, from the surface position, the object at the lowest does not c-command NCPNC, then under the OT reading, where does the binding relationship between the two come from? And how do we account for the ungrammaticality of [SOA-OT] in the situation with scopal expressions like modal or Neg? A more refined analysis is given in the following section, in which the issues discussed above show a reconstruction effect, as well as its certain constraint in Mandarin.

4.3. RECONSTRUCTION AND EPIPHENOMENON. The most widely adopted syntactic analysis for Adverb is to treat it as a V-projection adjunct, which has also been extended to Chinese by Huang et al. (2009), showing that AP can be both left-adjoined and right-adjoined to V'. However, under such an analysis, there would exist obvious puzzles in both of the two directions for adverbs like NCPNC. For the right-adjoined position, such distribution is prohibited for its ungrammaticality (16a). For the left-adjoined position, i.e. the most canonical position (16b), the surface syntactic structure would give rise to the violation of Binding Theory: the whole phrase, although not directly denotes an individual or individuals, it ranges over a set of individuals, and has to rely on an NP antecedent for establishing their referential relationship. Such quantificational binding requires the antecedent to c-command the anaphoric phrase *yige jie yige*. However, here in (16b) when it is co-indexed with the object *pingguo* 'apple', although the latter does not c-command the former, we can still get the object-targeted reading that "one apple after another is eaten by them", which strongly suggests that *yige jie yige* is supposed to undergo reconstruction and get its object-reference interpretation from Logical Form.

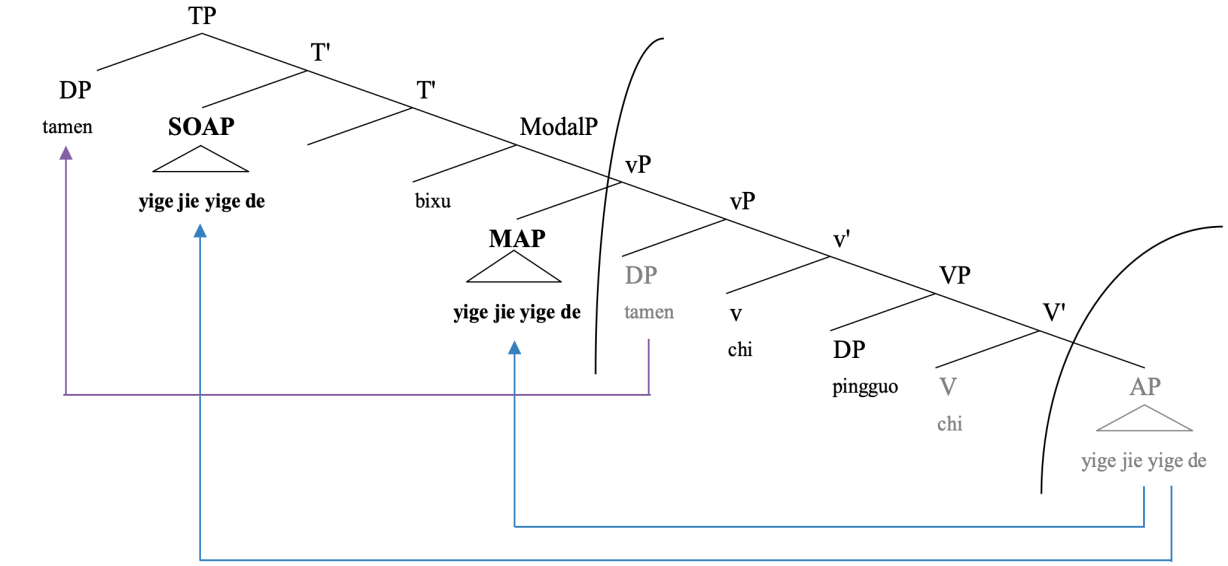
(16) a. * tamen chi pingguo yi-ge jie yi-ge (de).
they eat apple one-CL following one-CL (DE)
Intended: 'They eat apples one by one.'

b. [tamen]$_j$ [yi-ge jie yi-ge]$_{j/i}$ de chi [pingguo]$_i$.
[they]$_j$ [one-CL following one-CL]$_{j/i}$ DE eat [apples]$_i$
'[They]$_j$ eat [apples]$_i$ [one by one]$_{j/i}$.'

Where should its previous movement site be when placed back? Previous studies (Stroik 1990, Alexiadou 1997, Larson 1988, 2004, 2014) on adverb phrases, especially those with nominal elements in their structure, have offered some solid evidence for a uniform V complement position. For certain Mandarin Advs, which are usually attached with the adverbializer *de* and disallow the postverbal position (e.g. 16a-b), Larson (2018) assumes such structures with a nominal element and compares those with agreement-carrying inflections in articles and adjectives in some European languages,[16] arguing that Mandarin nominal APs, due to the nominal nature, also receive Case through Agreement in the same way, forcing AP-*de* to carry the whole AP to move to the Agr. Domain, i.e between a Case Probe and a Goal (i.e. between T and the Subject-in-VP), to achieve Case agreement, during which *de* serves as a concordial element.

Applying this movement analysis to Mandarin NCPNC, a reasonable derivation is presented in (17). Originally, the phrase is base generated in V-complement position, providing the informative assertion either for the subject of the event as SOA or for the manner of the verb as MA. For the sake of Case,[17] it moves up to the corresponding position between T and the subject in the original position - if we adopt Subject-in-VP hypothesis - via concord by *de*-effect. As discussed earlier, if *yige jie yige* rises above the ModalP to scope it over, it should be identified as SOAP; if it is lower than the ModalP to be scoped over, it should be MAP.

(17)



[16] Larson (2018) depicts such nominal substructure as [$_{AP}$ X N]; a typical example is *dasheng-de* (*sheng* 'voice' as N). In this paper, an NCPNC construction also contains nominal slots (see section 3).

[17] Suppose that the preposition head *jie* 'following' assigns oblique Case to its complement N2, but its Specifier N1 is unable to receive Case in the same way, thus forcing the concordializer *de* to raise the whole phrase to its corresponding Agr. Domain to achieve Case agreement.

To derive ST reading and OT reading, the anaphoric binding requirement must be satisfied. Given that the subject always occupies a higher syntactic position, c-commanding *yige jie yige*, we can naturally establish their binding relationship, i.e., get the ST reading from the surface position without reconstruction. By contrast, OT reading must be explained by assuming a binding relationship between *yige jie yige* and the c-commanding object antecedent after reconstruction. That is to say, the NCPNC construction should be placed back to its original movement site, i.e. the V-complement position, which is lower than the object, thus being c-commanded by the object (18a-b):

(18) a. [$_{TP}$ tamen **[yige jie yige de]$_j$** [$_{VP}$ chi [pingguo]$_j$ **t$_j$**]]. (SOA)

b. [$_{TP}$ tamen [$_{vP}$ **[yige jie yige de]$_j$** [$_{VP}$ chi [pingguo]$_j$ **t$_j$**]]]. (MA)

However, as discussed above, if there is another quantifier, such as ModalP inserted, the only survived interpretation under the OT reading is [MA-OT] (19b), but not [SOA-OT], whose reconstruction fails to derive the object-bound reading of *yige jie yige* (19a).

(19) a. * [$_{TP}$ tamen **[yige jie yige de]$_j$** [$_{ModalP}$ bixu [$_{VP}$ chi [pingguo]$_j$ **t$_j$**]]. (SOA)

b. [$_{TP}$ tamen [$_{ModalP}$ bixu [$_{vP}$ **[yige jie yige de]$_j$** [$_{VP}$ chi [pingguo]$_j$ **t$_j$**]]]]. (MA)

The absence of [SOA-OT] reading in a scenario involving two quantificational phrases is not surprising because of the well-known scope rigidity in Mandarin. Contrary to English, where the Quantifier Raising (QR) and related inverse scope phenomena are robustly attested, Mandarin does not exhibit QR and the corresponding scope ambiguities. Instead, it adheres to a strict prohibition on inverse scope, allowing only a surface scope interpretation (Huang 1981, Huang 1982, Lee 1986, Aoun & Li 1989, 2003, among others). Aoun & Li (1989), based on Huang (1982), set a theoretical description for such observed ban, i.e. *The Isomorphic Principle* (20):

(20) *The Isomorphic Principle* (Aoun & Li 1989: 142, based on Huang 1982)
Suppose A and B are quantifier phrases. Then if A c-commands B at S-Structure, A c-commands B at LF.

(19a) serves as a concrete example: when the QP *yige jie yige* is moved back to the lowest V-complement position to be c-commanded by the object *pingguo*, yet at the same time it would inevitably be lower than the ModalP *bixu*, thus yielding an inverse interpretation, which is prohibited by *The Isomorphic Principle*. Therefore, such epiphenomenon of the ban against inverse scope in Mandarin results in the unavailability of the reconstruction, hence, the [SOA-OT] reading fails to be derived when Mandarin NCPNC takes wide scope over another quantificational element.

5. Concluding remarks. This paper examines the Mandarin adverbial classifier reduplication, Num-Cl P Num-Cl construction. Based on its fine-grained four-way ambiguity, I argue that NCPNC is not base-generated as manner VP-adjunct (Huang et al. 2009), and instead, an NCPNC construction enters the derivation as a V complement and moves to its surface pre-VP position (cf. Larson 2018), therefore supporting the V-complement analysis of manner adverb (Alexiadou 1997; Stroik 1990, 1992), as well as Larson's Agreement-based movement approach. And the analysis for its quantificational scopal relationship reflects the scope rigidity of quantifiers in Chinese (Huang 1981, 1982; Lee 1986; Aoun & Li 1989, 2003).

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