Exhaustivity and bare numeral phrases in Mandarin

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A well-known generalization about bare numeral phrases (BNPs) in Mandarin is that they tend to require the existential verb *you* 'have' when in subject position, but there are some notable exceptions. This paper concentrates on the data cited by Li (1998) and proposes an *Exhaustivity Condition* according to which a subject BNP is felicitous if and only if it is interpreted exhaustively. It is shown how this condition generalizes to all the constructions under discussion, while at the same time they each belong to a particular type of quantificational construction or another (cumulativity, scalar focus, sufficiency, or conditional). I argue that the close relation between Mandarin subject BNPs and exhaustivity not only explains the restricted distribution of the former but also enables us to account for their so-called quantity readings in terms of exhaustive interpretation. Comparisons of the proposal with previous approaches will also be discussed.

Keywords: bare numeral phrase, quantity interpretation, exhaustivity, cumulativity, focus, sufficiency

1. Introduction

One prominent issue in the study of bare numeral phrases (BNPs for short) in Mandarin, namely numeral-classifier-noun expressions such as *san-ge ren* 'three people,' is that their distribution is somewhat restricted in a way not observed for similar expressions in English. Let me begin with the generalization stated by Lee (1986):

(1) Numeral phrases are generally prohibited from matrix subject position if no logical operators occur elsewhere in the sentence. (Lee 1986: 75)

Relevant examples include the episodic sentences (2a) and (2b):

https://doi.org/10.1075/lali.00079.tsa
Language and Linguistics 22:1 (2021), pp. 111–165. issn 1606-822x | e-issn 2309-5067 © ILAS

(2) a. ??*Yi-ge xiaohai tou-le wo-de chezi.*
one-CL kid steal-ASP I-POSS car
'A kid stole my car.'
b. ??*San-ge ren si le.*
three-CL person die ASP
'Three people died.' (Lee 1986: 75)

To render such sentences grammatical, the existential verb *you* 'have/exist' must be inserted to force the BNP to a postverbal position with an existential reading, as in (3a) and (3b), or the universal-like quantifier *dou* is required in the post-subject position to bring out a definite reading of the BNP (Liu 1997; Cheng 2009), as in (3c).

(3) a. *You yi-ge xiaohai tou-le wo-de chezi.*
have one-CL kid steal-ASP I-POSS car
'A kid stole my car.'
b. *You san-ge ren si le.*
have three-CL person die ASP
'Three people died.'
c. *San-ge ren dou si le.*
three-CL person DOU die ASP
'The three people all died.'

It has been pointed out, however, that there are a variety of exceptions to (1) (see Lee 1986; Jiang et al. 1997; Liu 1997; Li 1998; Lu & Pan 2009; Tsai 2001; Jiang 2012). The specific types of data that this paper will focus on are those cited in Li (1998: 695), reduplicated with minimal modifications below in (4–8).[1]

(4) *Liang-zhang chuang (, wo ting-shuo,) ji-le wu-ge ren.*
two-CL bed I hear-say squeeze-ASP five-CL person
'Two beds(, I heard,) were crowded with five people.'

(5) *San-ge baomu jiu zhaogu ta yi-ge xiaohai.*
three-CL babysitter only care he one-CL child
'Three babysitters took care of him, only one child.'

1. In Li's original work, (4) is followed by the continuation 'That was really too squishy'; (5) is an (exclamatory) question with the final particle *a* and the second person object *ni* 'you'; (6) contains the complex numeral *liang-san-ge* 'two or three' in the subject and the adjective *ye* 'wild' in the object; (7) is a question with the final particle *ma*; and finally (8) is a negative modal proposition. These minimal changes are made for the sake of exposition and will not affect the presentation of Li's data and analysis or my own.

(6) *Liang-ge laoshi jiu ba na-qun xiaohai kongzhi-zhu le.*
two-CL teacher then BA that-group children control-hold ASP
'Two teachers (sufficed to have) controlled that group of kids.'

(7) *San-zhi gunzi gou ni da ta.*
three-CL stick enough you hit him
'Three sticks are enough for you to hit him (with).'

(8) *Wu-ge xiaohai chi-de-wan shi-wan fan.*
five-CL child eat-can-finish ten-bowl rice
'Five children can finish ten bowls of rice.'

According to Li, the subject BNPs in (4–8) all bear a "quantity-denoting" (as opposed to an "individual-denoting") interpretation. For instance, (4) is concerned with the capacity of two beds, (5) the number of babysitters, (6) the number of teachers, and so forth. Using similar terminology, Lee (1986) states that the subjects in cases like (7) and (8) have a "numerical" reading. These observations have sparked considerable interest in what licenses the subject BNP (henceforth s-BNP) and how, and part of these data (in particular (7) and (8)) are picked up in subsequent literature, two of which will be reviewed in this paper (Tsai 2001 and Lu 2004).

Let us note in the outset that (4–8) constitute a heterogeneous group. The first three examples are propositions describing events or states in the actual world and making reference to actual individuals; the last two by contrast are intensional propositions, where the s-BNPs do not necessarily refer to sticks, children or bowls of rice in the actual world. Any theory that attempts to cover all of (4–8) should be restrictive enough with respect to the condition on s-BNPs, but at the same time should also be flexible enough to allow the s-BNPs to be interpreted either extensionally or intensionally. As will be discussed shortly, the current literature on s-BNPs has not quite successfully achieved this goal, which motivates the new account proposed in this work.

This paper will be developed to address the following two questions:

I. What is the semantics that underlies Li's (1998) "quantity" interpretation?
II. What (in syntax/semantics) determines the different judgments between (2) on the one hand and (4–8) on the other?

I shall argue that the key notion that explicates the quantity interpretation is *exhaustivity*: the s-BNPs in (4–8) must be interpreted exhaustively. This idea is descriptively stated as the *Exhaustivity Condition* in (9):

(9) **Exhaustivity Condition**
An s-BNP is felicitous in a sentence *p* if and only if the s-BNP is interpreted exhaustively.
An s-BNP in a sentence *p* is interpreted exhaustively if all relevant alternative propositions of *p* which are not entailed by *p* are excluded.

The thesis of this paper can be synthesized as follows. The "quantity" interpretation of a BNP is an obligatory exhaustive focus interpretation on the numeral. The examples in (2) are degraded because the intended existential interpretation is incompatible with exhaustivity, and what separates (3a)/(3b) apart from (4–8) is that the BNPs in the former are not subject to (9). Overall, this work attempts to contribute to the understanding of noun phrase interpretation in Mandarin more generally by closely examining the distribution and meaning of BNPs.

The remainder is organized as follows. § 2.1, § 2.2, and § 2.3 survey and critically reassess the accounts of Li (1998), Tsai (2001) and Lu (2004), respectively. § 3.1 through § 3.5 detail how (4–8) should be analyzed as different quantificational constructions (cumulative, scalar focus, sufficiency, and conditional) and the role of the *Exhaustivity Condition* in each construction, and § 3.6 provides an explanation for the puzzle stemming from (2). § 4 discusses four more environments licensing s-BNPs, § 5 compares the present proposal with previous ones, and finally § 6 concludes.

2. Previous analyses

2.1 Li 1998

2.1.1 *The NumP hypothesis*

Li claims that the data in (4–8) demonstrate a distinctive projection in the BNP, NumP, which denotes quantities and has the syntactic structure of (10a), whose topmost projection is NumP headed by the head Num. "Individual-denoting" expressions, by contrast, have the full DP structure with a null D, as in (10b).

(10) a. $[_{\text{NumP}}$ *san-ge* *xuesheng*]
three-CL student (quantity-denoting)

b. $[_{\text{DP}}$ D $[_{\text{NumP}}$ *san-ge* *xuesheng*]]
three-CL student (individual-denoting)

Central to the NumP hypothesis is the general assumption that D is the locus of (in)definiteness. By lacking D, (in)definiteness is irrelevant to NumPs. The ban against indefinite subjects/topics in Mandarin is, in turn, also irrelevant to

NumPs. Hence the examples in (4–8) are not true counterexamples to the generalization that existential indefinites must be licensed by *you*. Ungrammatical cases like (2b) are accounted for by assuming that the empty D in (10b) must be properly governed (Longobardi 1994). Since a DP cannot be properly governed in subject or topic position, ungrammaticality results.

Li (1998) first contends that DPs, but not NumPs, can co-occur with operators ranging over individuals. The two operators cited include *you* 'have/exist,' which asserts the existence of individuals as we have already seen, and the preverbal particle *dou*, which carries universal quantification over individuals and is translated as 'all' by Li. The BNPs in (11) and (12) therefore must be interpreted as individual-denoting DPs as they co-occur with *dou*/*you*.

(11) *San-ge xuesheng dou lai zher le.*
three-CL student all come here ASP
'Three students all came here.'

(12) *You san-ge xuesheng lai zher le.*
have three-CL student come here ASP
'There are three students that came here'

On the other hand, since NumPs denote quantities but not individuals, adding *dou*/*you* to sentences with NumPs should result in ungrammaticality. This is borne out, as evidenced by (13) and (14).

(13) **You san-ge baomu jiu zhaogu ta yi-ge xiaohai* (cf. (5))
have three-CL babysitter JIU care he one-CL child

(14) **You san-zhi gunzi gou ni da ta* (cf. (7))
have three-CL stick enough you hit him

Li's second argument builds on coreference and binding: only the DP in (15b) can make reference to individuals and bind pronouns, whereas the NumP in (15a) cannot, due to the absence of D (and thus the absence of the referential index).

(15) a. *San-ge ren$_i$ tai-bu-dong zhe-jia gangqin. *Tameni-de liliang tai xiao.*
three-CL person lift-not-move this-CL piano they-POSS strength too small
'Three people cannot lift up this piano. Their strength is too weak.'

b. *You san-ge ren$_i$ hui lai. Tamen$_i$ hai hui dai liwu lai.*
have three-CL person will come they still will bring present come
'There are three people coming and they will bring presents.'

Li's final argument has to do with scope interaction. Since NumPs are born without D, they are non-quantificational, and therefore cannot interact with a quantificational phrase, unlike DPs. Hence (16), where the subject is a NumP, does not have the reading that there is a total of 50 bowls of rice. On the other hand, the subject in (17) is a quantificational DP, and the 50-bowl interpretation is possible.

(16) *Wu-ge xiaohai chi-bu-wan shi-wan fan.*
five-CL child eat-not-finish ten-bowl rice
'Five children cannot finish ten bowls of rice.'
(10 bowls of rice, *50 bowls of rice)

(17) *You wu-ge xiaohai chi-bu-wan shi-wan fan.*
have five-CL child eat-not-finish ten-bowl rice
'Five children cannot finish ten bowls of rice.'
(10 bowls of rice, 50 bowls of rice)

Overall, the NumP hypothesis implies the following. First, there is a direct connection between the interpretation/reference of a nominal phrase and its internal syntactic structure. Second, the distribution of preverbal numeral phrases in Mandarin is restricted because they are arguments without an overt D. Li provides three pieces of evidence to support the conclusion that the difference between (3a) and (3b) on the one hand, and (4–8) on the other, stems from the structural distinction depicted in (10).

2.1.2 *Discussion on the NumP hypothesis*

There is evidence that the ungrammaticality of (13)/(14) may actually be caused by something other than the BNPs. To wit, (13) is still bad even if '3 babysitters' is replaced by a complex NP without a numeral, as in (18). This indicates that the illegitimacy of (13) in fact could be *irrelevant* to the nominal structure of '3 babysitters.'

(18) **You zheme nenggan-de baomu jiu zhaogu ta yi-ge xiaohai.* (cf. (5))
have such competent-ADJ babysitter JIU care he one-CL child

Li (1998: 698) remarks that *jiu* and *gou* 'enough' both require a quantity interpretation, hence only NumPs are compatible with these quantity predicates; and since NumPs cannot be quantified by *dou*/*you*, (13) and (14) are ruled out. This reasoning can nonetheless be falsified by (19) and (20) below, where the definite (which would be individual-denoting) subjects *tamen* 'they' and *zhexie qiaokeli* 'these chocolates' are fine with *jiu* and *gou*, respectively. It is therefore unclear in what sense *jiu* and *gou* should "require a quantity interpretation" for a preceding

BNP in Li's system, given that there is no NumP in (19) and (20) for *jiu* and *gou* to associate with, respectively.

(19) *Tamen jiu zhaogu ta yi-ge xiaohai.*
they JIU care he one-CL child
'They only (need to) take care of him, one child.'

(20) *Zhexie qiaokeli gou ta chi le.*
these chocolate suffice he eat ASP
'These chocolates are enough for him to eat.'

If the quantity interpretation is inherent to *jiu* and *gou* which do *not* require any co-occurring BNP, as the data here indicate, the NumP hypothesis seems no longer motivated by *jiu* and *gou*.

The problem with the second argument based on binding/coreference is twofold. First, it does not necessarily correlate with the DP vs. NumP, or individual vs. quantity, distinction. Indefinites in intensional contexts sometimes cannot refer to any specific individuals, and yet (semantic) binding/coreference is possible. The indefinites in (21) clearly need not have actual references, but they are able to bind/corefer with a following pronoun.[2]

(21) a. Drunk men$_i$ are miserable. They$_i$ can spend all the money they$_i$ earn.
b. A farmer who owns a donkey$_i$ usually beats it$_i$.

Conversely, the absence of binding/coreference does not entail a quantity-denoting NumP, either. The coreference is infelicitous in (22), but *basketball players* is not a quantity-denoting expression.

(22) Basketball players$_i$ can be very tall. *They$_i$ came yesterday.

An obvious explanation for (22) is the mismatch of tense-aspect-modal properties of the two clauses, a matter independent of the internal structure of the subject. There are various factors (particularly those related to the verbal or clausal domain) that affect the binding/coreference possibility of two noun phrases, and therefore the view that one can determine the NP-structure on the basis of binding/coreference may not be well-grounded.

Second, this argument seems to contradict Li's own data, as it rules out three of the five examples which are claimed to showcase NumPs. For instance, (5), repeated below as (23a), can be continued by (23b) in which 'they' is anaphoric to

2. A related issue here is that some special property of *tamen* 'they' in (15a) may also prevent it from being an E-type pronoun (Evans 1980) and coreferring with the subject in the preceding clause.

'3 babysitters' in (23a); and (6), repeated as (24a), can be followed by (24b) where 'they' is coreferential with the subject in (24a).

(23) a. *San-ge baomu jiu zhaogu ta yi-ge xiaohai.* (= (5))
three-CL babysitter only care he one-CL child
'Three babysitters took care of him, only one child.'
b. *Tamen zhenshi xingyun.* (possible continuation of (23a))
they really fortunate
'They (= the three babysitters) are really fortunate.'

(24) a. *Liang-ge laoshi jiu ba na-qun xiaohai kongzhi-zhu le.* (= (6))
two-CL teacher then BA that-group children control-hold ASP
'Two teachers (sufficed to have) controlled that group of kids.'
b. *Tamen zhenshi nenggan.* (possible continuation of (24a))
they really competent
'They (= the two teachers) are really competent.'

According to the argument of binding/coreference, the BNPs in these cases should be categorized as DPs, but they are regarded as NumPs by Li. By applying this criterion to the cases which Li claims to involve NumPs, it turns out that most of them should be categorized as DPs instead; the ones surviving this test are those that occur exclusively in *modal* or *sufficiency* constructions, i.e. (7) and (8). This inconsistency is apparently closely related to the first problem just mentioned, that the clausal context is unfortunately not taken into consideration when determining the interpretation of s-BNPs.

Last of all, the scope argument has not considered the possibility that the 50-bowl reading of (17) may result not from the subject being quantificational but from an implicit distributive operator at the clausal level. Take (25) as an example (from Schwarzschild 1996: 62). It is ambiguous between the distributive reading (25a) and the collective reading (25b). The subject of (25) is a scopeless proper name, and yet two interpretations are possible.

(25) John and Mary killed a dog.
a. 'John killed a dog and Mary killed a dog.' (*distributive* reading; two dogs killed)
b. 'John and Mary collaborated in killing a dog.' (*collective* reading; one dog killed)

What (25) shows is that the 50-bowl reading in (17) need not originate from the subject being quantificational; the subject may well be scopeless just like *John and Mary*, in which case the semantic difference between (16) and (17) is orthogonal

to the DP-NumP distinction.[3] In fact, (16) and (17) present a clear minimal pair showing that what stands responsible for their contrasting interpretations is the existential verb *you*, which one may attribute to the syntactic/semantic properties of *you* without regard to NP-internal structure.

Thus, while Li's (1998) observations raise important questions on the interpretation of s-BNPs, it is not clear whether the NumP hypothesis is strongly justified. Our major concern is the lack of *direct* evidence for the difference between DP and NumP. Suppose *san-ge ren* '3 people' can indeed be either a DP (with a null D) or a NumP (without D); we would then expect to observe two *distinct* readings, one referring to individuals and the other quantities, in a sentence where both a DP and a NumP qualify as subject. However, each (grammatical) example in Li (1998) has only one interpretation. Moreover, most instances of NumP come with a co-occurring element such as *jiu*, the modal verbal infix *-de-*, or the sufficiency predicate *gou* 'enough.' (The only exception is (4), where no special item exists to induce the quantity interpretation; see § 3.2 for a closer examination of this case.) The descriptive generalization over Li's data seems to be the following: *Mandarin BNPs denote quantities whenever some NP-external quantity-inducing element is present*. Crucially, this is independent of the internal structure of BNPs; what really matters is the existence of the relevant clausal elements. The same pattern holds for DPs: whenever there is an indefinite subject characterized as a DP, there is always something else (e.g. *you*/*dou*) that contributes to the so-called individual reading. This amounts to saying that the existence of DP is determined by something *outside* the nominal domain.[4]

2.2 Tsai 2001

2.2.1 *The extended mapping hypothesis*

Tsai (2001) draws on Diesing's (1992) Mapping Hypothesis (MH) to account for a subset of the data covered in Li (1998), namely those containing the predicate *gou* 'enough' and modal elements, and formulates the Extended Mapping Hypothesis (EMH) that hinges on syntactic verb movement.

In her seminal work, Diesing (1992) outlines a theory of the syntax-semantics interface based on the MH, according to which syntactic materials in Spec-IP

3. By the same token, the absence of the 50-bowl reading in (16) is not necessarily a consequence of the subject being scopeless. The right question to ask is why the implicit distributive operator is not operative in (16).

4. This is in fact a direct consequence of the tight connection that Li makes between the notion of DP and syntactic government in Mandarin: if a DP is valid only under a government relation, it is in a sense parasitic on the governing head.

are mapped to the Restriction Clause of a tripartite quantificational configuration (Heim 1982) while materials inside VP get mapped to the Nuclear Scope. Existential Closure (EC) applies at the VP-level, and the VP-internal variables not bound by a previously introduced operator will be "closed" by EC. Under the MH, if an indefinite is closed VP-internally, it receives the nonspecific reading.

For Tsai (2001), the BNP subjects in modal sentences such as (26) are *nonspecific indefinites*, the nonspecificity of which is attributed to EC. This appears to be the major motivation behind Tsai's (2001) work, where the MH is allowed to take place in a dynamic fashion with correlating semantic consequences. The proposal is that if the verb undergoes head movement to the Modal Phrase (ModP) headed by, e.g. the potential modal infix *-de-* in verb-*de*-result (V-*de*-R) compound verbs, the ∃-operator at VP will be "pushed up" accordingly to the level of Mod', creating an EC higher up in the tree structure. The promoted EC will then close the free variable (introduced by the BNP) in its extended scope. The comparison between MH and EMH is schematized by (27a) and (27b) below (note the positions of ∃).

(26) *Wu-ge ren chi-de-wan shi-wan fan.*
five-CL person eat-MOD-finish ten-bowl rice
'Five people can finish ten bowls of rice.'

(27) a. *Diesing's (1992) MH*
$[_{IP}$ (Subject) $[_{I'}$ I^0 ∃ $\underbrace{[_{VP}$ Subject $[_{V'}$ V^0 …]]]]}$
NUCLEAR SCOPE

b. *Tsai's (2001) EMH*
$[_{ModP}$ (Subject) ∃ $\underbrace{[_{Mod'}$ $V_i{}^0$+Mod^0 $[_{VP}$ Subject $[_{V'}$ t_i …]]]]}$
"EXTENDED" NUCLEAR SCOPE

Tsai (2001: 148) further proposes the situation-based semantics in (28) corresponding to the modal structure of (26). The position of ∃ that binds both variables (*x* and *y*) is lower than the possibility modal operator ◇, which introduces the generic operator *Gen*, hence the nonspecific interpretation of the BNPs.[5]

(28) $\Diamond Gen_s$ [*s* is a situation] $\exists_{x,y}$[*x* is a group of 5 people in *s* & *y* is a group of 10 bowls of rice in *s* & *x* finishes *y* in *s*]

5. It is not clear why a possibility modal should introduce *Gen*. Tsai (2001: 148) states that *Gen* is introduced to account for the free-choice *any* reading of (26), but such a reading is likely just an implicature of the possibility modality, rather than part of the underlying semantics of (26).

Tsai's approach thus assumes an explicit correlation between syntactic V-to-Mod movement and s-BNPs: if the former occurs, the latter can be licensed with a non-specific interpretation.[6]

In this proposal, then, there are two ways to license s-BNPs. First, they can be licensed by the existential predicate *you* 'have/exist,' which is assumed to be a modal head taking a VP as its complement (Huang 1988; Cheng 1991). In semantics, *you* serves as an unselective binder that binds the subject at Spec-VP. An s-BNP is therefore licensed with everything in situ, including a null *pro* in Spec-IP. Second, when without *you*, an s-BNP cannot be bound because it is outside the scope of EC (Tsai 2001: 140). In such cases, V-to-Mod movement comes to the rescue by extending the scope of EC to as high as Mod^0, thereby closing/licensing the s-BNP. All the data in Tsai (2001) that exemplify the second situation include a modal element, either explicit, as in (29), (30) and (31), or implicit, as in (32).

(29) *San-ge bu-bing keyi/neng/yinggai/bixu dai jiu-fen kouliang.*
three-CL foot-soldier may/can/should/must carry nine-CL ration
'Three foot-soldiers may/can/should/must carry nine rations.'

(30) *San-ge ren chi-de-wan shi-wan fan.* (cf. (8))
three-CL person eat-MOD-finish ten-bowl rice
'Three people can finish ten bowls of rice.'

(31) *Liang-zhang chuang shui liu-ge ren gou le.* (cf. (7))
two-CL bed sleep six-CL person enough INCH
'It is enough for two beds to hold six people in sleeping.'

(32) *Liu-ge ren shui liang-zhang chuang.*
six-CL person sleep two-CL bed
'Six people should/may sleep in two beds.'

Tsai (2008) further observes that modality plays a crucial role in licensing object BNPs (henceforth o-BNPs).[7] In the non-modal sentence (33a), the preverbal o-BNPs are out, whereas in (33b) both o-BNPs become licensed. This suggests that the distribution of Mandarin BNPs in general should be subject to the same constraints, which is what the EMH attempts to account for.

(33) a. **Wo liang-ben shu nian-guo, san-ben shu mei nian-guo.*
I two-CL book read-EXP three-CL book not read-EXP
'I read two books, not three.' (Tsai 2008: 480)

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6. In Footnote 18, Tsai acknowledges that there are counterexamples to this analysis, which may not be due to syntactic factors (e.g. the lexical semantics of cardinality or predicate types).

7. I thank a reviewer for pointing out this connection with shifted o-BNPs.

b. *Wo liang-ben shu nian-de-wan, san-ben shu jiu bu xing le.*
I two-CL book read-can-finish three-CL book then not possible INCH
'I can finish two books, not three.'

In short, modals and verb movement – rather than the NP-internal structure – underlie the EMH. As such, the EMH avoids the problems mentioned in § 2.1.2.

2.2.2 *Discussion on the extended mapping hypothesis*

The major issue that I can see with the EMH is that the semantics in (28) does not actually yield the interpretation intended by the EMH. Prima facie, (28) appears to capture the interpretation of (26) because the generic operator *Gen* is restricted by some possible situations, and this should get us the generic-like nonspecific reading of indefinites. What (28) really says, however, is something like "it is possible that generally there are 5 people together who finish 10 bowls of rice." This is not what (26) means, because the possibility modal is not about whether it is true that generally there are 5 people who finish 10 bowls of rice, but about *whether in the situation of there being 5 people to eat 10 bowls of rice, these 5 people in this situation can finish eating the rice.*

To understand why (28) goes wrong, observe that the semantics in (28) largely resembles (34b) below, one of the possible readings of (34) (from Diesing 1992: 17).[8] (34a) is an existential claim that there are (some) firemen available in certain factual situations. (34b) is a generic statement that there are firemen available generally, where the generic operator *Gen* is restricted by a time variable.

(34) Firemen are available.
a. $\exists_{x,y}$ [firemen(x) & available(y)]] (existential reading)
b. Gen_t [time(t)][$\exists_x$[firemen(x) & available(x)(t)]] (generic existential reading)

Informally, (34b) is paraphrased as 'at/during the times quantified by *Gen*, there are firemen available.' If in some actual situation no firemen are available for a short period of time, (34a) would be false (as $\exists$ is by default anchored to the actual world) but (34b) could remain true (depending on further contextual restrictions on *Gen*). Although both contain existential quantification, (34a) has an extensional reading of *firemen*, whereas (34b) has an intensional one due to *Gen*.

Crucially, while (34) on the reading of (34b) asserts 'generally there are firemen available,' (26) by no means makes such claim that 'generally there are 5 people who finish 10 bowls of rice.' One can imagine that (34) is uttered in a scenario where firemen work short shifts (Diesing 1992: 18), but it is difficult to

8. There is a third reading, where *Gen* binds both x and t. See Diesing's work for more details.

come up with a scenario where (26) is felicitous if (28) were the correct semantics for it. The problem is that the situations quantified over by *Gen* are *not properly restricted*. The restriction of *Gen* cannot be filled in by a time variable (like (34b)) because, as just mentioned, (26) does not mean 'generally there are 5 people who finish 10 bowls of rice.'

In brief, the references of '5 people' and '10 bowls of rice' cannot be fixed if *Gen* is not correctly restricted; simply ∃-closing the free variable introduced by the s-BNP does not yield the meaning which the EMH wants to capture. Given that the semantics following from the syntactic operation in the EMH is incorrect (or at least insufficient), it is hard to see why the EMH should be motivated in the first place. Note in addition that the gist of the EMH – syntactic V-movement can affect the semantic scope of a modal/generic operator – is not a logical consequence of Diesing's MH, as the latter was originally proposed to explain the distinction of strong vs. weak quantifiers and does not make any prediction on the semantics of the clausal structure involving syntactic V-movement.

The very origin of this problem is that the interpretation of the s-BNP in (26) is not identical to nonspecific indefinites that are purely existential. Tsai (2001) first introduces the notions of *specific* and *nonspecific* indefinites by using the English example (35) and refers to all instances of s-BNPs in Mandarin, including those without *you* 'have,' as "nonspecific" throughout the paper.

(35) A man arrived yesterday. (Tsai 2001: 129)
  a. A certain man arrived yesterday. (specific)
  b. One man (rather than two) arrived yesterday. (nonspecific)

Note however that (35) (as well as its Mandarin counterpart containing *you*) has an *extensional* interpretation and contrasts with (29–32), which are all *intensional*. On either reading, the sentence (35) *asserts* about the existence of a man in the actual world, but (29–32) are concerned with individuals in possible worlds (introduced by a modal or *Gen*). In other words, there are *three* different interpretations of indefinites in the present discussion: in the first two, which correspond to (35a) and (35b) above, respectively, *you* is typically required (as noted at the beginning of this paper) and the actual existence of the referent of the indefinite is entailed; the third interpretation does not contain *you* and is instead brought out by a modal, lacking an existential entailment. As mentioned above, the meaning of (26) has to do with situations of there being 5 people to eat 10 bowls of rice; these situations constitute the restriction of *Gen* (i.e. in uttering (26) one is concerned only with such situations, but not unrestricted "typical" situations). In contrast, no modal or *Gen* is present in (35). Thus, while one may descriptively refer to *a man* in (35) and the s-BNP in (26) both as "nonspecific," the latter must be distinguished from the former semantically.

Finally, the EMH does not deal with, and thus does not predict, the s-BNPs in non-modal sentences such as (4–6). The EMH is therefore unsatisfactory as far as its empirical coverage is concerned, although this is by no means a problem of this hypothesis per se.

2.3 Lu 2004

2.3.1 *The carlsonian analysis*

A third analysis has been proposed by Lu (2004), who argues that what is at stake is the semantic and pragmatic properties of the predicate which takes an s-BNP as its argument. This account draws heavily on Carlson's (1977) theory for English bare plurals, and is in part similar to Tsai's (2001) in the correlation of the distribution of BNPs with something outside the nominal domain.

The key idea here is that the s-BNPs under discussion denote *kinds*, not individuals, and their distributional restriction follows from the availability of *kind predicates*. Carlson (1977) distinguishes between two types of predicates, state and property (after Milsark 1974). State predicates are predicated of different stages (or realizations) of an individual whereas property predicates are predicated of the individual, or the thing that ties all the stages together. For instance, *be sitting on my lawn* in (36a) is a stage-level predicate, while *eat hay* in (36b) belongs to a kind-level predicate.

(36) a. Cows are sitting on my lawn.
b. Cows eat hay.

The interpretation of the bare plural *cows* then depends on the type of the predicate: a state predicate selects an existential indefinite reading, and a property predicate selects the generic or kind reading. The semantics of a bare plural is uniformly represented as a proper name of a kind, which is an abstract individual; the ∃-interpretation of a bare plural is derived from the stage-level predicate that has an ∃-quantifier built-in in the semantics.

Lu suggests the following: Mandarin s-BNPs can be treated on a par with English bare plurals, the interpretation of which is contingent upon the predicate. Specifically, (37) expresses predication of a property of a kind, where '5 children' is interpreted as a generic NP that denotes the "5-child group" kind, the instances of which are group individuals consisting of 5 normal children (see Jiang 2012: Chapter 3 for similar remarks). The semantics of (37) would then be paraphrased as (38) under this approach.

(37) *Wu-ge xiaohai chi-bu-wan shi-wan fan.*
five-CL child eat-not-finish ten-bowl rice
'Five children cannot finish ten bowls of rice.'

(38) The 5-child group kind has the kind-level property of being unable to eat 10 bowls of rice.

Under this approach, what's involved in (37) is not quantification over individuals but rather simple predication of a kind-denoting NP. This provides a plausible alternative explanation to the fact that no scope interaction is observed for (37), because a kind-denoting NP is not a quantifier.

Similarly, *tai-bu-dong* 'cannot lift up' in (39) is deemed a kind-level predicate over group individuals. According to Lu, whereas the first clause is in non-factual mood, the second clause is factual. The s-BNP in the former cannot be the antecedent of the pronoun *tamen* in the latter as they are not at the same Discourse Representation Structure (DRS) level, hence the failure of coreference.

(39) *San-ge ren$_i$ tai-bu-dong zhe-jia gangqin. *Tamen$_i$-de liliang tai xiao.*
three-CL person lift-not-move this-CL piano they-POSS strength too small
'Three people cannot lift up this piano. Their strength is too weak.' (= (15a))

If both clauses bear non-factual mood, coreference is predicted to be possible. Lu shows that this can be evidenced by (40), where *chufei* 'unless' in the second clause expresses a hypothetical condition. Such example would be left unaccounted for under Li's (1998) NumP hypothesis.

(40) *San-ge ren$_i$ tai-bu-dong zhe-jia gangqin, chufei tamen$_i$ liqi tebie da.*
three-CL person lift-not-move this-CL piano unless they strength especially big
'Three people cannot lift this piano, unless they are especially strong.'

Finally, Lu contends that the contrast of (41a) and (41b) below can be explained if the existential verb *you* introduces the existence of group individuals that instantiate a group kind, but the predicate *gou* 'enough' does not.[9] The existential interpretation of (41a) is given in (42).

(41) a. *You san-ge xuesheng lai zher le.* (= (12))
have three-CL student come here ASP
'There are three students that came here.'

9. Lu does not explicitly say whether *gou* 'enough' should be considered a kind-level predicate (and, if so, why), though this would be what is implied in his analysis.

b. **You san-zhi gunzi gou ni da ta* (= (14))
have three-CL stick enough you hit him

(42) There exists an instance *i* (*i* a 3-person group individual) of the 3-person group kind, such that there exists a stage s of *i* such that s came here.

2.3.2 *Discussion on the Carlsonian analysis*

The kind-based analysis of Lu (2004) is fully in line with the observation noted earlier that occurrences of the so-called quantity BNPs are contingent on the verbal or clausal context, and therefore is free from the problems for Li (1998). Meanwhile, the Carlsonian analysis differs from Tsai's (2001) EMH in treating the s-BNPs not as existential indefinites but as generic, kind-denoting NPs, without assuming any dynamicity of Existential Closure. Thus, it does not suffer from the semantic problem discussed in § 2.2.2.

Nevertheless, both Tsai (2001) and Lu (2004) leave the first three examples of Li (1998) unexplained, namely (4–6). In particular, it is unclear how the Carlsonian approach would handle such data, since none of them seems to involve kind-level predicates or bear non-factual mood, in contrast to the few cases that Lu specifically addresses in his work.

Moreover, while Lu has explained the function of *you* 'have', he does not explain why the BNP in episodic sentences like (2a)/(2b) requires this existential verb, which is the very generalization that previous studies have tried to offer a rationale for. That is, why is it not the case that aspectually marked verbs in Mandarin can provide an existential quantifier like they do in English (as in Carlson's system) for s-BNPs so that the s-BNPs can appear alone without *you*?

Finally, there is the important question of how to determine which modal predicates select a generic s-BNP and which do not. The majority of examples addressed by Tsai (2001) and Lu (2004) are modal sentences, in particular those featuring ability or some sort of "potential" modality. However, Carlson's (1977) data are different; none of the English kind-level predicates he discusses involves comparable modality. Note that Carlson's theory was motivated by a series of minimal pairs that highlight the systematic contrasts between bare plurals and indefinites headed by *a*; the same clearly does not apply to Mandarin. Thus, what counts as the right predicate selecting a generic BNP in Mandarin is not very clear in Lu's analysis.

3. Proposal

My main proposal is that s-BNPs are obligatorily focused and must evoke a set of alternatives. After a brief presentation on the alternative-based theory of focus interpretation, I shall show how this idea can account for the observed distribution of Mandarin s-BNPs.

3.1 Alternatives and focus interpretation

The following discussions in this section will adopt the two-dimensional alternative semantics of Rooth (1985; 1992). In this framework, which encompasses a range of phenomena including scalar implicatures, association with *only*, (symmetric) contrast, question-answer congruence and others, a constituent α containing a focused element F has an ordinary semantic value, $[[\alpha]]^o$, and a focus semantic value, $[[\alpha]]^f$, respectively. $[[\alpha]]^f$ represents the set of alternatives obtainable by replacing the focused element with alternative values.

Rooth also proposes a focus interpretation operator ~, which introduces a context-dependent variable C and adjoins to F, and is constrained by the presupposition that C is a member or a subset of $[[\alpha]]^f$ that is distinct from $[[\alpha]]^o$. For example, to interpret *Mary saw [John]$_F$* we apply ~ together with C to *John*, yielding [John] ~C, which presupposes $C \neq [[\text{John}]]^o$ and $C \in [[\text{John}]]^f$, where $[[\text{John}]]^f$ is a set of individuals including $[[\text{John}]]^o$. Once ~ is applied to a focused phrase, its presuppositional requirement has to be met. In a question-answer pair, the presupposition is satisfied by the question being a set of alternative propositions (Hamblin 1973); in association with *only*, the presupposition is satisfied by an (implicit) domain of quantification, and so on.

For Mandarin s-BNPs, I submit that they contribute a set of alternatives obtainable from substituting the *numeral* constituent with other numerals.[10] For instance, the ordinary value and focus value of the sentence (43), where the numeral is focused, are (44a) and (44b), respectively.

(43) *[Yi]$_F$-ge xuesheng lai le.*
one-CL student come ASP
'One student came.'

(44) a. $[[(43)]]^o = \exists x[\text{student}(x) \,\&\, \text{came}(x) \,\&\, 1(x)]$
b. $[[(43)]]^f = \{\exists x[\text{student}(x) \,\&\, \text{came}(x) \,\&\, n(x)] : n \in \mathbb{N}\}$

10. Certainly not every BNP in Mandarin is obligatorily focused. The major claim of this section is that the instances of s-BNPs in (4–8) are, but I do not claim all BNPs are.

As is well known, focus is strongly related to exhaustivity (among other semantic properties). For (43), this means a subset of (44b) is excluded, resulting in the interpretation 'only one student came'. When associated with a scalar adverb like *even*, exhaustivity would mean all relevant alternatives of *F* are ranked higher than the ordinary value of *F*.

From (44a), the reader can see that 'one student' is rendered an ∃-quantified phrase; (44a) per se does not prevent the BNP from being an ∃-subject. But given that the main function of an ∃-sentence is to present or introduce a referent into the scene of the discourse (Lambrecht 1994), rather than to contrast the asserted individual with alternatives, it would be difficult to interpret (43) as a pure ∃-sentence. I conjecture that such conflict in meaning is why in previous literature (43) and sentences alike have often been considered degraded. This point is further elaborated in § 3.6, after detailed discussions on Li's (1998) data points in § 3.2–§ 3.5. In § 4 a few other cases will be brought up and discussed, where it will be argued that s-BNPs may also be interpreted as contrastive topics, another kind of alternative-generating elements.

3.2 Cumulativity and exhaustivity

To begin with, I propose that Li's (1998) first example, repeated as (45) below, has *cumulative* quantification (Kroch 1974; Scha 1981; Krifka 1989, 1999; Landman 2000) as its asserted meaning. A similar example is given in (46).

(45) *Liang-zhang chuang (, wo ting-shuo,) ji-le wu-ge ren.* (= (4))
two-CL bed I hear-say squeeze-ASP five-CL person
'Two beds(, I heard,) were crowded with five people.'

(46) *San-ge ren dian-le jiu-dao cai.*
three-CL person order-ASP nine-CL dish
'Three people ordered nine dishes.'

These sentences show certain peculiar properties. First, when the object is a bare noun or a plural indefinite, the acceptability decreases:

(47) ??*Liang-zhang chuang ji-le ren/yixie ren.*
two-CL bed squeeze-ASP person/some person
'Two beds were crowded with people/some people.'

(48) ??*San-ge ren dian-le cai/yixie cai.*
three-CL person order-ASP dish/some dish
'Three people ordered dishes/some dishes.'

Second, they are considered much degraded if the transitive predicate is replaced by an intransitive adjectival predicate:

(49) **Liang-zhang chuang hen-gui.*
two-CL bed very-expensive
'Two beds were expensive.'

(50) **San-ge ren hen-bao.*
three-CL person very-full
'Three people were full.'

At first glance, the emerging generalization is that there must also be an o-BNP in order for an s-BNP to survive. But it is actually not true that an s-BNP can always be licensed by an o-BNP. An exception arises when the subject and object are both singular BNPs, in which case the sentences still sound awkward.[11]

(51) ??*Yi-zhang chuang tang-le yi-ge ren.*
one-CL bed lie-ASP one-CL person
'One bed lay one person.'

(52) ??*Yi-ge ren dian-le yi-dao cai.*
one-CL person order-ASP one-CL dish
'One person ordered one dish.'

It is also not the case that s-BNPs can only be licensed by o-BNPs. The following examples in which the object is a plural demonstrative phrase do not sound too bad, especially if the demonstrative is stressed or accompanied by a deictic gesture.

(53) (?) *Liang-zhang chuang ji-le zhexie ren.*
two-CL bed squeeze-ASP these person
'Two beds were crowded with these people.'

(54) (?) *San-ge ren dian-le zhexie cai.*
three-CL person order-ASP these dish
'Three people ordered these dishes.'

Hence, a more accurate generalization about these constructions seems to be that the object must be either a plural BNP (preferred) or a plural demonstrative.

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11. The main verb of (51) is changed to *tang* 'to lie (down)' for pragmatic reasons. Note also that (51) and (52) are grammatical on a contrastive topic reading, which requires a different contextual setting. See § 4.1.

My proposal is that the constructions exemplified by (45) contain a *cumulative operator* which can be overtly realized as one of the adverbs *yigong*, *zonggong*, and *heji*, all of which mean 'altogether' or 'in total.' In what follows, I show that the observed restrictions unexceptionally match those on the sentences with the cumulative operator, which will be illustrated using *yigong*, thereby supporting the idea that (45) has a cumulative reading.

First of all, the construction with a non-numeral object phrase is equally marginal when *yigong* is explicitly expressed.

(55) ??*Liang-zhang chuang* ***yigong*** *ji-le ren/yixie ren.* (cf. (47))
two-CL bed in.total squeeze-ASP person/some person
'Two beds were crowded with people/some people in total.'

(56) ??*San-ge ren* ***yigong*** *dian-le cai/yixie cai.* (cf. (48))
three-CL person in.total order-ASP dish/some dish
'Three people ordered dishes/some dishes in total.'

In addition, when the main predicate is replaced by an adjectival phrase or when the subject and object are both singular BNPs, the appearance of *yigong* does not make the sentence any better.

(57) **Liang-zhang chuang* ***yigong*** *hen-gui.* (cf. (49))
two-CL bed in.total very-expensive
'Two beds in total were expensive.'

(58) **San-ge ren* ***yigong*** *(chi-de) hen-bao.* (cf. (50))
three-CL person in.total eat-DE very-full
'Three people in total were full.'

(59) ??*Yi-zhang chuang* ***yigong*** *tang-le yi-ge ren.* (cf. (51))
one-CL bed in.total lie-ASP one-CL person
'One bed accommodated one person in total.'

(60) ??*Yi-ge ren* ***yigong*** *dian-le yi-dao cai.* (cf. (52))
one-CL person in.total order-ASP one-CL dish
'One person ordered one dish in total.'

We should also note that an episodic sentence does not license an s-BNP if the object is a coordination phrase, which is also the case when *yigong* is present (cf. Zhang 2010: 61).

(61) ??*San-ge ren* ***(yigong)*** *jian-le Zhangsan he Lisi.*
three-CL person in.total meet-ASP Zhangsan and Lisi
'Three people met Zhangsan and Lisi in total.'

Furthermore, *yigong* is more or less compatible with a plural demonstrative phrase in object position.

(62) (?)*Liang-zhang chuang* ***yigong*** *ji-le* *zhexie ren.* (cf. (53))
two-CL bed in.total squeeze-ASP these person
'Two beds were crowded with these people in total.'

(63) (?)*San-ge ren* ***yigong*** *dian-le* *zhexie cai.* (cf. (54))
three-CL person in.total order-ASP these dish
'Three people ordered these dishes in total.'

All in all, (45) and (46) behave as if they bear a silent *yigong* in a preverbal position. It is therefore reasonable to pursue the hypothesis that *yigong* may play a key role in these constructions, which we may now refer to as implicit cumulative constructions.

Setting aside the question of why *yigong* favors the co-occurrence of a numeral (and, to a lesser extent, demonstrative) but cannot associate with a conjunctive expression, I submit that sentences such as (45) and (46) are on a par with Scha's (1981: 500–501) classic Example (64a), which Scha suggests can be paraphrased as (64b). A similar example is (65) (Krifka 1999).

(64) a. 600 Dutch firms have 5,000 American computers.
b. 'The number of Dutch firms which have an American computer is 600, and the number of American computers possessed by a Dutch firm is 5,000.'

(65) Three boys ate seven apples.

Krifka (1989; 1999), Landman (2000) and others have observed that, on the cumulative reading, the two indefinites in such sentences are *scopeless*: they are both bound by an ∃-quantifier, and neither one takes scope over the other. In other words, (65) receives the following (weak) truth-condition in (66) (event/world variables omitted).

(66) $\exists x \exists y[3(x) \,\&\, \text{boy}(x) \,\&\, 7(y) \,\&\, \text{apple}(y) \,\&\, x \text{ ate } y]$

Krifka (1989; 1992; 1999) further notes that (66) by itself does not exclude there being more than 3 boys who ate apples or there being more than 7 apples eaten by boys; in addition, a scenario where 2 boys ate 6 apples would not be compatible with (65). He argues that these alternative values of boys/apples can be filtered out by scalar implicatures (SIs). By utilizing Rooth's alternative semantics, Krifka (1999) derives the implicated meaning of (65) in the following steps. First, a numeral such as *seven* introduces competing alternative numerals of its own, as in (67a), so that (65) ends up generating the set of propositional alternatives in

(67b).[12] Second, these alternatives are associated with an illocutionary operator ASSERT, defined in (67c).

(67) a. $[[\text{seven}]] = \lambda P \lambda x[7(x) \,\&\, P(x)]$
$[[\text{seven}]]_A = \{\lambda P \lambda x[n(x) \,\&\, P(x)] : n \in \mathbb{N}\}$
b. $[[\text{three boys ate seven apples}]]_A =$
$\{\exists x \exists y[n(x) \,\&\, \text{boy}(x) \,\&\, m(y) \,\&\, \text{apple}(y) \,\&\, x \text{ ate } y] : n, m \in \mathbb{N}\}$
c. ASSERT(M, A, c) (a sentence with meaning M and alternatives A in a context c is asserted):
– the speaker claims M (in c);
– for every alternative $M' \in A$, $M' \neq M$, the speaker explicitly does not claim M' (in c). (Krifka 1999: 207)

That the speaker of (65) does not assert an M' can be that she does not have evidence that M' is true or she has evidence that M' is false (maxim of Quality), or that M' is less informative than M (maxim of Quantity). It is for one of these cooperative principles that the numerals in (65) are interpreted on the "exact" reading, i.e. there are exactly 3 boys and exactly 7 apples in the context.[13] At any rate, the alternatives introduced by the numerals are ruled out by the pragmatics that determines why an alternative is not uttered.

The example (45) can be easily modeled on this analysis assuming that it is on a par with (64a) and (65) in the cumulative quantification and that both BNPs are focused. It would have the LF structure in (68a), with the meaning in (68b), alternatives in (68c) (a subset of $[[(68b)]]^f$), and SI in (68d).

(68) a. ASSERT[2 beds were crowded with 5 people]
b. 2 beds were crowded with 5 people
c. $Alt = \{n$ beds were crowded with m people : $n, m \in \mathbb{N}\}$
d. $\forall p \in Alt[[[(68b)]] \not\subseteq p \rightarrow \neg p]$ ($\not\subseteq$ = 'does not entail')

The meaning of (45) in plain words is rendered as follows: 'There were exactly two beds that were crowded with people, and exactly five people on the beds.' In this conception, (45) "licenses" the s-BNP because the set of alternatives intro-

12. Krifka (1999: 268) assumes that numerals can introduce alternatives without focus and uses the subscript A to stand for a focus semantic value in Rooth's system.

13. Krifka (1999: 266) actually states that n and m should represent the *highest* numbers in a context where (65) is true. I assume it does not harm to restate the "maximal" construal in terms of the "exact" construal in this case.

duced by the latter are "exhaustified" by ASSERT, resulting in the exhaustivity implicature that exactly 2 beds and 5 people were in the relevant context.[14]

A slight modification on this approach for (45) is probably needed. If the BNPs are both focused, then ASSERT should be an *obligatory* operator to ensure exhaustivity. This would be a stronger requirement than in Krifka's account, where ASSERT is added due to pragmatics. One may replace ASSERT with a *grammatical* exhaustivity operator like that in Chierchia et al. (2013), or take the exhaustivity as a presupposition, like that in *it*-clefts (Büring & Križ 2013, etc.). In any case, the exhaustivity in (68d) satisfies the *Exhaustivity Condition* in (9).

Note that since cumulativity and exhaustivity are both independent of modality, it is unsurprising that (45) is grammatical even if it is not a modal or generic sentence. This is an advantage over the EMH or the Carlsonian analysis surveyed above. Moreover, SIs can be triggered without assumptions about the internal structure of the BNPs. There is thus no need to resort to the NumP hypothesis.

To recapitulate, what the Mandarin data in (47) to (63) have shown is that sentences such as (45) are best treated as cumulative constructions. As a reviewer has remarked, the argument based on parallel grammaticality is weak. I agree that the observed pattern can be indirect support at best, and it is possible that the cumulative reading (which needs to be accounted for anyways) can be derived without assuming *yigong* or its covert counterpart in the LF, perhaps along the lines of Krifka's analysis for English. But then it would be a curious coincidence that (45)/(46) and *yigong*-sentences are subject to the same range of restrictions while being unrelated. Notice also that in English plural definites can form a cumulative construction (e.g. *The soldiers hit the targets*; Beck & Sauerland 2000); the subject and object need not be numeral phrases. This is not what (45) suggests with an s-BNP. I believe the fact that (45) behaves as if it involves an implicit *yigong* is indicative of an operating *yigong* which, unlike English, may have a strict *counting* function and is only compatible with numeral expressions, or phrases that allow one to easily infer a salient quantity contextually. If *yigong* is entirely absent, cumulative quantification does not require BNPs, as in (69), which is true on the cumulative reading.

14. A reviewer takes it that one can felicitously and truthfully utter *Liang-ge ren chi-le jiu-ge pingguo* '2 people ate 9 apples' in a situation where John ate 4 apples, Bill ate 5 and Mary ate 1. I agree with this judgment, but note that this does not contradict the present account based on Krifka's because the examples he cites and discusses are not situated in a context where an indefinite is made known to denote a non-maximum. For the reviewer's case, exhaustivity is relevant in the sense that the number of people who ate 9 apples in total is 2 and only 2, which would leave room for the presence of people who ate apples of a different quantity.

(69) *Zhexie xuesheng mai-le zhe ji-ben shu.*
these student buy-ASP this some-CL book
'These students bought these books.'

Still, I cannot explain why *yigong*-constructions require numeral expressions in order to establish cumulativity. A thorough investigation of the semantics of *yigong* will have to await further research, though I believe it is plausible, given available observations, to take the idea that (45) and (46) are implicit *yigong*-constructions as a working hypothesis.

Two reviewers (referred to as Reviewer #1 and #4 below) have independently made a connection between (45) and the adverb *fenbie* 'respectively/separately.' I shall discuss one here and postpone the other till § 4.3.

Reviewer #1 raises the following set of data, which seems to license cumulative reading as well (on the s-BNP), and asks whether *fenbie* is also a cumulative operator in these cases.

(70) a. *Shiyi-liang che* ***fenbie*** *zhui-zhuang cheng yi-tuan.*
eleven-CL car respectively chase-hit into one-mass
'Eleven cars collided (with each other) and piled up.'
b. *Qi-ba-ge ren* ***fenbie*** *shang-le liang-liang che.*
seven-eight-CL person respectively get.on-ASP two-CL car
'Seven or eight people got on two cars, respectively.'

I think not: *fenbie* is not a cumulative operator in the same sense that *yigong* is, although the truth condition of these sentences is identical to their counterparts containing *yigong*. As a first approximation, what *fenbie* does appears to be imposing the requirement that there be multiple distinct events in the propositional meaning of the sentence with it. Thus, for (70a) there must be at least two colliding events each of which results in a "piled-up" situation, and for (70b) there must be at least two riding events each of which involves a person and a car. Such requirement is compatible with the presence of cumulative quantification, hence the intuition that (70a)/(70b) carries a cumulative reading. Note that this may not be the whole story. For instance, (71a) could supposedly be interpreted as a plurality of singing events, but it sounds very odd or incomplete unless a numeral is added to the object, as in (71b).

(71) a. ??*Tamen* ***fenbie*** *chang-le ge.*
they respectively sing-ASP song
Intended: 'They sang songs, respectively.'
b. *Tamen* ***fenbie*** *chang-le liang-shou ge.*
they respectively sing-ASP two-CL song
'They sang two songs, respectively.'

It seems to be a general syntactic requirement for both *yigong* and *fenbie* that the object cannot be a bare NP, despite their semantic differences. I refer the reader to Liu (2005) for in-depth discussions on *fenbie* and will not explore this topic further.

Reviewer #4 remarks that (45) may also have a distributive reading in which 10 people were involved and that *fenbie* or *ge* 'each' can be added, as evidenced by (72). The question is whether (45) on this interpretation involves a distributive quantifier. I shall return to this case in § 4.3, where another related construction brought up by the same reviewer will be addressed as well.

(72) *Liang-zhang chuang (, wo ting-shuo,)* ***ge/fenbie*** *ji-le wu-ge*
two-CL bed I hear-say each/separately squeeze-ASP five-CL
ren.
person
'Two beds (I, heard,) were crowed with five people separately.'

Before closing this section, let us note that *yigong* cannot associate with a subject to its left; if it could, (57), (58) and many examples above would have been grammatical. For *yigong* to apply to a subject expression, it must occur on top of the subject together with the existential verb *you* 'have' (Simpson 2012), as in (73a). (73b) shows that *yigong* cannot quantify over the s-BNP.

(73) a. *Yigong you wushi-ge xuesheng lai jie shu le.*
in.total have fifty-CL student come borrow book ASP
'Altogether fifty students have come to borrow books.' (Simpson 2012: 93)
b. **Wushi-ge xuesheng yigong lai jie shu le.*
fifty-CL student in.total come borrow book ASP

Strictly speaking, the BNP in (73a) is no longer a subject; it has been "demoted" to a postverbal object due to the insertion of *you*. What this means is that it is not simply the existence of *yigong* that produces a cumulative construction which licenses s-BNPs; rather, it is *yigong* together with an object that does the job. In contrast, a plural subject is not required for *yigong*, as shown in (74):

(74) a. *Lisi yigong mai-le wu-ben shu.*
Lisi in.total buy-ASP five-CL book
'Lisi bought five books in total.'
b. *Shang-xingqi yigong xia-le san-ci yu.*
last-week in.total fall-ASP three-time rain
'It rained three times in total last week.'

A natural explanation is that in such cases one of the arguments of *yigong* is supplied by an implicit event or temporal argument, e.g. two buying events in (74a) and a week-long temporal duration in (74b).

To summarize, the constructions in (45) and (46) have a cumulative interpretation and exhaustivity over quantity alternatives due to the illocutionary operator ASSERT (following Krifka 1989; 1999). The quantity interpretation of the s-BNP in these constructions is the basic meaning of cumulative quantification together with an exhaustivity implicature.

3.3 Association with focus particles

Next, I propose that the second and third examples of Li (1998), repeated below, involve focus association with the scalar particle *jiu*, and that the s-BNPs in both cases introduce alternatives regulated by *jiu*.[15]

(75) *San-ge baomu jiu zhaogu ta [yi]$_F$-ge xiaohai.* (= (5))
three-CL babysitter only care he one-CL child
'Three babysitters took care of him, only one child.'

(76) *[Liang]$_F$-ge laoshi jiu ba na-qun xiaohai kongzhi-zhu le.* (= (6))
two-CL teacher then BA that-group children control-hold ASP
'Two teachers (sufficed to have) controlled that group of kids.'

As a starting point, observe that the following example is minimally different from (75) in the form of the subject.

(77) *Lisi jiu zhaogu ta [yi]$_F$-ge xiaohai.* (cf. (5))
Lisi only care he one-CL child
'Lisi (alone) took care of him, only one child.'

The subject *Lisi* in (77) denotes an amount of effort that is relatively significant with respect to taking care of one child. This is an interpretation parallel to (75) with a BNP, which suggests that the "quantity" reading is available even when the subject is not a BNP. In my analysis, this follows because what drives the "great-effort" reading is the particle *jiu* in either case, regardless of the form of the subject. Another example, (78), which differs from (76) again only in the subject, illustrates the same point.

(78) *[Lisi]$_F$ jiu ba na-qun xiaohai kongzhi-zhu le.* (cf. (6))
Lisi then BA that-group children control-hold ASP
'Lisi (sufficed to have) controlled that group of kids.'

Although the BNP is replaced by a proper name in (78), the sufficiency reading that nothing more than the referent denoted by the subject was needed (to control

15. The focus expression associated with *jiu* is marked by [.]$_F$.

that group of kids) does not go away. This indicates the so-called quantity reading associated with sufficiency in (6) is not a semantic property specific to the BNP but a more general one that hinges on the presence of *jiu*.

Biq (1984) and subsequent literature have observed that the scalar interpretation of a *jiu*-sentence is correlated with its syntactic form: if *jiu* precedes its focus associate, as in (75), the *only* reading results; otherwise, *jiu* signals a *sufficiency* condition, as in (76). What has been referred to as quantity reading in *jiu*-sentences appear to be underlain by the scalarity stemming from the interaction between *jiu* and a focus phrase. The meaning and different uses of *jiu* have been a matter of controversy over the years (Biq 1984, 1988; Paris 1985; Lai 1995, 1999; Hole 2004, 2006; Zhang & Lee 2013; Liu 2017), though most of these studies converge on the idea that *jiu* is a focus element that induces scalarity and triggers alternative values at some level of interpretation. For example, Lai (1995; 1999) proposes a model based on the notion of "rejected expectations" in which *jiu* presupposes a change of state of the truth value of a proposition that contradicts one's expectation. Hole (2004; 2006), who concentrates on the type of *jiu* in (76), maintains that it is an agreement marker between a verbal background and a focus or contrastive topic and carries the presupposition that at least one of the alternatives is false.

A more recent account that accords with the present proposal, which I shall tentatively adopt for (75) and (76), is offered by Liu (2017). In this account, *jiu* is analyzed as a "weak" variant of *only* defined in (79): Every alternative q of the prejacent π in the implicit domain of quantification C that asymmetrically entails π is false.

(79) $[[\textsc{only}_{\text{weak}}(\pi)]]$ is true iff $\forall q \in C[q \subset \pi \rightarrow \neg q]$ (Liu 2017: 64)

Liu's weak *only* analysis is motivated to handle cases such as (80a) and (80b), where *jiu* interacts with a focus (a proper name or BNP) that follows it, as well as (81a) and (81b), where *jiu* is associated with a preceding contrastive topic (CT) (Liu 2017: 82–83).

(80) a. *Jiu [Yuehan]$_F$ hui shuo fayu.*
JIU John can speak French
'Only John can speak French.'

b. *Shangci, jiu [liang]$_F$-ge ren taiqi le gangqin.*
last.time JIU two-CL people lift ASP the.piano
'Only two people lifted the piano.'

(81) a. *[Yuehan]$_{CT}$ jiu hui shuo fayu.*
John JIU can speak French
'John, who is easy to get hold of, can speak French.'

b. *Shangci, [liang]$_{CT}$-ge ren jiu taiqi le gangqin.*
last.time two-CL people JIU lift ASP the.piano
'Last time, a group of two people, which was a small group, together lifted the piano.'

Liu's theory relies on a distinction between sum-based and atom-based alternatives, another distinction between distributivity and collectivity, and yet another between CT and focus. In (80a), the set of alternatives (*Alt*) denoted by 'John' is *sum*-based: if John, Bill and Mary are the only relevant individuals, then *Alt* = {*j, b, m, j⊕b, j⊕m, b⊕m, j⊕b⊕m*}. Alternative propositions would be those of the form "*x* can speak French" where *x* is replaced by the members in *Alt*. Since all the propositions with a plural individual (e.g. *j⊕b*) asymmetrically entail π ('John can speak French'), the former are ruled out by the weak *only*, which in turn rules out *b* and *m*. The result: all alternatives but 'John' are excluded, just as what we would get with the "strong" *only*. The meaning of (80b), on the distributive reading, is accounted for similarly: alternative propositions with the numeral 3 and higher are excluded (i.e. '3 people each lifted the piano' entails '2 people each lifted the piano,' and so on).

On the other hand, Liu argues that the alternatives involved in (81a) are *atom*-based, and 'John' is not a focus but a CT, which only triggers atomic alternatives, i.e. *Alt* = {*j, b, m*}. Since none of these members entails π, none is excluded, and the "non-exclusiveness" of the weak *only* obtains. Likewise, (81b) on the collective reading does not exclude propositions with the numeral 3 or higher. But now a crucial question is how then the easy-to-get-hold-of reading of (81a) should come about if the weak *only* effect of *jiu* is vacuous. Liu's solution is to additionally assign the scalar presupposition (82) for *jiu*, which says the asserted individual is ranked lower than all members in *Alt* introduced by the CT along a scale *R* (e.g. a scale of "effort").[16]

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16. The easy-to-get-hold-of reading could probably be derived in a different manner than (82). As Hole (2004: 70) observes, yet another scalar focus marker *guang* 'alone, merely' can precede the focus associate of the non-exclusive type of *jiu* without resulting in any redundancy, as shown in (i).

(i) ***Guang*** *(shi) [liang]$_{F}$-ge laoshi jiu ba na-qun xiaohai kongzhi-zhu le.*
alone be two-CL teacher then BA that-group children control-hold ASP
'Two teachers alone (sufficed to have) controlled that group of kids.'

Crucially, *guang* cannot be inserted in the same position in (75). This implies that the difference between the two types of *jiu* in (75) and (76) may have to do with *guang*, which seems to be the source of the presupposition (82) and/or the non-exclusiveness of ONLY$_{weak}$. Assuming that (76) contains a covert *guang*, it is possible that one may be able to obtain the non-exclusiveness compositionally (using (i) as the underlying structure) without (82) being an additional condition.

(82) Scalar presupposition of *jiu*:
$\forall x \in Alt([[\text{associate}]])[x \neq [[\text{associate}]]) \rightarrow [[\text{associate}]] <_R x]$ (Liu 2017: 74)

Now back to (76), our thesis that s-BNPs obligatorily evoke alternatives implies that '2 teachers' must introduce alternatives along the quantity scale on which an exhaustivity operator will operate. This idea is in concert with Liu's framework, though we need to bring in the notion of CT and collectivity to enrich our proposal. More specifically, the prejacent of (76) is (83a), and alternatives (83b). Since none of the alternatives entails the prejacent in this atom-based context (e.g. that 3 teachers together controlled the kids does not entail that 2 teachers did so together), no exclusive inference arises, hence the perceived non-exclusiveness of *jiu*.

(83) a. π of (76): 2 teachers together controlled that group of kids
b. $Alt([[[\text{liang}]_{CT}\text{-ge laoshi}]]) = \{n \text{ teachers} : n \in \mathbb{N}\}$
c. Exclusive inference of (76): none

On the other hand, the s-BNP is still subject to (82). Thus, the former is exhaustively interpreted, but at the level of presupposition.

The situation with (75) is more complicated. Given that *jiu* in this example has a prominent exclusive interpretation, it should be analyzed as the weak *only* associated with *distributivity* and a focus in its scope that introduces sum-based alternatives, as with (80a)/(80b). Following Liu, its prejacent would be (84a), and the alternatives activated by '1 child' is the set in (84b). The resulting exclusive inference is (84c): the alternatives in (84b) all asymmetrically entail (84a) and therefore must be excluded per the semantics of *jiu*.

(84) a. π of (75): 3 babysitters each took care of him, 1 child
b. $Alt([[[\text{yi}]_{CT}\text{-ge xiaohai}]]) = \{n \text{ children} : n \in \mathbb{N}\}$
c. $\forall p \in \{3 \text{ babysitters each took care of } n \text{ children} : n \in \mathbb{N}\}[p \subset [[(84a)]] \rightarrow \neg p]$

One problem of this account, however, is that the only reading of (75) is *collective*, namely '3 babysitters together took care of him, 1 child.' And if so, the exclusive interpretation should not arise because that 3 babysitters together took care of him does not entail that 2 babysitters together did so (cf. (81b)). In other words, under Liu's theory the exclusive reading of (75) requires sum-based alternatives with a distributive construal, but in fact (75) has a collective interpretation which predicts no exclusiveness. Note further that (84c) does not involve alternatives of the s-BNP, which contradicts the current proposal that s-BNPs always introduce alternatives. In addition, it does not help to let *jiu* outscope both the subject and object because this does not remove the distributivity that is unavailable in (75).

Rather than taking this dilemma to be a problem for Liu, I am in favor of the hybrid analysis where (75) is a *cumulative* construction (§ 3.2) together with *jiu*, and the role of the latter is to impose the scalar presupposition in (82) above but

with a reversed ordering relation. Specifically, the basic meaning of (75) is shown in (85a) below, which (per Krifka's account) introduces the alternatives in (85b) that will be excluded by an exhaustivity implicature, as in (85c); and finally, *jiu* adds the presupposition in (85d) that '3 babysitters' is ranked *higher* than alternatives along an "effort" scale *R*, which is responsible for the great-effort reading on the s-BNP. That is, the *only*-like reading of *jiu* results from the presupposition that '3 babysitters' competes with the alternatives {*n* babysitters : $n \geq 3$}.

(85) a. $\exists x \exists y[3(x)$ & babysitter(x) & $1(y)$ & child(y) & x took care of $y]$
b. $Alt = \{n$ babysitters each took care of m child : $n, m \in \mathbb{N}\}$
c. $\forall p \in Alt[[[(85b)]] \not\subseteq p \rightarrow \neg p]$
d. $\forall x \in Alt([[$san-ge baomu$]])[x \neq [[$san-ge baomu$]] \rightarrow x <_R [[$san-ge baomu$]]]$

That the (pragmatic) ordering relation between the s-BNP and alternatives may change with the context can be evidenced by the fact that the former may receive either a great- or little-effort reading depending on the numeral of the subject relative to that of the object: while (86a) (= (75)) conveys that '3 babysitters' represents great effort, (86b) expresses the otherwise.

(86) a. *San-ge baomu jiu zhaogu ta yi-ge xiaohai.* (= (75))
three-CL babysitter JIU care he one-CL child
'Three babysitters took care of him, only one child.'
⇢ '3 babysitters' represents great effort
b. *San-ge baomu jiu zhaogu tamen ershi-ge xiaohai.*
three-CL babysitter JIU care they twenty-CL child
'(Only) three babysitter took care of them, twenty children.'
⇢ '3 babysitters' represents little effort

A similar case, (87), is observed by a reviewer who asks what is responsible for the licensing of the s-BNP as the sentence contains *yigong* 'in total' on top of *jiu*. The answer is that both *yigong* and *jiu* exert their force here: *yigong* triggers propositional alternatives of the kind in (85a), whereas *jiu* contributes the scalar presupposition in (82), assuming Liu's (2017) analysis. Since the alternatives pertaining to *yigong* and *jiu* are different, they can both be introduced.

(87) *San-ge ren* ***yigong jiu*** *dian-le liang-dao cai.*
three-CL person in.total JIU order-ASP two-CL dish
'Three people only ordered two dishes.'

The application of Liu's (2017) theory to Li's (1998) data may not be the most parsimonious solution. However, for our purposes it suffices to show that the quantity interpretation of (75) and (76) is in fact rooted in the focus operator *jiu*, in particular its exclusiveness/exhaustivity (if alternatives are sum-based) and

scalar presupposition (if alternatives are atom-based). Note also that the idea that s-BNPs are "licensed" by focus interpretation can be corroborated by another scalar focus particle, *cai*, which is similar to *jiu* and can also license a "quantity-denoting" and yet referential s-BNP. (88) and (89) below are essentially identical to (5) and (6), respectively, except that the scalar element is replaced by *cai*. *Cai* conveys pretty much the same exclusiveness as *jiu* does in (5); in (89), *cai* is associated with '5 teachers' to its left and the scalar inference is that such represents a good deal of effort. In addition, in both cases the subject can serve as a coreferential antecedent of a pronoun, just like the pattern of (5) and (6) (§ 2.1.2).

(88) *San-ge baomu cai zhaogu [yi]$_F$-ge xiaohai.* (cf. (5))
three-CL babysitter CAI care one-CL child
'Three babysitters took care of only one child.'

(89) *[Wu]$_F$-ge laoshi cai ba na-qun xiaohai kongzhi-zhu.* (cf. (6))
five-CL teacher CAI BA that-group children control-hold
'It took (no fewer than) five teachers to control that group of kids.'

Once again, the perceived "quantity" reading of the s-BNP is correlated with the scalarity of *cai*, which, like *jiu*, may come into two types, one interacting with a preceding CT and the other with a following focus. In either case, the s-BNP triggers alternatives to be exhaustified in the scalar semantics of *cai*.

3.4 Sufficiency and exhaustivity

Let us now revisit Li's (1998) fourth example (7), repeated as (90).

(90) *San-zhi gunzi gou ni da ta.* (= (7))
three-CL stick enough you hit him
'Three sticks are enough for you to hit him (with).'

An alternative-based analysis for the predicate *sufficient* in English can be found in the work of Beck & Rullmann (1999), which I believe applies to *gou* straightforwardly.[17] Their semantics for *sufficient* is shown in (91).

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17. One different but closely related approach is Meier's (2003) on English *enough*. Details aside, the basic idea is that *enough*-sentences with an infinitival clausal complement are comparative constructions bearing implicit modality (if there is no overt modal). For example, the meaning of (i.a) is paraphrased as (i.b).

(i) a. Bertha is old enough to drive a car.
b. 'The value *v* such that Bertha is *v*-old is greater than or equal to the minimum of all values *v** such that, if Bertha is *v**-old, she *is able to* drive a car.' (Meier 2003: 72)

(91) $[[\text{sufficient}]]^o(w)(p) = 1$ iff $\exists w' : w \sim w'[\neg\exists q[q \in [[p]]^f \,\&\, q(w') \,\&\, [[p]]^o \nrightarrow q]]$
(Beck & Rullmann 1999: 261)

In this analysis, *sufficient* contains two components: a possibility modal (taking a propositional argument p), and a meaning resembling *only* (in being sensitive to the focus semantic value of p). The sentence *it is sufficient p* states that it is possible (given what is permitted) that no alternative proposition to p that is not implied by p is true. For example, (92a) has the semantics in (92b), which operates on the focus semantic value of p in (92c); the alternatives with the numeral 5 or more are asserted to be excludable in the accessible worlds.

(92) a. It is sufficient that $[\text{four}]_F$ people show up.
b. $\exists w' : w \sim w'[\neg\exists q[q \in [[(92a)]]^f \,\&\, q(w') \,\&\,$ that 4 people show up $\nrightarrow q]]$
c. $[[(92a)]]^f =$ {that 4 people show up, that 5 people show up…that 3 people show up…}

It follows that (92a) entails (93), because the alternatives negated in the latter is a subset of those negated in the former.

(93) It is sufficient that five people show up.

Applying this analysis on (90) will require the s-BNP 'three sticks' to be focused whose focus semantic value is a set of *propositions*. I assume the s-BNP, despite its nominal form, actually underlies a covert clausal structure that can be interpreted as 'that you use 3 sticks' in this case.[18] The semantics of (90) can then be given as (94a), which operates on the alternatives in (94b). This translates to the following: it is possible that no alternative proposition that is distinct from (94b) and

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An *enough*-sentence of the form [*x* is ADJ enough to *p*] on this account relates two values under a comparative (more precisely, equative) relation. The first value is the one for which the proposition denoted by the main clause is true, i.e. Bertha is of certain age. The second value is the minimum among a set of values determined by a hidden conditional structure headed by (in this case, implicit) *be able to*, and the conditional antecedent and consequent are provided by the main clause and the infinitival complement, respectively. The comparative and modal components altogether constitute the meaning of an *enough*-sentence with an infinitival complement. This treatment shares with Beck & Rullmann's (1999) for *sufficient* the component of a possibility modal, but additionally involves comparative semantics due to the fact that *enough* can follow an adjective. As a reviewer has noted, however, it is not clear how this analysis fits into the alternative semantics picture as proposed in this paper. For this reason, I adopt the one of Beck & Rullmann and leave for future research whether Meier's (2003) view on *enough* can be recast in alternative semantics as well.

18. This is not an implausible assumption, since certain nominal phrases can indeed be attributed propositional content, e.g. definite DPs as concealed questions when embedded under certain verbs.

not implied by (94b) is true. To further paraphrase: 'It is possible that you use 3 sticks, and it is possible that you do not use 4 sticks or more.' This seems to be the right meaning of (90).

(94) a. $\exists w' : w \sim w'[\neg\exists q[q \in [[\text{that you use 3 sticks}]]^f \,\&\, q(w') \,\&\, \text{that you use 3 sticks} \nrightarrow q]]$
b. $[[\text{that you use 3 sticks}]]^f = \{\text{that you use 4 sticks, that you use 5 sticks, ...}\}$[19]

The only difference between (90) and Beck & Rullmann's *sufficient*-examples is that the former has an overt purpose phrase 'for you to hit (with)' whereas for the latter such is derived through context. This does not affect the present proposal that (91) is the correct semantics for *gou* because the purpose phrase is simply a restriction on the relevant modal. Note that (90) can be alternatively expressed as (95), in which the purpose phrase is promoted to a topic (syntactically an adjunct) and *gou* turns into a one-place predicate with the BNP as the sole argument (the example (31) above, due to Tsai 2001, is a similar one).

(95) *(Rang) ni da ta, san-zhi gunzi gou le.*
let you hit him three-CL stick enough ASP
'For you to hit him, three sticks are enough.'

Assuming (95) is synonymous to (90) and the two structures may be syntactically related, I take (95) to be another indication that (91) is a suitable treatment for *gou*. More importantly, *gou* has a built-in *exhaustive* interpretation: the ordinary semantic value has the lowest number relative to all excluded alternatives, and *gou*(*p*) has the same truth-condition as *it is possible that only p*.

To sum up, if Beck & Rullmann are on the right track and if Mandarin *gou* has the identical lexical semantics as English *(be) sufficient*, then *gou*-sentences prove to be yet an environment where s-BNPs in Mandarin observe the *Exhaustivity Condition*.

3.5 Conditionals and exhaustivity

Finally, given the cumulativity analysis for (45), it is tempting to analyze Li's (1998) last example (8) (and the majority of the data in Tsai 2001) in the same way, which has a BNP in both the subject and object positions.

(96) *Wu-ge xiaohai chi-de-wan shi-wan fan.* (= (8))
five-CL child eat-can-finish ten-bowl rice
'Five children can finish ten bowls of rice.'

19. Alternatives with the numeral 2 and 1 are entailed by assertion and are therefore omitted here.

There are nonetheless at least two indications that this is not on the right track. First, such modal sentences are grammatical when the object is a singular demonstrative phrase, but the latter is incompatible with the cumulative operator *yigong*:

(97) *Liu-ge ren (*yigong) tai-de-qi na-kuai shitou.*
six-CL person in.total lift-can-up that-CL rock
'Six persons can lift that rock (*in total).' (cf. Tsai 2008: 481)

Second, while (96) is fine with *yigong*, its negative counterpart is not. The contrast is given in (98).

(98) a. *Wu-ge xiaohai yigong chi-de-wan shi-wan fan.*
five-CL child in.total eat-can-finish ten-bowl rice
'Five children can finish ten bowls of rice in total.'
b. **Wu-ge xiaohai yigong chi-bu-wan shi-wan fan.*
five-CL child in.total eat-not-finish ten-bowl rice
'Five children cannot finish ten bowls of rice in total.'

For reasons not clear to me, *yigong* is incompatible with a negated predicate in general:

(99) a. *San-ge ren yigong mai-le shi-ben shu.*
three-CL person in.total buy-ASP ten-CL book
'Three students bought ten books in total.'
b. **San-ge ren yigong mei-you mai shi-ben shu.*
three-CL person in.total not-have buy ten-CL book
'Three students didn't buy ten books in total.'

Regardless of why this is so, the fact that (96) is grammatical, unlike (98b) or (99b), indicates that the former is not a cumulative construction, and therefore a different analysis has to be pursued.

I contend that (96) is best analyzed as a *conditional* construction marked by the V-*de*-R modal predicate. This has been independently suggested by W. Liao (2011: Chapter 5). Under the conditional analysis, the meaning of (96) is paraphrased as (100):

(100) 'If there are 5 children to eat 10 bowls of rice, finishing eating the 10 bowls of rice (by the 5 children) is possible.'

The driving intuition behind this paraphrase is that (96) is synonymous to (101), a topic-comment structure with a sentential topic and the V-*de*-R predicate being the comment, a modalized proposition.[20]

---

20. In contrast, non-modal cumulative constructions like (45) cannot be rendered this way. This again shows that (45) and (96) are distinct quantificational constructions.

(101) [$_{\text{topic}}$ *Wu-ge xiaohai chi shi-wan fan*][$_{\text{comment}}$ *chi-de-wan*].
five-CL child eat ten-bowl rice eat-can-finish
'For five children to eat ten bowls of rice, (they) can finish eating (them).'

The (existential) modal meaning of (101) in terms of situation semantics (e.g. Kratzer 2014) is shown in (102): there exists a situation *s'*, in which 5 children eat 10 bowls of rice, such that there is an extended situation *s''* where these 5 children finish eating the 10 bowls of rice.

(102) $\lambda s.\exists s'[s' \leq s$ & 5 children eat 10 bowls of rice in $s'] \; \& \; \exists s''[s' \leq s''$ & the 5 children finish eating the 10 bowls of rice in $s'']$

There is a transparent mapping relation between (101) and (102): The sentential topic supplies the restriction of the implicit existential capacity/potential modal (much like a conditional *if*-clause does; von Fintel 1994; Partee 1995), whereas the V-*de*-R predicate is mapped to the nuclear scope of the modal (the main assertion of the modal sentence).

The formula (102) is to be contrasted with (28) in which the restriction of the generic operator is not explicitly restricted; in (102), what the modal is concerned with is the specific situations with 5 children bearing an eating relation with 10 bowls of rice (rather than "situations in general"). This ensures that '5 children' and '10 bowls of rice' in the nuclear scope of the modal can establish a correct anaphoric relation with the situations in the restrictor, thereby avoiding the problem of Tsai (2001) (see § 2.2).

Note also that in (102) the s-BNP and o-BNP in the scope are both definite expressions *the X*, instead of existential ones. This could be syntactically motivated as well, since in the comment constituent in (101) there should be a null subject *pro* and a null object *pro*, both of which are definite and anaphoric in nature. This again contrasts with the EMH, under which such BNPs are existential terms.

A reviewer asks how one can derive the topic-comment structure of (101) in some syntactic level from (96), and how (96) can map to the LF in (102) in a syntactically acceptable way. First of all, my claim here is not that (96) bears any syntactic derivational relation to (101); rather, the conditional analysis simply states the following: (96) is synonymous to (101), (101) has the semantics in (102), and therefore (96) should be analyzed with (102). In other words, I claim that the semantics of (96) is (102), while leaving it open whether (101) and (96) can be derived from each other in syntax.

The reviewer's second question of how (96) gets the paraphrase in (100) and the LF in (102) is now addressed as follows. I assume that the main assertion (or "information center") of (96) lies in the (negated) modal plus the resultative ele-

ment, whereas the subject, main verb and object altogether constitute the presupposed proposition, or the old/topical information.

(103) a. Presupposition of (96): 5 children eat 10 bowls of rice.
b. Assertion/focus of (96): For the children to finish the rice is possible.

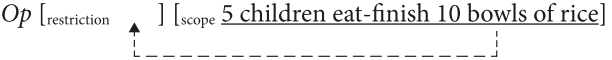
At the syntactic level, the presupposition is part of the assertion/focus; the former does not form a syntactic constituent excluding the latter because the modal *-de-* is an infix that cannot be separated from the main verb 'eat.' This seems to be where the reviewer's concern is. But there is in fact a natural way to derive the semantic tripartite structure in (102), which I shall first illustrate using the English sentence (104a) containing the adverb of quantification *always*. Here, *always* is associated with the focused object $[John]_F$, and the interpretation of (104a) is given in (104b) (Rooth 1985: Chapter 5; Johnston 1994: 84).

(104) a. Mary always takes $[\text{John}]_F$ to the movies.
b. LF: always [Mary takes *x* to the movies] [Mary takes John to the movies]

What (104b) says is that in all occasions on which Mary takes someone to the movies, that someone is John. In this LF, the restriction of *always* is obtained by copying the material in its scope and then replacing the focused constituent *John* with an existentially closed variable of the same type as *John* (an individual). This is essentially the Roothian analysis of focus interpretation: the presupposition of the adverb is factored into the restriction while the entire clause remains in the nuclear scope, and this is what happens when there is no explicit adjunct (e.g. a *when*-clause) to provide restriction for *always*, as constrained by the Prohibition against Vacuous Quantification (Kratzer 1995).[21]

I claim that the meaning of (96) can (and should) be handled in the same way. First, the modal infix *-de-* introduces a tripartite structure whose scope includes the whole sentence and whose restriction is empty initially. To avoid vacuous quantification, the restriction gets filled in by copying the material in the scope, as in (105a). Next, the resultative morpheme *wan* 'finish' is replaced by an existentially closed variable *P*, as in (105b). *P* is a variable ranging over resultative or end states compatible with an eating activity.

(105) a. *Step 1: Copying material from the nuclear scope into restriction*



21. See Larson & Sawada (2012) for further implementation of this mapping mechanism on various quantificational constructions.

b. *Step 2: Replacing the focused element in the restriction with an ∃-closed variable*
Op [$_{\text{restriction}}$ 5 children eat-[∃*P*] 10 b-o-r] [$_{\text{scope}}$ 5 children eat-finish 10 b-o-r]

As a result, the restriction in (105b) denotes the proposition that there exists some resultative state of 5 children eating 10 bowls of rice, and (105b) as a whole claims that there are situations containing such state in which the state is a completion of eating. This is what (102) attempts to capture. In short, my response to the question of how the LF (102) is derived is that we do this through a semantic copying operation where the restriction of a quantifier is supplied by part of the material in its nuclear scope.

This conditional analysis can moreover find at least the following supporting arguments. First, (96) and its negative counterpart can take respective "conditional particles," as shown in (106a) and (106b), without discernible change of meaning.

(106) a. *Wu-ge xiaohai **jiu** chi-de-wan shi-wan fan.*
five-CL child JIU eat-can-finish ten-bowl rice
'Five children can finish ten bowls of rice.'
b. *Wu-ge xiaohai **ye** chi-bu-wan shi-wan fan.*
five-CL child YE eat-not-finish ten-bowl rice
'Five children cannot finish ten bowls of rice.'

That *jiu* in (106a) signals an ordinary *if*-conditional construction and that *ye* in the negative (106b) is indicative of a concessive *even if*-conditional construction can be evidenced by the following pair:[22]

(107) a. *(Yaoshi/Ruguo) mingtian xiayu, wo **jiu** bu qu.*
if/if tomorrow rain I JIU not go
'If it rains tomorrow, I will not go.'
b. *(Jishi/Jiusuan) mingtian mei xiayu, wo **ye** bu qu.*
even.if/even.if tomorrow not rain I YE not go
'Even if it does not rain tomorrow, I will not go.'

22. Typically *ye* is used as an additive focus particle on a par with *also*, though it appears in several other focus/conditional constructions as well. Likewise, the particle *jiu* may serve as a scalar focus element, as mentioned before, or a conditional marker. See Hole 2004 for a survey of the variety of uses of these particles.

It is reasonable to take the parallel between (106a) and (107a), and between (106b) and (107b), to be an argument for the (reduced) conditional status of the s-BNP in (96).[23]

Another argument comes from the fact that the counterpart sentences of (96) in Japanese employ conditional morphology. (108) below exemplifies the same type of modal sentence with a "quantity" interpretation on the numeral subject when one of the conditional suffixes *-nara*, *-tara* and *-ba* is used (Kazunori Kikushima, personal communication):

(108) *Hutari-**nara**/Hutari-dat-**tara**/Hutari-ire-**ba**, gohan go-hai-o*
two.people-if/two.people-COP-if/two.people-exist-if rice five-bowl-ACC
tabe-oe-rare-ru.
eat-finish-can-NONPST
'Two people can finish five bowls of rice.'

That *-nara*, *-tara* and *-ba* are conditional markers can be confirmed by the following conditional sentences:

(109) a. *Asita ame-nara, ika-nai.*
tomorrow rain-if go-NEG
'If it rains tomorrow, I will not go.'
b. *Asita ame-ga fut-tara, ensoku-wa tyuusi-suru.*
tomorrow rain-NOM fall-if excursion-TOP cancel-do
'If it rains tomorrow, the excursion will be cancelled.'
c. *Ronbun-o dase-ba, sotugyoo-dekiru.*
thesis-ACC submit-if graduate-can.
'If you submit the thesis, you can graduate.'

However, the quantity reading is not available if the conditional suffix is replaced by the nominative case, as in (110), where the subject is understood as referring to two *specific* individuals.

(110) *Hutari-**ga** gohan go-hai-o tabe-oe-rare-ru.*
two.people-NOM rice five-bowl-ACC eat-finish-can-NONPST
'Two people can finish five bowls of rice.'

The contrast between (108) and (110) therefore supports the idea that modal sentences such as (96) have an underlying conditional structure.

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23. Note that although *jiu* appears in both scalar and conditional constructions, it may be necessary to make such distinction because the denotation of the s-BNP in (5)/(6) is extensional, while that in (8) is intensional. Whether this difference can receive a unified treatment is a burden for the theory of *jiu*, to which I shall remain neutral in this paper.

The analysis that (96) is a conditional construction interpreted along the lines of (100–102) is just half of the picture. The second half has to do with the modal inference in (111).

(111) 5 children can finish 10 bowls of rice
⇢ it is not necessary that 6 or more children finish 10 bowls of rice

Such inference arises because, as before, numeral alternatives of the s-BNP are obligatorily activated and exhaustified. I propose that exhaustivity is relevant to (96) because it involves an implicit sufficiency operator with the semantics in (91), which serves to exclude the alternative propositions in (112a), resulting in (112b) and the strengthened meaning: '5 children can finish 10 bowls of rice, and it is possible for *only* 5 children to finish 10 bowls of rice.'

(112) a. $Alt = \{n$ children finish 10 bowls of rice : $n > 5\}$
b. $\exists w' : w \sim w'[\neg\exists q[q \in [[(112a)]]^{\int} \,\&\, q(w') \,\&\, 5$ children finish 10 bowls of rice $\nrightarrow q]]$

The application of the sufficiency semantics on (96) should not be unexpected, since the latter is also inherently modal. On the other hand, it is admittedly debatable whether the exhaustivity component is a presupposition, an implicature, or part of the asserted meaning of *gou*; the modal base of (96) (epistemic) should also be different from a *gou*-construction (goal-oriented). What's important here however is that all the alternatives of (96) must be exhaustified at some level of interpretation.

3.6 Some notes on "individual-denoting" BNPs

I have argued that Mandarin s-BNPs obligatorily evoke quantity alternatives, which are quantified by an operator effecting exhaustivity, e.g. $\text{ONLY}_{\text{weak}}$ or ASSERT. Exhaustification over quantity alternatives leads to the impression that the s-BNPs in these constructions have a "quantity-denoting" interpretation.

Two obvious questions at this point are (i) whether alternatives are also relevant to Li's (1998) "individual-denoting" BNPs, i.e. those in (113) and (114), and (ii) why these sentences become degraded if without the operators *you* 'have/exist' or *dou*.

(113) *You san-ge xuesheng lai zher le.*
have three-CL student come here PAR
'There are three students that came here.'

(114) *San-ge xuesheng dou lai zher le.*
three-CL student DOU come here PAR
'Three students all came here.'

With respect to (113), question (ii) can be addressed as follows. (113) cannot be construed as an ordinary existential or presentational sentence in the absence of *you* because such existential construal typically does *not* relate the asserted referent to alternatives. For instance, in an out-of-blue context I can felicitously say (115a) without further implying exhaustivity on the quantity of letters. No implicature is activated in such scenario, unlike the canonical examples of quantity implicatures, e.g. (115b) (Gazdar 1979).

(115) a. There is one letter in your mailbox. (no SI)
b. Some of the boys were at the party. ⇢ Not all of the boys were at the party.

Exhaustivity (and focus marking in general) is *context-sensitive*; the context must provide some clues from which the relevant alternatives can be drawn. Recall from § 3.1 that focus is interpreted by the ~ operator which introduces a variable *C* and presupposes *C* is a subset of the focus value of a sentence containing a focus. In an out-of-blue context, such presupposition cannot be met; there is no antecedent with which *C* can be identified. It would indeed be odd if I stress *one* in (115a), because what's at issue is the existence of one letter in your mailbox, not that there is *only* one letter. I conjecture this is why (113) cannot be interpreted as a purely existential statement in the absence of *you*: the BNP *must* be related to quantity alternatives, but alternatives are not computed in an existential/presentational statement.

Of course, alternatives *can* be made relevant to (113) if focus is placed on the numeral. This would be, for example, a case where (113) is intended to correct a previous statement or to answer a quantity question (see § 4.4 below). My claim is therefore not that an existential sentence containing *you* is incompatible with alternative semantics, but that the generation of alternatives is *obligatory* to an existential sentence without *you* while it is only *optional* to one with *you*. Thus, *you*-less existentials cannot be intended as focus-less and implicature-less existentials. On the other hand, my proposal predicts that *you*-less existentials can still be felicitous on a reading where quantity alternatives are factored into meaning. This is borne out when the s-BNP is interpreted as a *contrastive topic*, to be discussed in § 4.1.

As for question (i), I submit that the s-BNP in (113) is actually *not* an alternative-inducing expression, but rather an ordinary nominal predicate which combines with *you*, an existential quantifier, to yield an existential proposition. In other words, I maintain a *non-uniform* treatment for Mandarin BNPs: some of them obligatorily introduce alternatives, such as those in (4–8), but others do

not. While this may seem a conceptual imperfection, notice that indefinites in Diesing (1992) also come in two variants, those with the *strong* reading, which are presuppositional, and those with the *weak* reading, which are cardinal predicates. Moreover, if we adopt the idea that *you* is indeed a verb (Fang & Lin 2008; Fang 2010), then the BNP in (113) should be categorized as an *object*, rather than a subject, and thus the *Exhaustivity Condition* need not apply. This may be the simplest explanation for (113) within the proposed account of Mandarin BNPs, though certainly not the only one.

I do not have much to say about *dou*. The semantics of *dou* has recently received serious attention from researchers who approach this issue using alternative semantics (Hole 2004; H. Liao 2011; Liu 2017; Xiang 2016). Technical details aside, the essence is that *dou* serves as a kind of operator that interacts with the alternatives introduced by a focused element, e.g. the BNP in (114). Thus, the BNP will need to be analyzed as a source of alternatives for *dou* to quantify over, which is in line with our current position that Mandarin s-BNPs are pertinent to quantification of alternatives. As *dou* is itself a complicated issue, I shall not attempt further investigation here.

4. Other cases of exhaustivity

4.1 Contrastive topics

The initial puzzle we began with is the fact that a BNP somehow cannot serve as an (existential) subject of an episodic sentence such as (116), again due to Lee (1986).

(116) ??*Yi-ge laoshi mai(-le) fangzi*
one-CL teacher buy-ASP house
'A teacher bought a house/houses.' (Lee 1986: 75)

What has gone unnoticed in previous studies is that (116) becomes acceptable once a *contrastive clause* is appended which contains one or more contrasting elements. In the following examples (117a), (117b) and (117c), contrast (indicated by $[.]_F$) is established by the object phrases, the main verbs, and the aspectually marked VPs, respectively.[24] In (117d) and (117e), two elements in the first clause (one in the subject and the other outside) contrast with the corresponding two elements in the second.

24. *Mai* 'buy' and *mai* 'sell' in (117b) differ in tones, which are not marked in the examples.

(117) a. *Yi-ge laoshi mai-le [fangzi]$_F$, yi-ge laoshi mai-le [chezi]$_F$.*
one-CL teacher buy-ASP house one-CL teacher buy-ASP car
'One teacher bought a house, and one teacher bought a car.'

b. *Yi-ge laoshi [mai-le]$_F$ fangzi, yi-ge laoshi [mai-le]$_F$ fangzi.*
one-CL teacher buy-ASP house one-CL teacher sell-ASP house
'One teacher bought a house, and one teacher sold a house.'

c. *Yi-ge laoshi [mai-le]$_F$ fangzi, yi-ge laoshi [mei]$_F$ mai.*
one-CL teacher buy-ASP house one-CL teacher not buy
'One teacher bought a house, and one teacher didn't.'

d. *[Yi]$_F$-ge laoshi [mai]$_F$-le fangzi, [san]$_F$-ge laoshi [mai]$_F$-le fangzi.*
one-CL teacher buy-ASP house three-CL teacher sell-ASP house
'One teacher bought a house, and three teachers sold a house.'

e. *Yi-ge [laoshi]$_F$ mai-le [fangzi]$_F$, yi-ge [xuesheng]$_F$ mai-le [chezi]$_F$.*
one-CL teacher buy-ASP house one-CL student buy-ASP car
'One teacher bought a house, and one student bought a car.'

But contrast does not always license (116). In each of (118a) and (118b) below, some element in the s-BNP in the first clause forms a contrast with an element in the same position in the second clause (and no other contrasts are established), and yet both sentences are ungrammatical still.

(118) a. **[Yi]$_F$-ge laoshi mai-le fangzi, [san]$_F$-ge laoshi mai-le fangzi.*
one-CL teacher buy-ASP house three-CL teacher buy-ASP house
'One teacher bought a house, and three teachers bought a house.'

b. **Yi-ge [laoshi]$_F$ mai-le fangzi, yi-ge [xuesheng]$_F$ mai-le fangzi.*
one-CL teacher buy-ASP house one-CL student buy-ASP house
'One teacher bought a house, and one student bought a house.'

The generalization we can draw from the data is the following: (116) is grammatical only if at least one element *outside* the s-BNP (i.e. in the VP) forms contrast with a corresponding one in the same position of a contrastive clause. This amounts to saying that (116) is interpreted *exhaustively*: the property denoted by *mai-le fangzi* 'bought a house' holds true of one *and only one* teacher. (118a) and (118b) are ruled out accordingly, since both entail that the set of individuals who bought a house consists of one teacher and at least one other individual. On the other hand, the examples in (117) are all grammatical because they are compatible with the exhaustive interpretation.

Note furthermore that even though the pairs of s-BNPs in (117a–c) are identical ('one teacher'), they cannot have the *same reference*, e.g. in the case of (117a) if John bought a house then the teacher who bought a car cannot be John. That is, the exhaustivity in (116) applies not only to (part of) the VP but also to the denotation of the subject: the VP property holds true of one and only one teacher, and

the one teacher only has a property denoted by 'bought a house.' Essentially the same conclusion is reached by van Rooij & Schulz (2017) for English *contrastive topic* (CT) constructions.

I maintain that (116) should be analyzed as a CT construction, where the s-BNP is an exhaustive contrastive topic paired with a focus. On the interpretation of (117a) where contrast is marked for the object, (116) is understood with the CT+F configuration in (119).

(119) [One teacher]$_{CT}$ bought a [house]$_{F}$.

A CT, like focus, may be prosodically prominent; but while focus introduces a set of alternative propositions (per Rooth), a CT introduces a set of *alternative questions*, according to Büring (2003). The basic idea is that 'one teacher' in (119) evokes the set of (sub)questions {*What did x buy?*} where *x* is some individual. (119) therefore does not completely resolve the question under discussion (QUD), i.e. it is a partial answer. This leads to the inference, as a conversational implicature, that there are other individuals who might have done other things than buying a house. This is precisely the pattern observed above: adding a contrastive clause to (116) can completely resolve all the (sub)questions introduced by the CT, thereby "rescuing" (116) from being ungrammatical.

In other words, CT interpretation is what licenses the s-BNP. This echoes the present proposal that Mandarin BNPs must activate alternatives. In CT constructions, the alternatives are of a more complicated type, i.e. questions (instead of propositions). It is therefore not true that (116) and examples alike are always infelicitous; we just need to find the right interpretation (in the right context), e.g. the CT interpretation.

4.2 Distributivity

In § 3.2 I mentioned one observation by Reviewer #4 that the sentence (120) (= (4)/(45)) also permits a distributive reading involving 10 people in total, a reading that can be evidenced by (121), which leads to the question of whether (121) encodes distributive quantification.

(120) *Liang-zhang chuang (, wo ting-shuo,) ji-le wu-ge ren.* (= (4)/(45))
two-CL bed I hear-say squeeze-ASP five-CL person
'Two beds(, I heard,) were crowded with five people.'

(121) *Liang-zhang chuang (, wo ting-shuo,) ge/fenbie ji-le wu-ge*
two-CL bed I hear-say each/separately squeeze-ASP five-CL
ren.
person
'Two beds (I, heard,) were crowed with five people separately.'

It seems to me difficult for (120) to obtain the 10-people reading; the five speakers I consulted also agreed with my judgment. On the other hand, I fully acknowledge that the fact that (121) is grammatical and licenses the subject clearly indicates distributivity must be connected to alternatives in some way as well. A distributive semantics along the lines of (122) appears inevitable (Link 1987; Schwarzschild 1996):

(122) $\forall x[(x \in X \,\&\, \text{2-bed}(X)) \rightarrow x$ was crowded with 5 people]

This may not be the complete analysis for the distributivity of *ge/fenbie* because, as briefly mentioned in § 3.2, *fenbie* additionally requires a numeral object, a requirement that is not quite captured by (122).[25] A more serious concern, though, is that (122) alone also does not tell us what licenses the s-BNP in (121).

I propose that (121), too, is interpreted exhaustively, just like every other construction discussed previously. The guiding observation is that in a scenario in which there were 3 beds (or more), each of which was crowded with 5 people and known to the discourse participants, (121) if uttered alone is infelicitous. In other words, 'two' has to be interpreted as the maximal number of beds in the relevant context. Similarly, if (it is known that) each bed was crowded with 6 people (or more), (121) is infelicitous as well because it violates the maxim of Quantity. This observation is reminiscent of the exhaustivity of (120) when it is understood as a cumulative construction (§ 3.2). Thus, the strengthened meaning of (121) can be modeled on (68): it has the LF in (123a) (where the distributivity of *ge/fenbie* is indicated by *each*), which asserts (123b) and implicates that all the alternatives in (123c) not entailed by the assertion is false.

(123) a. ASSERT[2 beds were **each** crowded with 5 people]
b. 2 beds were **each** crowded with 5 people
c. $Alt = \{n$ beds were **each** crowded with m people : $n, m \in \mathbb{N}\}$
d. $\forall p \in Alt[[[(123b)\,]] \not\subseteq p \rightarrow \neg p]$

Note that the exhaustive implicature could be canceled if the context is enriched, e.g. in (124), which sounds acceptable. In this case, the s-BNP should be considered a CT, as discussed in the previous section.

25. For a parallel pattern of *ge* 'each,' see Lin (1997).

(124) *Liang-zhang chuang ge/fenbie ji-le wu-ge ren. Disan-zhang*
two-CL bed each/separately squeeze-ASP five-CL person third-CL
zhi you yi-ge.
only have one-CL
'Two beds were crowed with five people separately. The third had only one (on it).'

In short, I contend that (121), as well as (120) on the distributive reading (if possible), is subject to an exhaustive interpretation. Such an interpretation results from the ASSERT operator (Krifka 1999) which excludes alternatives introduced by both the s-BPN and o-BNP. Hence, the response to Reviewer #4's question is that there is no problem treating (120)/(121) as a distributive sentence, but what "licenses" the s-BNP is the ASSERT operator and exhaustivity on the s-BNP.

4.3 Double singular BNPs

Reviewer #4 raised another interesting case where the s-BNP and o-BNP are both *singular*, as in (125a). As he/she correctly observes, neither the distributive *ge/fenbie* nor the cumulative *zonggong* can be inserted, and moreover overt modals are blocked, as in (125b).

(125) a. *Yi-ge ren (*ge/fenbie/zonggong) yi-zhang zui, shi-ge ren*
one-CL person each/separately/altogether one-CL mouth ten-CL person
shi-zhang zui.
ten-CL mouth
'One person (has) one mouth. Ten people (have) ten mouths.'

b. *Yi-ge ren (* keyi/yinggai) yi-zhang zui, …*
one-CL person can/should one-CL mouth
'One person can/should have one mouth, …'

The reviewer's question is what type of quantification is involved in such case, and more generally whether the various types of quantificational constructions entertained in this paper have covered all the possibilities regarding the licensing conditions for s-BNPs.

While I do not have a full account to offer presently, I think it is reasonable to take (125a) as another CT construction. The QUD that the reviewer had in mind for this example appears to be something like *How many mouths do the relevant 10 people have?* (which may be pragmatically odd but I shall set this aside). The subject in the first clause 'one person (has) one mouth' is a CT, whereas the object is a focus; the clause serves as an answer to the subquestion *How many mouths does 1 person have?* and the subject triggers the set of questions {*How*

many mouths do n people have?} where *n* is a natural number. Given that an answer to a subquestion only partially addresses the main QUD, a follow-up utterance will be forced out to completely resolve the latter. This underlies the way the reviewer constructed (125a): the first clause is followed by the second, which altogether provide a complete answer.

If this explanation is on the right track, CT construction and the pragmatic operation over the alternative questions related to the CT are what is involved in (125a). CTs are orthogonal to cumulativity/distributivity, and so whether quantificational adverbs like *fenbie* or *zonggong* can be added or not should depend solely on whether they are compatible with the entire propositional content. Since the clause 'one person has one mouth' does not have the plural NPs required for cumulativity and distributivity, the pattern in (125a) is expected. Moreover, the quantification involved here is generic, and the predicate expresses an inalienable possession relation. This explains why the modals in (125b) are blocked, because they imply possibilities that one person may not have exactly one mouth.[26]

4.4 Question-answer congruence

Finally, one reviewer points out that Li (1998) has mentioned in a footnote that an s-BNP is possible in a question-answer pair, e.g. (126). In an out-of-blue context, (126b) is deviant, but here it is felicitous.

(126) a. *Duoshao ren si le?*
how.many person die ASP
'How many people died?'
b. *[San]$_F$-ge ren si le.*
three-CL person die ASP
'Three people died.'

Given that the QUD provides an antecedent for the variable of the ~ operator attached to the focus constituent in the answer (Rooth 1992), and that (complete) answers are generally assumed to be exhaustive, question-answer congruence can be considered yet another case where an s-BNP is licensed due to the *Exhaustivity Condition*.

This concludes the brief survey of the variety of constructions where a Mandarin BNP is "licensed" in subject position, aside from those cited in Li (1998), Tsai (2001) and Lu (2004). I do not claim to have exhausted all the environments that license an s-BNP; there are certainly more not covered here. But more important is the thesis that, as far as the empirical facts in this work are concerned, plac-

26. Alternatively, one may blame on the absence of the main verb, as these modals seem to need to attach to a verb.

ing a BNP in subject position in Mandarin has to obey the constraint that the BNP be obligatorily interpreted with exhaustivity of its quantity alternatives.

5. Comparison with previous accounts

One obvious difference between Li (1998) and the current proposal is that, whereas the former attributes the quantity reading of s-BNPs to a distinctive NumP, the latter takes the perspective that s-BNPs are subject to the *Exhaustivity Condition* in (9) and that the quantity reading is not an intrinsic semantic property of the s-BNP but instead exhaustivity, which is typical of focus marking. Since a focused expression may or may not denote actual individuals (depending on the tense-aspect property of the sentence where it appears), the present account predicts that the s-BNP in the scalar *jiu*-sentence may or may not be referential. That the s-BNPs in (5) and (6) both have an actual reference is therefore compatible with this prediction, but not on Li's (1998) NumP hypothesis, as noted in § 2.1.2.

Furthermore, Li's (1998) arguments for the NumP hypothesis can be made compatible with the current proposal. Recall that it is claimed that NumP, unlike DP, cannot bind a pronoun or participate in scope interaction (§ 2.1.1).

(127) *San-ge ren$_i$ tai-bu-dong zhe-jia gangqin. *Tamen$_i$-de liliang tai xiao.*
three-CL person lift-not-move this-CL piano they-POSS strength too small
'Three people$_i$ cannot lift up this piano. Their$_i$ strength is too weak.' (= (15a))

(128) *Wu-ge xiaohai chi-de-wan shi-wan fan.* (= (8))
five-CL child eat-can-finish ten-bowl rice
'Five children can finish ten bowls of rice.' (10 bowls of rice, *50 bowls of rice)

Crucially, if (127) takes the *even if*-conditional marker *ye* and turns into a genuine conditional/modal sentence, as in (129), the pronoun 'they' in the second sentence also fails to be bound by '3 people.' Thus, for whatever reason pronominal binding is impossible in (129), the same can be said for (127).

(129) *San-ge ren$_i$ **ye** tai-bu-dong zhe-jia gangqin. * Tamen$_i$-de liliang tai xiao.*
three-CL person YE lift-not-move this-CL piano they-POSS strength too small
'Three people$_i$ cannot lift up this piano. Their$_i$ strength is too weak.'(cf. (127))

That (128) does not permit the 50-bowl interpretation also falls out naturally from the analysis that '5 children' is a conditional antecedent (see (102)). Given that

a conditional antecedent is not a quantifier, scope interaction is impossible (and irrelevant).

My proposal does not argue directly for or against another point by Li (1998) that DP (with a null D) exists in Mandarin, as the proposal does not look into the internal make-up of BNPs. On the other hand, it provides an alternative view to understand the semantics behind Li's "quantity" interpretation, i.e. exhaustivity on quantity alternatives. The proposal also makes its own prediction about the distribution of s-BNPs, namely that they are "licensed" when interpreted exhaustively. The oddness of (2a) and (2b) is predicted, because the intended existential reading does not encode exhaustivity. In contrast, there seems to be no principled way to rule them out on the basis of the NumP hypothesis, as this approach puts constraints on DPs while always allowing a BNP to denote quantities, hence incorrectly predicting (2a)/(2b) to be fine on the quantity interpretation.[27]

When compared with Tsai (2001) and Lu (2004), the present approach is superior in that it unifies across the non-modal sentences (4–6) and the modal ones (7–8). In particular, it does not tie the licensing condition for s-BNPs only to modality or genericity. This is a welcome result, since exhaustivity or focus interpretation does not rely on modality or genericity. Notice that non-modal, cumulative sentences such as (45) and (46) are quite natural and productive, which should be accounted for in any theory for s-BNPs in Mandarin.

Further, even though I have acknowledged that modality plays a crucial role in (8), the proposed semantics is different from that in Tsai (2001): the s-BNP is not only in the nuclear scope of the relevant modal but also inside its restriction, and I have argued that the interpretation of (8) only correctly follows from this analysis; compare (28) with (102). Meanwhile, we can do without Lu's (2004) specific stipulation that modal predicates are kind-level predicates selecting generic NPs.

Finally, the fact that the form of object can affect grammaticality in cases like (4) receives a straightforward explanation under the cumulative quantification analysis but not under any of the other three treatments: that there must be a plural numeral or demonstrative phrase in the object position is a requirement imposed by the cumulative operator *yigong*. Of course, since the observed pat-

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27. A reviewer points out that Li focuses on explaining why individual-denoting NumPs in a subject position have to be licensed, which does not exclude the possibility that quantity-denoting ones may be related to different types of quantification. Thus, it will not be the case as I put it here that quantity-denoting NumPs are always available. I agree this is a possibility, but given the brevity of Li's discussion it is hard to see what constraints may be imposed on the distribution of NumP or when a NumP is forbidden from subject position. One may try to connect the two analyses by equating the quantity reading to the exhaustive reading, but the latter still cannot be easily associated with a particular projection in the noun phrase as the NumP hypothesis claims, because other elements in the noun phrase can receive focus as well.

tern of (4) is never addressed by previous studies, one can add cumulativity to the NumP hypothesis, EMH or Carlsonian treatment without eradicating these theories of BNPs, but this comes at the cost of losing a more general and unified account for the distribution and interpretation of s-BNPs.

6. Concluding remarks

To conclude, what has been referred to as quantity interpretation by Li (1998) is in fact the exhaustive interpretation of numerals in focus. I have shown that the instances of s-BNPs cited in Li's work are related to the following types of quantificational constructions:

(130) a. Cumulativity, as in (4) (§ 3.2)
b. Scalar focus, as in (5) and (6) (§ 3.3)
c. Sufficiency, as in (7) (§ 3.4)
d. Conditional, as in (8) (§ 3.5)

And four more environments have been identified where s-BNPs are grammatical.

(131) a. Contrastive topics, as in (117a) (§ 4.1)
b. Distributivity, as in (121) (§ 4.2)
c. Double singular BNPs, as in (125a) (§ 4.3)
d. Question-answer congruence, as in (126) (§ 4.4)

The unifying thesis across all these cases is the *Exhaustivity Condition*, repeated below in (132):

(132) **Exhaustivity Condition**
An s-BNP is felicitous if and only if it is interpreted exhaustively.

Whether the syntax and semantics of Mandarin BNPs can be fully accounted for within an alternative-based framework is a research program to be further explored. There are many details that I am unable to flesh out at this point, but I hope this paper has shed light on a new direction on this topic. From the perspective of alternative semantics, Li's (1998) and Tsai's (2001) observations on the variety of constructions that license s-BNPs in Mandarin turn out to offer important insights into the environments where the BNPs are obligatorily focused and exhaustively interpreted.

The conclusion of this paper should not be taken to imply that NP-syntax is irrelevant to NP-interpretation in Mandarin. A respectable amount of literature (e.g. Cheng & Sybesma 1999, 2014; Jiang 2012; and references therein) have suggested the otherwise. What this paper really takes issue with is the idea that the

so-called quantity reading is due to a specific syntactic projection, and that s-BNPs must be licensed in modal or generic contexts. As discussed extensively in § 2, a problem in the NumP hypothesis is that the distinction of quantity- and individual-denoting interpretations is shaky, and in the EMH the notion of nonspecificity applied to s-BNPs seems to be contingent on intensionality, rather than, e.g. relative scope, one of the standard tests for specificity. Without a clear and precise characterization of the semantics of s-BNPs in the first place, it is not easy to base their NP-internal structure on interpretation. A related issue raised by a reviewer is whether the internal structure of BNPs is still in some way relevant since they can have at least three different readings (specific, nonspecific, and the kind of "nonspecific" reading which Tsai (2001) attributes to the s-BNPs in modal contexts). This is no doubt an important aspect in the research program of Mandarin BNPs, but again the relevant arguments may turn out to rely on the clausal structure and semantics alone (cf. the Mapping Hypothesis of Diesing 1992). That the quantificational meaning of other types of noun phrases (bare and not-so-bare nouns, modified nominals, quantifiers) requires a fine-grained nominal syntax is possible, though this topic must be addressed on another occasion.

The problem of numeral subjects in Mandarin is far from entirely settled, as this paper does not deal with the exceptional cases where they can occur in episodic existential sentences in the absence of the existential verb *you* (Fan 1985; Lee 1986; Huang 1996; Jiang et al. 1997; Xu 1997; Yao 2010; and Jiang 2012, among others). These include those where a BNP is preceded by a topic/adjunct, e.g. (133), where the head noun of the numeral phrase is modified (hence a "non-bare" numeral phrase), e.g. (134), where a BNP is interpreted as specific, referring to some familiar individuals, e.g. (135), or where a proper context is provided for the s-BNP, e.g. (136).

(133) *Zuotian yi-ge gongren cong chuangkou diao-le xialai.*
yesterday one-CL worker from window fall-ASP down
'Yesterday a worker fell down from the window.' (Lee 1986: 83)

(134) *Liang-ge cengjing dedao Nobel jiang de jiaoshou jinnian tuixiu le.*
two-CL have.been obtain prize REL professor this.year retire ASP
'Two professors who had obtained the Nobel prize retired this year.'
(Lee 1986: 85)

(135) *San-ge haizi zai lou-shang zuo zuoye ne.*
three-CL kid at stair-up do homework SFP
'Three (specific) kids are doing homework upstairs.' (Jiang 2012: 117)

(136) *Ni zuotian xiawu nali qu le? Yi-ge xuesheng lai kan ni.*
you yesterday afternoon where go ASP one-CL student come see you
'Where were you yesterday afternoon? A student came to see you.'
(Xu 1997: 29)

It appears to me that these examples are indeed existential statements where *you* is truly optional, and neither focus nor exhaustivity is obligatory. Context-dependency and referentiality seem to be among the key factors, unlike the instances of s-BNPs discussed in this work. Exactly how *you* is not required in these cases must await future investigation (see Xu 1997; Yao 2010; and Jiang 2012: 219–220 for some discussion).

Acknowledgements

I would like to thank Livy Chiu, Juiyi Chung, Jim Huang, Kazunori Kikushima, Roger Liao, Jo-Wang Lin, Masha Polinsky, Chih-hsiang Shu and Barry Yang for helpful comments on earlier versions and presentations of this work. Thanks also go to the anonymous reviewers of *L&L* for their insightful suggestions which have significantly improved this paper. All errors remain my own. Part of this work was supported by the Start-up Grant for New Faculty from City University of Hong Kong (Project No. 7200540).

Abbreviations

ACC	accusative
ADJ	adjectival
ASP	aspectual
BNP	bare numeral phrase
CL	classifier
COP	copula
EMH	Extended Mapping Hypothesis
EXP	experiential
INCH	inchoative
MH	Mapping Hypothesis
MOD	modal
NEG	negation
NOM	nominative
NONPST	non-past
NumP	Number Phrase
O-BNP	object bare numeral phrase
PAR	particle
POSS	possessive
QUD	question under discussion
REL	relative
S-BNP	subject bare numeral phrase
SFP	sentence final particle
TOP	topic
V-*de*-R	Verb-*de*-Result

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Publication history

Date received: 18 July 2017
Date accepted: 30 October 2018