

1. Introduction

This paper discusses a few observations on numeral classifiers in non-differential and differential quantity expressions in Mandarin, as seen in the underlined part in (1a) and (1b), respectively.¹

- (1) a. Amei you yi-zhang zhuozi gao. (non-differential)
Amei have one-CL table tall
'Amei's height is the same as that of a table.'
- b. Amei bi wo gao yi-ge tou. (differential)
Amei than I tall one-CL head
'Amei is one head taller than me.'

Following Rett (2020) and others, we use the term parameter for the word that denotes a gradable property in such constructions, such as *gao* 'tall, tallness', *zhong* 'heavy, weight', and *hou* 'thick, thickness'. We also use the term Numeral Expression (NE) for the underlined part in both constructions. We discuss two kinds of NEs. One is headed by a measure term (MT), such as *gongfen* 'centimeter', as seen in (2a). We call this kind of NE MT-NE. The other is headed by an individual classifier (CL), as seen in (2b) (adapted from Grano & Kennedy 2012: 221). We call this kind of NE CL-NE.

- (2) a. Amei bi Alangao(-le) san gongfen. (MT-NE)
Amei than Alantall-PRF three centimeter
'Amei is three centimeters taller than Alan.'
- b. Amei bi Alangao(-le) san-ge zhitou. (CL-NE)
Amei than Alantall-PRF three-CL finger
'Amei is three fingers taller than Alan.'

As in an MT-NE, in a CL-NE, the numeral is important, and therefore, it must be overt, as seen in (3a). This is different from a CL expression in other uses. In (3b), *yi* 'one' is optional, although its singular reading is not affected by this optionality. Also, like an MT-NE, a CL-NE is not referential, it cannot be the antecedent of a pronoun, as shown in (4a), and it cannot follow a demonstrative, as shown in (4b). See Li (1998) for a discussion of the contrasts between a pure quantity reading and an individual reading of numeral expressions, and her claim that a nominal in the former reading is not a DP. Zhang (2019) further argues that in (3b), the CL moves to a D position. Compatible with their research, we assume that neither a CL-NE nor a MT-NE is a DP. Instead, they are quantity property denoting nominals, and their category is a nominal functional category other than DP (see 4.2).

- (3) a. Amei bi wo gao *(yi)-ge tou.
Amei than I tall one-CL head
'Amei is one head taller than me.'
- b. Amei zhi lu-le (yi)-ge tou.
Amei only show-PRF one-CL head
'Amei showed only her head.'

¹ Main abbreviations used in this paper: CL: classifier; CL-NE: classifier numeral expression; ILP: individual level predicate; MOD: modification marker; MT: measure term; MT-NE: measure term numeral expression; NCC: Number Comparison Construction; NE: numeral expression; PRF: perfective; SLP: stage level predicate.

- (4) a. Amei bi wo gao yi-ge tou_i. #Ta_i shangmian you maozi.
 Amei than I tall one-CL head it on have hat
 Intended: ‘Amei is one head taller than me. There is a hat on the head.’
 b. *Amei bi wo gao na yi-ge tou.
 Amei than I tall that one-CL head

This paper explains four major empirical issues:

A. An NE puzzle: in the absence of *you* ‘have’, why can an MT-NE occur, but not a CL-NE? For example, the MT-NE *100 ke* ‘100 gram’ occurs in (5a), but the CL-NE *yi-ge pingguo* ‘one apple’ cannot occur in (5b).

- (5) a. Zhe-zhi shouji zhong 100 ke.
 this-CL cellphone heavy 100 gram
 ‘This cellphone is 100 grams heavy.’
 b. *Zhe-zhi shouji zhong yi-ge pingguo.
 this-CL cellphone heavy one-CL apple

B. A *-le* puzzle: why may an apparent aspect marker *-le* occur in an individual-level predicate (ILP) in comparative constructions (e.g., Liu 2007), as seen in (2)?

C. A differential puzzle: when does a comparative require a differential?

D. An NP puzzle: why no NP follows the CL in a differential NE in a construction like (6)? In (6), the differential CL-NE rejects any noun, including *pingguo* ‘apple’ (Chen 2022: 52)

- (6) Pingguo bi liucheng duo san-ke (*pingguo).
 apple than orange more three-CL apple
 ‘There are three more apples than oranges.’

We discuss issue A in §2, issue B and C in §3, issue D in §4, and conclude in §5.

2. Non-differential NEs

2.1 Two constructions

An NE can occur in a construction that asserts the degree of a certain gradable property (i.e., parameter) of an individual, rather than comparing different individuals with that parameter. There are two such degree constructions in Mandarin, a *you* construction, such as those in (7), and a non-*you* construction, such as those in (8).²

- (7) a. Zhe-zhi shouji you 100 ke zhong. (you constr.; MT-NE)
 this-CL cellphone have 100 gram heavy
 ‘This cellphone is 100 grams heavy.’
 b. Zhe-zhi shouji you yi-ge pingguo zhong. (you constr.; CL-NE)
 this-CL cellphone have one-CL apple heavy
 ‘This cellphone’s weight is the same as that of an apple.’
 (8) Zhe-zhi shouji zhong 100 ke. (non-you constr.; MT-NE)
 this-CL cellphone heavy 100 gram
 ‘This cellphone is 100 grams heavy.’

² Both Gong & Coppock (2021) and Zhang (2021) show that Mandarin does have degree abstraction.

In both *you* and non-*you* constructions, an NE is next to a parameter word, but they are ordered differently. In §2.2, we investigate a distribution contrast between MT-NEs and CL-NEs in the two constructions.

2.2 A contrast between MT-NEs and CL-NEs

Both an MT-NE and a CL-NE can occur in a *you* construction, but only an MT-NE can occur in a non-*you* construction. In the *you* constructions in (9), the MT-NE *si gongfen* ‘four centimeters’ occurs in (9a) and the CL-NE *san-ge zhitou* ‘three fingers’ occurs in (9b). However, in the non-*you* constructions in (10), the MT-NE *50 ke* ‘50 grams’ occurs in (10a), but the CL-NE *yi-ge pingguo* ‘an apple’ cannot occur in (10b). The examples in (11) show the same contrast (in (9b), *san-ge zhitou hou* can be shortened as *san zhi hou*).

- (9) a. Na-ceng fei-rou you si gongfen hou.
 that-layer fat-meat have four centimeter thick
 ‘That layer of fat meat is four centimeters thick.’
 b. Na-ceng fei-rou you san-ge zhitou hou.
 that-layer fat-meat have three-CL finger thick
 ‘That layer of fat meat is as thick as four fingers.’
- (10) a. Zhe-zhi shouji zhong 100 ke.
 this-CL cellphone heavy 100 gram
 ‘This cellphone is 100 grams heavy.’
 b. *Zhe-zhi shouji zhong yi-ge pingguo.
 this-CL cellphone heavy one-CL apple
- (11) a. Na-ceng fei-rou hou si gongfen.
 that-layer fat-meat thick four centimeter
 ‘That layer of fat meat is four centimeters thick.’
 b. *Na-ceng fei-rou hou san-ge zhitou.
 that-layer fat-meat thick three-CL finger

In order to explain the contrast between MT-NEs and CL-NEs, we need to look at the structures of the two constructions. According to Xiang (2003: (50)), the parameter word in the non-*you* construction moves to *you*’s position. In this parameter-raising analysis, the raised parameter word is expected to be verbal, like the auxiliary *you* ‘have’.

- (12) a. Na-ceng fei-rou **you** si gongfen hou.
 that-layer fat-meat have four centimeter thick
 b. Na-ceng fei-rou **hou** si gongfen <hou>.
 that-layer fat-meat thick four centimeter thick

Zhang (2009: 262-263), however, gives a few arguments against this parameter-raising analysis. First, *you* can have an A-not-A form, encoding a polar question, whereas the parameter word cannot, in the non-*you* construction, as seen in the acceptability contrast between (13a) and (13b). If *mei* ‘not’ is replaced with *bu* ‘not’, (13b) is still unacceptable.

- (13) a. Na-ceng fei-rou you-mei-you si gongfen hou?
 that-layer fat-meat have-not-have four centimeter thick
 ‘Is that layer of fat meat four centimeters thick?’
 b. *Na-ceng fei-rou hou-mei-hou si gongfen?
 that-layer fat-meat thick-not-thick four centimeter

Second, *you* can follow a negative word, but the parameter word in the non-*you* construction cannot:

- (14) a. Na-ceng fei-rou mei you si gongfen hou.
 that-layer fat-meat not have four centimeter thick
 ‘That layer of fat meat is not four centimeters thick.’
 b. *Na-ceng fei-rou {mei/bu} hou si gongfen.
 that-layer fat-meat not/not thick four centimeter

The above argumentation shows that the parameter word in a non-*you* construction is not verbal and thus it does not surface at the position of the auxiliary *you*.

In Mandarin, different categories may be realized in the same form. For example, *chang* ‘long, length’ is an adjective in (15a), but a noun in (15b).

- (15) a. Zhe-zhang zhuozi hen chang.
 this-CL table very long
 ‘This table is very long.’
 b. Zhe-zhang zhuozi de chang, kuan, gao fenbie shi 200
 this-CL table MOD long wide high respectively be 200
 gongfen, 50 gongfen, 100 gongfen.
 centimeter 50 centimeter 100 centimeter
 The length, width, and height of this table are 200cm, 50cm, and 100cm, respectively.’

The parameter word in a non-*you* construction can alternate with a disyllabic nominal, as shown in (16). This shows that the parameter word occurs in a nominal position in the construction.

- (16) a. Zhe-zhi shouji {zhong/zhong-liang} 100 ke.
 this-CL cellphone heavy/heavy-quantity 100 gram
 ‘This cellphone is 100 grams heavy.’
 b. Amei {gao/shen-gao} 180 gongfen.
 Amei tall/body-height 180 centimeter
 ‘Amei is 180cm tall.’

Zhang (2009) proposes that the parameter word in such a construction is a relational noun inside a subject DP, then, its licenser, i.e., the other part of the subject, moves to a higher position, as illustrated in (17). The raising of DP2 in (17) is seen in its pre-modal and pre-adverb position, shown in (18a) and (18b), respectively.³

- (17) [DP2_i [[DP1 t_i NP^{relational}] XP]]
 (18) a. Zhe-zhi shouji yinggai zhong 100 ke.
 this-CL cellphone should heavy 100 gram
 ‘This cellphone should be 100 grams heavy.’

³ If the parameter is a disyllabic word, such as *shen-gao* ‘body-height’, it is also possible for the whole DP1 in (19b) to move to a higher position. Then the parameter word can precede a modal or adverb (Zhang 2009: 273-273). Thus, in addition to (ia), (ib) is also possible.

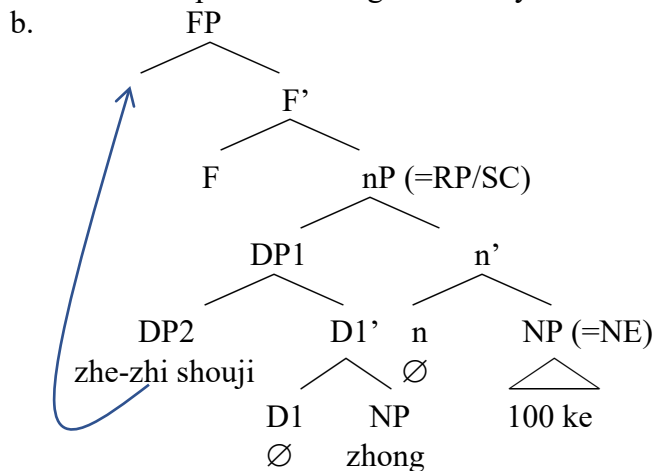
- (i) a. Lulu {yinggai/dagai} shen-gao 170 gongfen.
 Lulu should/probably body-height 170 centimeter
 b. Lulu shen-gao {yinggai/dagai} 170 gongfen.
 Lulu body-height should/probably 170 centimeter
 Both a and b: ‘{Lulu should be 170cm tall/Lulu is probably 170cm tall.}’

- b. Zhe-zhi shouji dagai zhong 100 ke.
 this-CL cellphone probably heavy 100 gram
 ‘This cellphone is probably 100 grams heavy.’

This nominal analysis of the parameter word (NP in (17)) explains the above contrasts: unlike *you*, the parameter word, as a nominal, cannot have an A-not-A form, and cannot follow a negation word directly, but its position can be taken by an elaborated nominal form.

Based on Zhang’s (2009) nominal analysis of the parameter word in the construction, we propose the structure in (19b) for the non-*you* construction in (19a) (In all the trees proposed in this paper, the subject DP may move further to a topic position).

- (19) a. Zhe-zhi shouji zhong 100 ke.
 this-CL cellphone heavy 100 gram
 ‘This cellphone is 100 grams heavy.’



In this structure, the subject is base-generated as a complex DP, DP1, and the left part of it, DP2, surfaces at a position external to the theta domain, like the subject in other constructions (Huang 1993). The semantic head of the subject is the parameter word *zhong* ‘weight’. The MT-NE *200 ke* is a nominal predicate of this parameter subject. The theta domain is a nP (Small Clause, or a den Dikken’s 2006 Relator Phrase, RP, or Bower’s 1993 PredP).⁴

Importantly, in our proposed structure of the construction, the parameter word is in the subject and the NE is the predicate. This is different from the parallel construction in English. According to Corver (1997: 138), (20b) is the structure of (20a). In (20b), both the parameter *tall* and the NE *five feet* are in the predicate, the latter is the complement of the former, and moves to a higher position, before the subject *Bill* moves to the left-edge of the clause.

- (20) a. Bill is five feet tall. b. [QP five feet_j [Q' Q [AP Bill [A' tall t_j]]]]

We now consider why an MT-NE, but not a CL-NE, can be the NP predicate in (19b) (see (9), (10), (11)). We have observed that if a parameter is specified in the context, a predicate must also be restricted to that parameter. This generalization is stated in (21).

- (21) If a parameter is specified in the context, a predicate must be restricted to that parameter in a certain way.

⁴ We adopt the theory that only DPs need to be Case-licensed. Thus, the relational NP and the NE, which is also a nominal, do not need to be Case-licensed in (19b) (cf. Grano & Kennedy 2012: 242 fn. 18).

An MT determines the relevant parameter and the MT-NE maps individuals onto the appropriate scale of that parameter (e.g., Krantz et al. 1971; Scontras 2021). For example, *gongfen* ‘centimeter’ determines the length parameter and *si gongfen* ‘four centimeters’ maps individuals onto a length scale. In the dialogue in (22a), the question is about weight. The first answer, *50 ke* ‘50 grams’, which has the weight-specific unit *ke* ‘gram’, satisfies (21), but the second one, *yi-ge pingguo* ‘an apple’, does not. This is because the unit word *ge* is not a weight unit. The dialogue in (22b) shows the same point with respect to the parameter of thickness.

- (22) a. Q: Zhongliang shi duoshao?
 weight be how
 ‘How is the weight?’
 A: Zhongliang shi {50 ke/ *yi-ge pingguo}. [MT-NE/*CL-NE]
 weight be 50 gram/*one-CL apple
 ‘The weight is 50 grams.’
- b. Q: Hou-du shi duoshao?
 thick-degree be how
 ‘How is the thickness?’
 A: Hou-du shi {san cun/*liang-ge shouzhi}. [MT-NE/*CL-NE]
 thick-degree be three inch/two-CL finger
 ‘The thickness is three inches.’

The generalization in (21) is observed in not only the answers to the *shi* questions in (22), but also the answer to the *you* question in (23) (I thank xxx for giving me the example in (23)).

- (23) Q: Zhe-zhi shouji you duo zhong? A1: *Yi-ge pingguo.
 this-CL cellphone have how heavy one-CL apple
 ‘How heavy is this cellphone?’ A2: Yi-ge pingguo (name) zhong.
 one-CL apple that heavy
 ‘As heavy as an apple.’

In (23), the question asks the weight of an entity. The answer can be a fragment of a clause, a nominal predicate. Since the question is about the weight, the nominal predicate in the answer must have a compatible parameter-explicit element, *zhong* ‘weight’; and thus only A2 is acceptable. The CL-NE in A1 is underspecified with a parameter, thus, like the answer in (22a) and (22b), it cannot occur as a predicate where the parameter is already specified in the context.

The contrast between MT-NEs and CL-NEs here reflects a more general restriction. Consider the two dialogues in (24). The parameter of the question is time in (24a) and location in (24b). A1 is not an acceptable answer but A2 is, to the time question in (24a). They contrast in the presence of the time-denoting word *shihou* ‘time’ in the latter, but not in the former. Likewise, A1 is not acceptable but A2 is, to the location question in (24b). They contrast in the presence of the location-denoting word *difang* ‘place’ in the latter, but not in the former.

- (24) a. Q: Ni shenme-shihou mai-le zhe-jian chenshan?
 you what-time buy-PRF that-CL shirt
 ‘When did you buy this shirt?’
 A1: #Wo mai-le na-shuang xie.
 I buy-PRF that-pair shoe
 ‘I bought that pair of shoes.’

- A2: (Na shi) zai wo mai na-shuang xie de shihou.
 that be at I buy that-pair shoe MOD time
 ‘That was the time when I bought that pair of shoes.’
- b. Q: Ni zai-nali mai-le zhe-jian chenshan?
 You at-where buy-PRF that-CL shirt
 ‘Where did you buy this shirt?’
- A1: #Wo mai-le na-shuang xie.
 I buy-PRF that-pair shoe
 ‘I bought that pair of shoes.’
- A2: (Na shi) zai wo mai na-shuang xie de difang.
 that be at I buy that-pair shoe MOD place
 ‘That was the place where I bought that pair of shoes.’

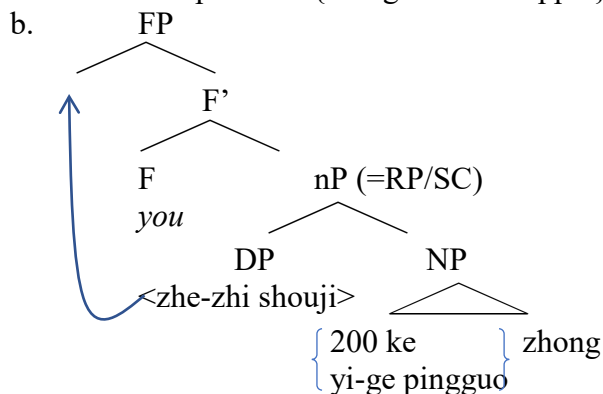
In the two types of NEs, the unit word of an MT-NE is parameter-specific, but the individual CL of a CL-NE is not. Thus, in the non-*you* construction, the NE, which is a predicate, can only be a MT-NE, not a CL-NE. In (25), for example, in the presence of *zhong* ‘heavy, weight’, the unit word in an NE not only cannot be an individual CL, but also cannot be any type of unit other than a weight unit, such as *xiang* ‘box’, *zu* ‘group’, or *gongfen* ‘centimeter’.

- (25) Zhe-zhi shouji zhong {50 ke /*san xiang/*san zu/*50 gongfen}.
 this-CL cellphone heavy 50 gram/three box/three group/50 centimeter
 ‘This cellphone is 50 grams heavy.’

We have thus explained why a CL-NE cannot occur in a non-*you* construction.

As for the *you* construction, we propose that the functional word *you* ‘have’ is merged external to the theta domain, like the *you* in the existential construction in the language (Huang 1988) and the HAVE word in other languages (see Sæbø 2009). (26a) has the structure in (26b).

- (26) a. Zhe-zhi shouji you {200 ke /yi-ge pingguo} zhong.
 this-CL cellphone have 200 gram/one-CL apple heavy
 ‘This cellphone is {200 grams/one apple} heavy.’



In this structure, the parameter word is also a noun, but it occurs at the right-edge of the construction, and is modified by the NE to its left. The parameter noun and the NE thus form a complex NP. The auxiliary *you* takes a SC-like constituent as its complement. In the complement of *you*, the DP is the subject, and the complex NP is the predicate, and the DP moves out of the theta domain, like a subject in other constructions (Huang 1993).

In a *you* construction, the modification marker *de* can show up between the NE and the parameter noun; and in this case, the latter should be in a disyllabic form, such as *zhong-liang*

‘weight-quantity’, *chang-du* ‘length-degree’, etc. (see Zhang 2009: 297). (27) is an example. Thus, as in the non-*you* construction, the parameter occurs in a nominal position and thus it is able to alternate with an elaborated nominal form.⁵

(27) Na-zhi shouji you {yi-ge pingguo/200 ke} de zhongliang.
 that-CL cellphone have one-CL apple/200 gram MOD weight
 ‘That cellphone is {one apple/200 grams} heavy.’

The parameter word and the NE in the *you* and non-*you* constructions have different structural positions, as shown in (19b) and (26b). The differences are summarized in (28).

(28)	the non- <i>you</i> construction	the <i>you</i> construction
parameter word	in a subject	in a nominal predicate
NE	nominal predicate	a modifier of the nominal predicate
	MT-NEs, but not CL-NEs, meet (21)	(21) does not apply

In the non-*you* construction, and the answers in (22a) and (22b), the NE is a predicate in a context where the parameter is specified. As a predicate, the NE must be specified with that parameter (see (21)). Since a MT-NE can do so, it can be such a predicate; but a CL-NE is underspecified with a parameter property, it thus cannot be a predicate in the construction. In contrast, in the *you* construction, the whole post-*you* part is a nominal predicate of the pre-*you* DP, and the DP is not specified with any parameter content. Therefore, the NE alone is not a predicate in the construction, thus, it is not subject to (21). Instead, in this construction, the NE and the clause-final parameter element have an intersective relation, like in other modification relations. Consequently, the NE in the construction can be either an MT-NE or a CL-NE.

The conclusion of this section is that the parameter word is a nominal in both the *you* and the non-*you* constructions; but it is the semantic head of a subject in the non-*you* construction and the semantic head of a predicate in the *you* construction. Moreover, the NEs are also different in their structural functions in the two constructions. In the non-*you* construction, the NE is a predicate in a parameter-specific context, and therefore, the unit in the NE must be related to the parameter, exclusively. Consequently, a CL-NE is rejected. However, in the *you* construction, the NE modifies the parameter. Therefore, either a CL-NE or an MT-NE can occur.

3. Differential NEs in physical property comparison constructions

3.1 Two constructions

In a comparative construction, two individuals are compared with respect to a certain parameter, and an NE denotes the differential degree between the two individuals. We discuss two such constructions in Mandarin: one has the standard marker *bi* ‘than’, as in (29a), and the other does not, as in (29b).

(29) a. Shujia bi zhuozi gao(-le) {san gongfen/san-ge zhitou}.
 bookshelf than table tall-PRF three centimeter/three-CL finger

⁵ Xie (2014) claims that an example like (i) is an equative construction, which compares two individuals with respect to a certain gradable property. In (i), the two individuals, Zhangsan and his brother, are compared. In our *you* construction, neither an MT-NE nor a CL-NE is referential, and thus the subject DP is not compared with the post-*you* NE. Therefore, the *you* construction is not an equative construction.

(i) Zhangsan you ta gege gao. (Xie 2014: 114)
 Zhangsan have he brother all
 ‘Zhangsan is (at least) as tall as his brother.’

- b. Shujia gao(-le) zhuozhi {san gongfen/san-ge zhitou}.
 bookshelftall-PRF table three centimeter/three-CL finger
 Both a and b: ‘The bookshelf is {three centimeters/three fingers} taller than the table.’

A non-*bi* construction differs from a *bi* one systematically. First, it must have a differential NE. Therefore, Mok (1998: 110) calls it Obligatory Measuring Comparative. Second, it does not have the standard marker *bi*. Therefore, Xiang (2005) calls it Bare Comparative. Third, it seems to have the same word order as a transitive verb: one DP precedes and the other follows, the parameter word. Therefore, Erlewine (2007) calls it Transitive Comparative.

But in both constructions, first, the differential NE can be either an MT-NE or a CL-NE, as seen in (29). Second, the parameter word is not a nominal, unlike the one in the non-comparative constructions discussed in §2. The position of the parameter word in the construction cannot be taken by any nominal, as seen in (30).

- (30) a. Amei bi Alan {gao/*shen-gao} (san gongfen/yi-ge tou).
 Amei than Alan tall/body-height threecentimeter/one-CL head
 b. Amei {gao/*shen-gao} Alan {san-gongfen/yi-ge tou}.
 Amei tall/body-height Alan threecentimeter/one-CL head
 Both a and b: ‘Amei is {three centimeters/one head} taller than Alan.’

Following Zhu (1982: 89-90), we assume that the standard marker *bi* ‘than’ is a preposition, taking the standard DP as its complement. The basic structure of (31a) is (31b).⁶

- (31) a. Zhangsan bi Lisi gao.
 Zhangsan than Lisi tall
 ‘Zhangsan is taller than Lisi.’
 b.
-
- ```

 graph TD
 DegP --> PP
 DegP --> Deg_prime[Deg']
 PP --> P[bi]
 PP --> DP[Lisi]
 Deg_prime --> Deg[gao]
 Deg_prime --> AP["AP (=RP)"]
 AP --> Zhangsan
 AP --> A_prime[A']
 A_prime --> gao

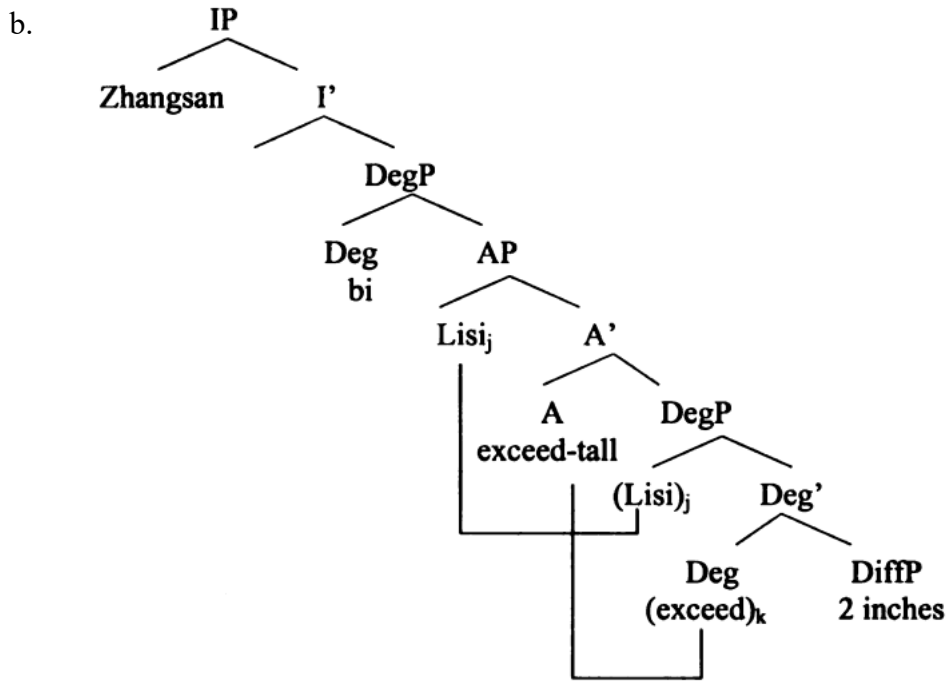
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This structure can be compared with Xiang’s (2005: 192) structure in (32b) for (32a). Xiang (2005: 192) correctly states that a differential in the construction is optional. In the absence of a differential, the DiffP in (32b) should be either covert or just not there.

- (32) a. Zhangsan bi Lisi gao (liang cun).  
 Zhangsan than Lisi tall two inch  
 ‘Zhangsan is two inches taller than Lisi.’

<sup>6</sup> This paper discusses the simplest comparative constructions only, which has only one pair of elements under comparison. We do not discuss examples like (i), where both the individuals and the temporals are compared. Therefore, a phrasal approach is sufficient for the *bi* construction studied here.

(i) Ta jintian bi ni zuotian mang.  
 he today than you yesterday busy  
 ‘He is busier today than you were yesterday.’



The structure in (32b) has two problems, however. First, the coordination of two *bi*-DP clusters is possible, as seen in (33a). Xiang (2005:197) claims that this “could be derived through a rightward across the board movement,” as illustrated in (33b). Thus, the combination of *bi* and the standard DP is not considered a constituent.

- (33) a. Zhangsan bi Lisi huozhe bi Wangwu gao (liang cun).  
 Zhangsan than Lisi or than Wangwu tall two inch  
 ‘Zhangsan is (two inches) taller than Lisi or Wangwu.’
- b. Zhangsan [[bi Lisi  $gao_k$ ] huozhe [bi Wangwu  $gao_k$ ]  $gao_k$ ]  
 Zhangsan than Lisi tall or than Wangwu tall tall

But the structure in (32b) suggests that what undergoes the assumed across the board movement in this analysis is A’ *gao (liang cun)* ‘taller (two inches)’, stranding the SpecAP *Lisi*. Theoretically, an intermediate projection cannot move. Thus, this movement approach to the coordination in (33a) can be theoretically challenged. See Lin (2009: 9) for more challenges to the constituency in (32b).

Second, in (32b), the standard DP (*Lisi*) is base-generated at the Spec of the lower DegP, which is headed by A. The subject *Zhangsan* is base-generated higher, at SpecIP. Thus, the subject is not local to the complex predicate in (32b). The locality of the base-position of *Lisi* and the Deg’ in the lower DegP seems to encode a predication relation between the standard *Lisi* and the string (*exceed*)-*liang cun*. This is not the intended meaning of the construction. We therefore do not adopt Xiang’s analysis.

In this section, we investigate two issues: why the apparent aspect marker *-le* may occur with the ILP in the presence of a differential NE (3.2), and why the transitive comparative construction correlates with the obligatory presence of a differential NE (3.3).

### 3.2 The occurrence of *-le*

If a predicate denotes a change of state, the perfective aspect marker *-le* may occur, as seen in (34) (Zhang 2022: (15); Grano 2012: 529). The predicate in such a case is not an ILP.

- (34) (he guoqu xiangbi) Huai-He shui-wei gao-le yi mi.  
 with past compare Huai-River water-level high-PRF one meter  
 ‘(Compared with the past,) the water level of Huaihe River is one meter higher.’

In this paper, we consider ILPs only. ILPs reject the aspect marker *-le*, as seen in (35). Since an ILP does not encode any episodic eventuality, and the perfective aspect marker may occur in a clause that denotes an episodic eventuality only, this rejection is expected.

- (35) a. Amei shu-(\*le) long.  
 Amei belong.to-PRF dragon  
 ‘Amei’s Chinese zodiac sign is dragon.’
- b. #Zhe-zhi shouji zhong-le 50 ke.  
 this-CL cellphone heavy-PRF 50 gram  
 Possible: ‘This cell-phone becomes 50 grams heavier than before.’ SLP  
 Impossible: ‘This cell-phone weighs 50 grams.’ ILP
- c. \*Zhe-zhi shoujin you-le {50 ke/yi-ge pingguo} zhong.  
 this-CL cellphone have-PRF 50 gram/one-CL apple heavy
- d. #Zhe-zhi shouji you {50 ke/yi-ge pingguo} zhong-le.  
 this-CL cellphone have 50 gram/one-CL apple heavy-PRF  
 Possible: ‘This cell-phone becomes {50 grams/as heavy as an apple}.’ SLP  
 Impossible: ‘This cell-phone weighs 50 grams.’ ILP

However, in a comparative construction, there is a tricky interaction between a differential and the occurrence of *-le*, even though the predicate is an ILP. There are three generalizations. (A), if no differential occurs, *le* may not occur, as seen in (36a). (B), if *-le* occurs, a differential must occur, as seen in (36b) (Liu 2007: 779). (C), if a differential occurs, *-le* may occur, as seen in (36 c) (also see Zhang 2022: 10).

- (36) a. Shujia bi zhuozi gao(\*-le).  
 bookshelf than table tall-PRF  
 ‘The bookshelf is taller than the table.’
- b. Shujia bi zhuozi gao-le \*({san gongfen/san-ge zhitou}).  
 bookshelf than table tall-PRF three centimeter/three-CL finger  
 ‘The bookshelf is {three centimeters/three fingers} taller than the table.’
- c. Shujia bi zhuozi gao(-le) {san gongfen/san-ge zhitou}.  
 bookshelf than table tall-PRF three centimeter/three-CL finger  
 ‘The bookshelf is {three centimeters/three fingers} taller than the table.’

One important observation is that the *-le* in the ILP of a comparative construction can alternate with the verb *chu* ‘exceed’ in general (Zhang 2013b: 36).<sup>7</sup> Thus, for example, (37a) and (37b) are synonymous:

- (37) a. Zhe-shuang kuaizi bi na-shuang chang-le 5 gongfen.  
 this-pair chopstick than that-pair long-PRF 5 centimeter
- b. Zhe-shuang kuaizi bi na-shuang chang-chu 5 gongfen.  
 this-pair chopstick than that-pair long-exceed 5 centimeter
- Both a and b: ‘This pair of chopsticks is 5 centimeters longer than that pair.’

<sup>7</sup> If the parameter is *hou* ‘thick’ or *da* ‘big’, *-le*, instead of *chu*, precedes a differential. Thus, *-le* is unmarked.

Liu (2007) proposes a *pro*-licensor analysis of the pre-differential *-le* (see Zhang 2013b: 30-31 for a critical comment on Liu’s analysis). Zhang (2022) mentions the occurrence of *-le* in the *bi* comparatives (her p. 10) and the occurrence of *chu* 出 in transitive comparatives (her p. 11). Grano & Kennedy (2012: 247; 248 fn. 23) address the pre-differential *chu* in both *bi* and transitive comparative constructions, and point out that in the absence of a differential, *chu* may not occur (cf. our generalization (A) above). But these previous analyses did not give a unified treatment of *chu* and *le* in comparatives.<sup>8</sup>

I claim that it is this *chu/-le* that introduces a differential. Thus, the parameter expression is not directly associated with the differential. Accordingly, if *chu/-le* occurs, a differential must occur. This explains generalization (B) above. Also, in the absence of a differential, no *chu/-le* is allowed. This explains generalization (A) above. I also claim that this *chu/-le* can be implicit. Thus, whenever a differential occurs, it must follow an explicit or implicit *chu/-le*. The implicit form gives the apparent optionality effect. This explains generalization (C) above.

Hu (2019) claims that both *chu* and *-le* in a comparative construction are aspect markers. But if ILPs disallow aspect markers semantically and universally, Hu’s claim is challenged. Instead, we claim that both *chu* and *-le* in the construction are a verb, instead of an aspect marker, although we still gloss *-le* as a perfective marker in the examples of the paper.

*Chu* is used as a verb exclusively. But why is *-le* in this use also a verb? The syntactic category of *-le* depends on the structural context. Another verbal use of *-le* is studied by Sybesma (1997).<sup>9</sup> In a comparative construction, the verb status of *-le* can be seen in its relations to the verb *chu*. First, in such a construction, *-le* can alternate with the verb *chu*, as in (37). Such an alternation is impossible for other uses of *-le*. For example, the aspect marker *-le* may not be replaced with *chu* in (38).

- (38) Kefei mai- $\{le/*chu\}$  yi-ben shu.  
 Kefei buy-PRF/exceed one-CL book  
 ‘Kefei bought a book.’

Second, in a comparative, both *chu* and *-le* precede an NE, introducing the latter as a differential. Third, *chu* and *-le* never co-occur in the same ILP. In contrast, in a SLP, *chu* and *-le* may co-occur, where *-le* is an aspect marker. My non-linguist informant gave me following examples to show this contrast. If Kefei is taller than Leilin, (39a) is not acceptable. However, if the two persons have the same height, but when Kefei steps on a big rock, he appears taller than Leilin. In this case, (39b) is acceptable. (39b) is obviously a coerced SLP, and the *-le* there is a real aspect marker, following the complex verb *gao-chu* ‘tall-exceed’, indicating a change of state.

- (39) a. \*Kefei bi Leilin gao-chu-le wu gongfen.  
 Kefei than Leilin tall-exceed-PRF five centimeter  
 Intended: ‘Kefei is five centimeters taller than Leilin’

<sup>8</sup> Grano & Kennedy (2012) also discuss the verb *guo* to the immediate right of a parameter word. But the *guo* constructions may be accepted in the southern dialects only. They are consistently rejected by my informants. I thus do not discuss the *guo* constructions.

<sup>9</sup> Another non-temporal use of *-le* is the mirative use (Zhang 2013b), as in (i). In such examples, the asserted state is deviated from the expected state from the mind of the speaker. See Zhang (2013b: 42) for a unified Asp-head analysis of this use of *-le* and an aspect marker use of *-le*. Also, *-le* is an empty morpheme when it follows the preposition *wei* ‘for’ and *chu* 除 ‘except’ (Li & Thompson 1974: 262, 267).

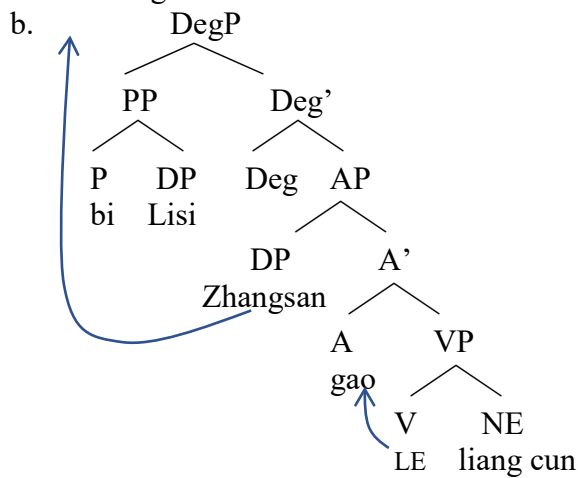
- (i) a. Tang xian-le. (Chao 1968: 692) b. Zhuozi tai gao-le.  
 soup salty-PRF table too tall-PRF  
 ‘The soup is too salty.’ ‘The table is too tall.’

- b. Kefei (jiu) gao-chu-le Leilin wu gongfen.  
 Kefei then tall-exceed-PRF Leilin five centimeter  
 ‘Kefei then became five centimeters taller than Leilin.’

Based on these relations with *chu*, we claim that *-le* in the ILP of a comparative construction plays the same role as *chu*, and thus is also a verb, instead of a functional element.

Syntactically, in a comparative, *chu* or *-le* takes an NE as its complement, and the combination of *chu* or *-le* with an NE is the complement of the parameter expression (see Zhang 2013b: 39). We add a complement to the A in (31b). The syntactic structure of (40a) (= (32a)) is (40b) (in this paper, the order of the elements in a head cluster formed by movement may be decided by other factors, an issue we put aside; cf. Roberts 2001 and the references therein).

- (40) a. Zhangsanbi Lisi gao (liang cun).  
 Zhangsanthan Lisi tall two inch  
 ‘Zhangsan is two inches taller than Lisi.’



Erlewine (2018: 456) states that “Semantically, the differential would be an argument of the comparative operator, *bi*, with a modified comparative semantics which specifies the differential as equal to the difference  $\max(D1) - \max(D2)$ .” Since a differential is optional in a comparative (see (40a)), in our analysis, syntactically, a differential is not an argument of the parameter expression; instead, it is a complement of the verb *chu* or *-le* in Mandarin. In (40b), the VP headed by the implicit LE is the complement of A, which is realized by *gao* ‘tall’. This structure is different from the structure of the comparative construction that does not have a differential, (31b). In (31b), *gao* does not have a complement.

In English comparatives, a differential can either precede the parameter or occur at the right edge, following the preposition *by*. The two examples in (41) are synonymous, and the two examples in (42) are also synonymous.

- (41) a. John is one inch taller than Mary.      b. John is taller than Mary by one inch.  
 (42) a. John is one head taller than Mary.      b. John is taller than Mary by a head.

In (41b) and (42b), the differential is introduced by the preposition *by*, and thus it is an argument of a head element. The correlation between a preposition in English and a verb in Mandarin can be seen in other constructions. In (43), for example, the verb *jin* ‘enter’ is translated into the preposition *into* in English. Thus, the possibility for a verb to introduce a differential in Mandarin is not unexpected.

- (43) Alanzou-jin-le fangjian.  
 Alanwalk-enter-PRF room  
 ‘Alan walked into the room.’

In our proposed structure, as seen in (40b), the predication of the clause is encoded by an AP. SpecAP hosts the base-position of the subject, and the complement of A hosts the differential phrase. The complement is a VP in Mandarin. Since the paper is not about English, I do not analyze the structures of the constructions in (41) and (42).

Moreover, the PP standard in (44a) can also appear in the left-edge, as in (44b).

- (44) a. Amei [bi-qi Alan] gao-le yi-ge tou.  
 Amei than Alan tall-PRF one-CL head  
 ‘Amei is one head taller than Alan.’  
 b. [Bi-qi Alan] Amei gao-le yi-ge tou.  
 than Alan Amei tall-PRF one-CL head  
 ‘Compared to Alan, Amei is one head taller.’

(44a) is similar to the explicit comparison in English, as in (45a), and (44b) is similar to the implicit comparison in English, as in (45b).

- (45) a. Explicit comparison: John is taller than Lee.  
 b. Implicit comparison: Compared to Lee, John is tall.

Kennedy (2009) finds a contrast between the two kinds of comparison: explicit comparison is acceptable in the contexts that involve very slight differences between the compared objects, while implicit comparison is marginal in such contexts, as seen in (46) and (47).

(46) Context: A 600 word essay and a 200 word essay

- a. This essay is longer than that one.  
 b. Compared to that essay, this one is long.

(47) Context: a 600 word essay and a 597 word essay

- a. This essay is longer than that one.  
 b. #Compared to that essay, this one is long.

A similar contrast can be seen in Mandarin.

(48) Context: A 600 word essay and a 200 word essay

- a. Zhe-pian wenzhang bi na-pian wenzhang chang.  
 this-CL essay than that-CL essay long  
 ‘This essay is longer than that one.’  
 b. Bi-qi na-pian wenzhang, zhe-pian wenzhang chang.  
 than that-CL essay this-CL essay long  
 ‘Compared to that essay, this one is long.’

(49) Context: a 600 word essay and a 597 word essay

- a. Zhe-pian wenzhang bi na-pian wenzhang chang.  
 this-CL essay than that-CL essay long  
 ‘This essay is longer than that one.’  
 b. #Bi-qi na-pian wenzhang, zhe-pian wenzhang chang.  
 than that-CL essay this-CL essay long  
 ‘Compared to that essay, this one is long.’

Furthermore, as a non-referential nominal, an NE cannot be passivized (cf. Scontras 2021: 1805), as in (50), topicalized, as in (51a), or preposed to a pre-verbal focus position, as in (51b).

- (50) a. John weighs 100 kilos.    b. \*100 kilos are weighed by John.  
 (51) a. \*San      gongfen,      Amei      bi      Alangao-le      <san gongfen>.  
           three    centimeter    Amei      than Alantall-PRF    threecentimeter  
       b. \*Amei    san      gongfen      bi      Alangao-le      <san gongfen>.  
           Amei    three    centimeter    than Alantall-PRF    threecentimeter

The NE in a comparative can be replaced with the phrasal expression *hen duo* ‘very much’ or *feichang duo* ‘very much’. In this case, *chu* or *-le* may be overt, as expected. But if the differential is the monosyllabic head element *duo* ‘much’, then, *-le*, instead of *chu*, must occur. In this case, there is a head element from the differential to the V head *-le* and then to the adjectival parameter, forming a cluster that is composed of the three elements. Therefore, such a construction ends with the cluster *A-duo-le*, as seen in (52).

- (52) a. Zhangsan bi    Lisi {congming/gao}    duo-\*(le).      (Lin 2014: 164)  
           Zhangsan than Lisi clever/tall                    much-PRF  
           ‘Zhangsan is much cleverer/taller than Lisi.’  
       b. Zhangsan {congming/gao}    duo-\*(le).      (Lin 2014: 164)  
           Zhangsan clever/tall                    much-PRF  
           ‘Zhangsan is much cleverer/taller (than a contextually relevant person).’

The obligatory occurrence of the post-*duo -le* is observed in Lin (2014: 164; also see Liu 2018: 222 fn. 19), but he leaves the issue open. In our analysis, whenever a differential occurs, *-le* occurs in syntax, and it undergoes a head movement to the parameter word. In other words, *gao-duo-le* in (52) is a head cluster. What needs to be explained is why in this assumed head movement, *-le* must be overt. We leave this for future research.

### 3.3 A correlation issue

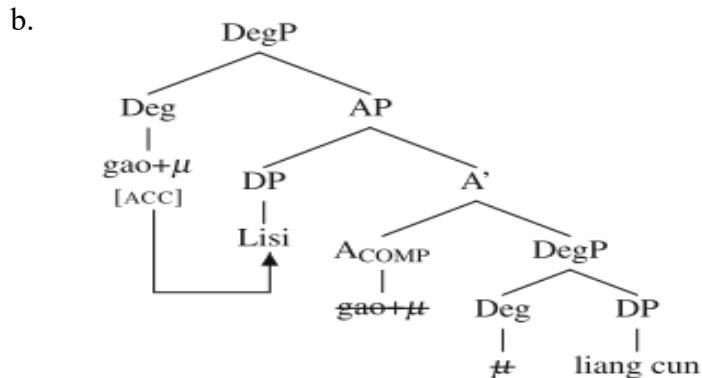
A differential must occur in a transitive comparative construction (e.g., Mok 1998: 110), as seen in (53a), compared with the *bi* construction in (53b). We thus see a correlation: the absence of a standard marker (*bi* ‘than’) correlates with the presence of a differential.

- (53) a. Shujia            gao-le    zhuozi    \*(san    gongfen/san-ge    zhitou).  
           bookshelf    tall-PRF    table    three    centimeter  
           ‘The bookshelf is {three centimeters/three fingers} taller than the table.’  
       b. Shujia    **bi**    zhuozi    gao (san    gongfen/san-ge    zhitou).  
           bookshelfthan table    tall three    centimeter/three-CL finger  
           ‘The bookshelf is {three centimeters/three fingers} taller than the table.’

To explain the correlation, let us consider the structure of a transitive comparative. For the predicate of (54a), Grano & Kennedy (2012: 243 (46a)) propose the structure in (54b) (See their p. 241-242 for their comments on Xiang’s 2005 structure for the construction, and their p. 245-247 for their comments on Lin’s 2009 review of Xiang’s structure):<sup>10</sup>

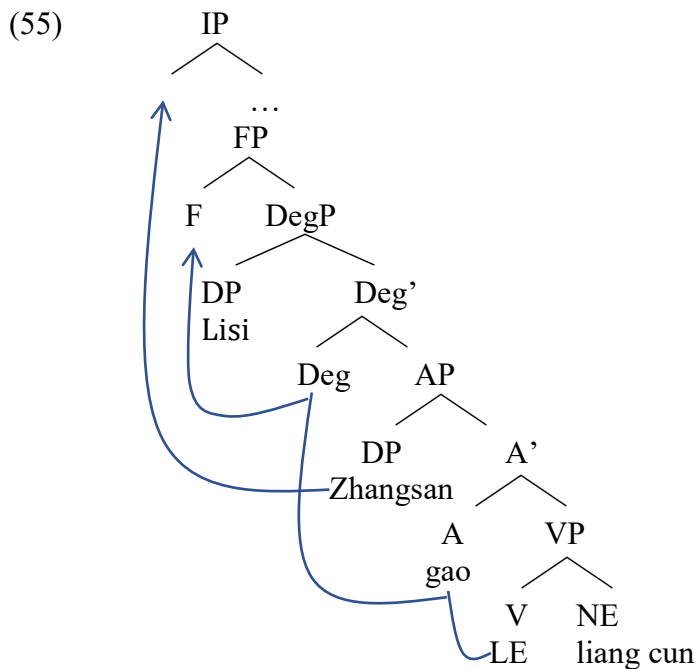
<sup>10</sup> Grano & Kennedy (2012: 244) also propose another structure, where the parameter and  $\mu$  form a complex head, and this complex head selects for a differential. This second structure is not substantially different from (54b).

- (54) a. Zhangsangao Lisi liang cun.  
 Zhangsantall Lisi two inch  
 ‘Zhangsan is two inches taller than Lisi.’



In (54b), the standard DP (*Lisi*) is at SpecAP, which is headed by a comparative A. The subject *Zhangsan* is base-generated higher, not shown in (54b). The lower DegP is headed by a null  $\mu$ , which introduces the differential *liang cun* ‘two inches’. However, the locality of *Lisi* to A’ seems to encode a predication relation between *Lisi* and the string *gao liang cun*. This is not the intended meaning of the construction, a problem similar to the one seen in Xiang’s (2005) structure in (32b) above.

To avoid the problem, we claim that the structure of (54a) is (55).



There are three major ingredients in (55). First, as in the *bi* structure in (40b), the differential *liang cun* is also introduced by *chu* or *-le*, which is implicit in (54a). We are then able to explain why either a CL-NE or an MT-NE can occur in the two comparative constructions, i.e., the *bi* one and the transitive one. A simple reason is that the NE is the complement of *chu* or *-le*, rather than being the predicate of any parameter subject. From (40b) and (55), we can see that the word *gao* ‘tall’ is not next to the NE in the structure. It is separated by an implicit verb *chu* or *-le*. Thus, the NE, as a complement of a verb, is not subject to the restriction in (21).



Second, as in (40b), the subject is base-generated at SpecAP, local to the complex predicate *gao LE liang cun* ‘taller by two inches’. This captures their predication relation.

Third, as in (40b), the standard DP is also hosted in SpecDegP. But there is no preposition to Case-license this DP. In our (55), we adopt Xiang’s (2005) and Grano & Kennedy’s (2012) head movement analysis in (54b). Grano & Kennedy correctly point out that this head movement is to Case-license the standard DP, *Lisi* in (54a). In a *bi* construction, the Case of the standard DP is licensed by *bi*. But there is no overt head element base-generated higher than the standard DP in a transitive comparative construction. As claimed by Grano & Kennedy (2012), their  $\mu_{COMP}$  has double functions: it assigns Case to the standard DP and introduces a differential. But importantly, an adjectival head is unable to license Case, and therefore, in our analysis, the verbal *-le* or *chu* is necessary in the head movement; meanwhile, *-le* or *chu* introduces a differential in its base-position. Consequently, the licensing the Case of the standard DP correlates with the occurrence of a differential. This explains why a transitive comparative construction must have a differential.

Also, according to the extension condition, movement must extend the available structure. Thus, the head movement must occur before the raising of the subject *Zhangsan* to SpecIP. After the head movement, the Case-licensed *Lisi*, which is closer to SpecIP than *Zhangsan*, will not be able to undergo an A-movement, blocking the subject *Zhangsan* to do so.

In this section, we have argued that when *-le* occurs in an ILP in comparatives, it is used as verb, rather than an aspect marker. Also, a transitive comparative needs a differential because the standard DP needs to be Case-licensed by a verbal element and the verb that introduces a differential can raise to do the Case-licensing. The structures of the three comparative constructions discussed in this section are put together in (56).

| (56) a. The simple <i>bi</i> const.                                   | b. The <i>bi</i> const. with a NE                                                            | c. The transitive const.                                                               |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Lili bi Mimi gao.<br>Lili SM Mimi tall<br>‘Lili is taller than Mimi.’ | Lili bi Mimi gao yi cun.<br>Lili SM Mimi tall one inch<br>‘Lili is 1 inch taller than Mimi.’ | Lili gao Mimi yi cun.<br>Lili tall Mimi one inch<br>‘Lili is 1 inch taller than Mimi.’ |
|                                                                       |                                                                                              |                                                                                        |

#### 4. Differential NEs in number-comparison constructions

##### 4.1 Comparing the numbers of two sets of individuals

In this section, we consider differential NEs in the constructions that compare the numbers of two sets of atomic individuals, as shown in (57). In non-numeral CL languages, atomic individuals are denoted by count nouns and they do not have any CL when they occur with a numeral; and in a differential of a comparative construction, the numeral also does not occur with any CL. The numeral *three* in (58) is not accompanied by any CL. However, a CL is obligatory in the differential NE in Mandarin, as seen in (57).

- (57) a. Zhexie xuesheng bi naxie xuesheng duo(-le) san-\*(ge).  
 these student than those student more-PRF three-CL  
 Lit: ‘These students are three more than those students.’
- b. Xueshengbi yizi duo(-le) san-\*(ge).  
 student than chair more-PRF three-CL  
 Lit: ‘The students are three more than the chairs.’
- (58) a. This group of students has three more than that group of students.  
 b. ?This group of students has three more than that group of chairs.

In counting the number of atomic individuals, the parameter is the default cardinality, encoded by *duo* ‘more’ or *shao* ‘less’, instead of *zhong* ‘weight, heavy’ or *gao* ‘height, tall’, etc. In this section, accordingly, we consider the differential NEs in which the unit word is an individual CL. We thus do not consider examples like (59a), where what is compared is not the numbers of individual books, but the numbers of boxes of books, or the weight of books. We also do not consider constructions like (59b), where it is the presence or absence of a certain entity is compared between two individuals. Furthermore, we also do not consider constructions like (59c), where the word *duo* is combined with a verb (e.g., *du* ‘read’ in (59c); see Lin 2014 and Li 2015 and the references therein).

- (59) a. Zhexie shu bi naxie shu duo wu {xiang/gongjin}.  
 these book than those book more five box/kilo  
 ‘These books are five {boxes/kilos} more than those books.’
- b. Zhe-jian fangzi bi na-jian fangzi duo-le yi-zhan deng.  
 his-CL house than that-CL house more-PRF one-CL light  
 ‘This house has a light, but that one does not.’
- c. Ta bi wo duo-kan-le {liang-ben shu/Jian'ai gen Beican-Shijie}.  
 he than I more-read-PRF two-CL book/JaneEyre and Les Misérables  
 ‘He read two more books than I did: *Jane Eyre* and *Les Misérables*.’

The nouns in the two DPs under the comparison are the same in (57a), but different in (57b). We call both constructions Number Comparison Construction (NCC). There is no reason to assume that the structure of such *bi* constructions is different from that of the *bi* construction discussed in §3, seen in (40b)/(56b).<sup>11</sup> Like the parameter words discussed in §3, the parameter word *duo* is not a noun, since its position cannot be taken by any nominal, as seen in (60).

- (60) Zhexie xuesheng bi naxie xuesheng {duo/\*duo-shu} san-ge.  
 these student than those student more/more-number three-CL  
 Lit: ‘These students are three more than those students.’

Also, as in the *bi* constructions discussed in §3, in an NCC, a differential is optional. For example, the NCC in (61) has no differential. Moreover, as in the *bi* constructions discussed in §3, in an NCC, it is an explicit or implicit *chu/-le* that introduces a differential, as seen in (57).

<sup>11</sup> It is not clear to us why the *bi* NCC in (ia) does not have the transitive version in (ib).

- (i) a. Zhexie yu bi naxie yu duo-le san-tiao.  
 these fish than those fish more-PRF three-CL  
 Lit.: ‘These fish are three more than those.’
- b. \*Zhexie yu duo-le naxie yu san-tiao.  
 these fish more-PRF those fish three-CL

- (61) Zhexie xuesheng bi naxie xuesheng duo.  
 these student than those student more  
 ‘These students are more than those students.’

After providing certain background (4.2), we investigate two issues in NCCs: the NP in a differential NE (4.3), and its forms (4.4).

#### 4.2 Background on the syntax of numeral CL nominals: selection and complement

Before starting on the discussion of NCCs, we spell out two properties of individual CLs: their s-selection and complement.

There is an s-selection relation between an individual CL and the co-occurring noun. The relation s-selection covers the semantic restrictions on the combination of a head element with another element. For example, the direct object of *pay* must be an amount of money (Jackendoff 1987: 384); and the direct object of the verb *drink* must denote liquid, but the direct object of the verb *pour* can denote either liquid or non-liquid, as seen in (62), although the syntactic structures of the clauses are not affected by this s-selection contrast between the verbs.

- (62) a. Bill drank the {juice/\*shrimps}.      b. Bill poured the {juice/shrimps}.

Also, in Mandarin, the verb *kan* ‘cut (with an axe)’ requires its object to denote a hard entity, such as trees and walls, but not nominals that denote soft entities such as thread, hair, and paper; but the verb *jian* ‘cut (with a pair of scissors)’ can take an object that denotes such soft entities.

An individual CL selects the NP to its right in Mandarin. For example, the CL *tiao* occurs with an NP that denotes a stick-like entity. Thus, in (63), *huanggua* ‘cucumber’ can occur with *tiao*, but *pingguo* ‘apple’ cannot.

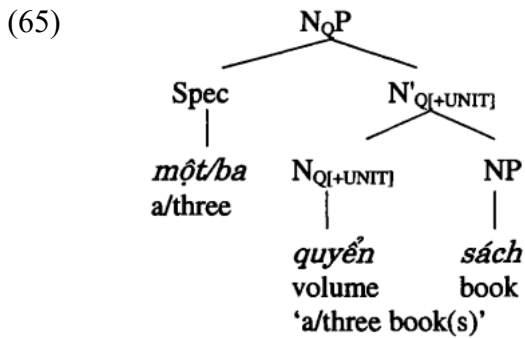
- (63) san-tiao {huanggua/\*pingguo}  
 three-CL cucumber/apple

The selection of an individual CL for a specific type of NP can be arbitrary, and thus the so-called s-selection is not always a real semantic selection. For example, although the CL *tiao* can occur with *huanggua*, it cannot occur with *shouzhi* ‘finger’. Also, *zhuozi* ‘table’, *zui* ‘mouth’, and *gong* ‘bow’ do not form a natural class semantically, but they all are selected by the CL *zhang*. Therefore, more precisely, the selection could be treated as lexical or root selection. For this reason, individual CLs should not be called sortal CLs.

An individual CL is a word that spells out the natural unit of an intrinsic atomic individual. It is implicit in the numeral expressions in non-CL languages such as English. In other words, the syntactic position of a CL is also available in English. Thus, in both (64a) and (64b), *three* occurs with a silent CL (Borer 2005: 109; Zhang 2013a).

- (64) a. I ate three apples.      b. There are three more apples than oranges (on the table).

What is the internal structure of a nominal that is composed of a CL, a numeral, and an NP (i.e., a CL-NE)? It is generally recognized that the CL is the head of the nominal, but which of the other two is the complement of the head? Regarding these questions, Csirmaz & Stavrou (2017: 15) introduce that “Löbel was among the first linguists to address these issues”. Löbel (1989, 2001: 262) proposes the following structure, with a Vietnamese example. Since a CL is recognized as a semi-functional category (Löbel 2001, Zhang 2013a), calling it  $N_Q$  or CL makes no empirical difference.



We find that the structure can be supported from the following aspects in Mandarin. First, the selection relation between an individual CL and the NP introduced above is a local relation between a head and its complement. This selection relation shows that the NP is closer to the CL than the numeral, and thus indicates a right-branching structure, as in (65).

Second, in Mandarin, the combination of a CL and a noun can be pronominalized by *zhe* ‘entity’. In (66a), as expected, the CL *jian* is obligatory, but in (66b), no CL may be next to *zhe*. On the other hand, the last clause in (67) shows that no noun may be next to *zhe*. Thus, when *zhe* follows a numeral, it takes the combination of a CL and a noun as its antecedent.

(66) a. San\*(-jian) shi dou hen zhongyao.  
 three-CL matter all very important  
 ‘The three matters are all very important.’

b. San(\*-jian)-zhe dou hen zhongyao.  
 three-CL-ZHE all very important  
 ‘The three are all very important.’

(67) Lulu mai-le liang-jian chenshan. Yi-jian shi huangse-de, yi-jian shi  
 Lulu buy-PRF two-CL shirt one-CL be yellow-MOD one-CL be  
 lüse-de. Liang-zhe (\*chenshan) dou hen bianyi.  
 green-MOD two-ZHE shirt all very cheap  
 ‘Lulu bought two shirts. One is yellow and the other is green. Both are cheap.’

The fact that the combination of a CL and a noun can be pronominalized by *-zhe* indicates that a CL and a noun form a constituent, excluding a numeral. This constituency supports the right-branching structure in (65).

Third, the modifier of an individual CL and the modifier of the associated NP cannot be antonymous, as seen in the contrast between (68a) and (68b). This is different from a container unit construction, seen in (68c) (Zhang 2011, 2013a). The restriction seen in (68b) would be unexpected if the numeral and the CL formed a constituent, excluding the noun. If the CL did not c-command the noun, no interaction between them would be expected.

(68) a. yi-ke xiao pingguo                      b. yi da-ke (\*xiao) pingguo  
 one-CL small apple                              one big-CL small apple  
 ‘one small apple’                                      ‘one big apple’

c. yi da xiang xiao pingguo  
 one big box small apple  
 ‘one big box of small apples’

Syntactically, the selection seen in (63), the pronominalization seen in (66) and (67), and the direct semantic interactions seen in (68) all support Löbel’s right-branching structure.

### 4.3 The occurrence of an NP inside a CL-NE

If we compare the numbers of two sets of individuals that have the same property, i.e., two DPs that have the same NPs, it is possible for a differential NE to have a full-fledged form, i.e., to have an overt NP, under certain conditions, and this NP must be identical to the NP that is shared by the two DPs. This is possible especially if the NP in both DPs is implicit but recoverable from the context, and the DPs have a demonstrative. When talking about two groups of people, our informants gave the examples in (69).

- (69) a. Zhe zu            bi    na    zu            duo-le    san-ge ren.  
           this group    than that group    more-PRF three-CL person  
           Lit.: ‘This group of persons have three more persons than that group.’
- b. Zhe qun            bi    na    qun            duo-le    san-ge ren.  
           this crowd    than that crowd    more-PRF three-CL person  
           Lit.: ‘This crowd of persons have three more persons than that crowd.’

In the differential NE in these examples (the underlined part), the CL *ge* is followed by the noun *ren* ‘person’. Such examples clearly indicate the syntactic reality of an NP in a differential NE in such NCCs.

However, if we compare the numbers of two sets of different types of individuals, it seems impossible for a differential NE to have an NP (Chen 2022), as seen in (70).

- (70) a. Pingguo bi    xiangjiao duo(-le)    san-ge    (\*pingguo).  
           apple    than banana    more-PRF three-CL apple  
           ‘The apples are three more than the bananas.’
- b. Xuesheng    bi    yizi            duo(-le)    san-ge    (\*xuesheng).  
           student    than chair    more-PRF three-CL student  
           ‘The students are three more than the chairs.’

I claim, however, that there is always an NP following the CL in a differential CL-NE, and in constructions like (70a) and (70b), the NP has a null form. One clear argument for the claim is the s-selection effect of an individual CL in NCCs. The CL in a differential NE must be compatible with the noun in the subject. If the CL is not compatible with the NP in the subject, the construction is not acceptable (Chen 2022). In (70a) above, the CL *ge* is compatible with *pingguo* ‘apple’, and in (70b), the CL *ge* is also compatible with *xuesheng* ‘student’. In (71a) below, the CL *ba* is compatible with *yusan* ‘umbrella’ and the CL *jian* is compatible with *yu-yi* ‘rain-coat’, but not *yusan*. Then, in the differential, only *ba* is acceptable to some speakers, whereas *jian* is rejected by all speakers. In (71b), the CL *ding* is compatible with *maozi* ‘hat’ and the CL *liao* is compatible with *weijin* ‘scarf’, but not *maozi*. Then, in the differential, only *ding* is acceptable to some speakers, whereas *tiao* is rejected by all speakers. Also, although the CL *ge* is more generally used than other CLs, especially by the northern speakers, it is still not compatible with certain nouns. We can imagine a context where each hair is paired with a sesame seed, in order to make certain model. Hairs are counted by the CL *gen*, sesame seeds are counted by the CL *li*, but neither is counted by the CL *ge*. If the number of the hairs is more than the number of the sesame seeds, one cannot use either *ge* or *li* in (71c).

- (71) a. Yisan    bi    yu-yi            duo-le    san-{%ba/\*jian}.  
           umbrella than rain-coat    more-PRF three-CL/CL  
           ‘The umbrellas are three more than the raincoats.’

- b. Maozi bi weijin duo-le san- $\{\%ding/*tiao\}$ .  
rain-coat than umbrella more-PRF three-CL/CL  
'The hats are three more than the scarfs.'
- c. Toufa bi zhima duo-le san- $\{\%gen/*li/*ge\}$ .  
hair than sesame more-PRF three-CL/CL  
'The hairs are three more than the sesame seeds.'

The s-selection of a head must be satisfied in the time of the merger of the head and its complement (Zhang 2016), and thus it is impossible for the selection of the CL in an NE to be satisfied by the NP in the subject. Consequently, it must be the case that the CL in the NE is satisfied by an antecedent-taking NP locally, this NP can be null in the construction, and its antecedent is the NP in the subject.

Theoretically, in a numeral nominal, a unit word takes two semantic arguments: a numeral and a property denoted by a noun (e.g., see Scontras 2021 for a brief review and the references cited there). Our claim is compatible with the well-recognized theory.

Empirically, the selection effect is seen not only in differential CL-NEs in comparative constructions, but also in cumulative CL-NEs and distributive CL-NEs in coordinate constructions. In the two examples in (72), the subject is a coordination of two DPs that have different NPs, and the individual CL in the numeral predicate must be compatible with the NPs in the two conjuncts of the subject at the same time. In (72a), although the CL *pi* is compatible with the first conjunct and the CL *tiao* is compatible with the second conjunct, neither of them can occur in the predicate. Since a numeral must be followed by a CL, (72a) is not acceptable. In (72b), however, since the CL *tou* is compatible with both the first and the second conjunct, it can occur in the predicate. The selection effects indicate that an antecedent-taking NP occurs with the CL in the predicate in the examples in (72).

- (72) a. \*Naxie ma gen naxie gou yigong shi shiyi- $\{pi/tiao\}$ .  
those horse and those dog together be eleven-CL/CL
- b. Naxie niu gen naxie zhu yigong shi shiyi-tou.  
those cow and those pig together be eleven-CL  
'Those cows and those pigs are eleven in total.'

In the two examples in (73), the clause-initial topic is a coordination of two DPs that have different NPs; the direct object of the verb has a numeral and an individual CL; the CL must be compatible with the two NPs of both conjuncts of the topic at the same time. In (73a), as we stated above, although the CL *pi* is compatible with the NP in the first conjunct and the CL *tiao* is compatible with the NP in the second conjunct, neither of them is compatible with both of the NPs, and thus neither can follow the numeral in the object. In (73b), also as we stated above, since the CL *tou* is compatible with the NP of both the first and the second conjunct, it thus can follow the numeral in the object. The selection effects indicate that an antecedent-taking NP occurs with the CL in the object in the predicate in the examples in (73).

- (73) a. \*Naxie ma gen naxie gou wo yao ge mai liang- $\{pi/tiao\}$ .  
those horse and those dog I wanteach buy two-CL/CL
- b. Naxie niu gen naxie zhu wo yao ge mai liang-tou.  
those cow and those pig I wanteach buy two-CL  
'As for those cows and those pigs, I want to buy two each.'



have a split antecedent: the pro-DP *they* takes the combination of *Peter* and *Mary* as its antecedent in (77a), and similarly, PRO takes the combination of *Peter* and *Mary* as its antecedent in (77b), but in neither examples, *Peter* and *Mary* form a constituent. Thus, not only *they*, but also *PRO*, must be a proform, instead of the output of ellipsis.

- (77) a. Peter told Mary that [they should have dinner together].  
 b. Peter proposed to Mary [PRO to have dinner together]. (cf. Williams 1980: 218)

In our (72b) and (73b), the antecedent of the null NP at the right-edge of the clause must take the combination of the NP in the first DP conjunct and the NP in the second DP conjunct as its antecedent. Since the two NPs are embedded in different demonstrative DPs, there is no way for them to form a constituent. Thus, the null NP, just like the PRO in (77b), cannot be the output of ellipsis. Therefore, null pro-NP is independently available in Mandarin.

Based on the above discussion and in the absence of any evidence for an ellipsis possibility, we extend this pro-NP approach to differential NEs in NCCs. We thus assume that the null NP in a differential NE is just a null pro-NP.

We have claimed that in an NCC where the two DPs under the comparison have different NPs, a differential NE has a null pro-NP. We have also shown that in an NCC where the two DPs under the comparison have the same NP, a differential NE may have an overt NP, and this NP is identical to the one in the two DPs (see *ren* ‘person’ in (69)). We further claim that the overt NP in a differential in the latter kind of NCC is also a pro-NP, but it is an overt pro-NP. The overt form is a copy of its antecedent, i.e., a copy of the NP in the subject DP in the NCC. In this respect, there is a parallelism between pro-DPs and pro-NPs in the language. Consider (78). In (78a), the second *ren* ‘person’ is a pro-DP, taking the first *ren* as its antecedent. Similarly, in (78b), the second *nanhai* ‘boy’ is a pro-DP, taking the first *nanhai* as its antecedent; and the second *nühai* ‘girl’ is a pro-DP, taking the first *nühai* as its antecedent.

- (78) a. Ren<sub>i</sub> bu fan wo, wo bu fan ren<sub>i</sub>.  
 person not offend I I not offend person  
 ‘If anyone does not offend me, I will not offend him.’  
 b. Zai nali, nanhai<sub>i</sub> zhaogu nanhai<sub>i</sub>, nühai<sub>k</sub> zhaogu nühai<sub>k</sub>.  
 at there boy care boy girl care girl  
 ‘Over there, the boys take care of each other, and the girls also take care of each other.’

Therefore, in Mandarin, it is possible for a pro-form to be in the form of its antecedent. We thus assume that in an NCC, if the two DPs under the comparison have the same NP, a differential NE may have an overt pro-NP, and the overt form is a copy of its antecedent. But if the two DPs have different NPs, a differential NE must have a null pro-NP.

Cross-linguistically, the choice between a null pro-NP and an overt one may be decided by various semantic and syntactic factors. Déchaine & Wiltschko (2002: 427) claim that in French, the clitic *en* is an overt pro-NP if it occurs in a weak indefinite DP, as in (79a), and its null version occurs in a definite DP, as in (79b). They further suggest that this has to do with the restriction on moving out of a definite DP.

- (79) a. J'ai achete une voiture rouge, et Marie en a achete une  
 I-have bought a car red and Marie EN has bought a  
 jaune.  
 yellow  
 ‘I bought a red car and Mary bought a yellow one.’



- b. J'ai achete la voiture rouge, et Marie a achete la  
 I-have bought the car red and Marie has bought the  
 jaune Ø.  
 yellow  
 'I bought the red car and Mary bought the yellow one.'

The English word *one* in examples like (80) is analyzed as a pronominal in Postal (1969) and Radford (1989, 1993). Déchaine & Wiltschko (2002: 420) further specify it as a pro-NP.

- (80) a. The large [girls]<sub>i</sub> can't stand the small [ones]<sub>i</sub>. (cf. Postal 1966: 202, (2))  
 b. The red [car]<sub>i</sub> is more expensive than the yellow [one]<sub>i</sub>.

The antecedent of this use of *one* must be a count noun (e.g., Panagiotidis 2003b: 282). This is reflected in Alexiadou & Gengel's (2012: 191-192) treatment of *one* as a CL.

Postal (1969) argues that a pronominal such as *they* and *he* is a D element followed by a null NP. Panagiotidis (2003a, b) argues that this null NP is an empty noun, and the *one* used in examples like (80) is an overt empty noun, but *one* never follows a pronoun. Since *one* must keep the countability property of its antecedent, we adopt Déchaine & Wiltschko's (2002) pro-NP analysis. We then can see that if a pro-NP occurs in a pronominal such as *they* and *he*, it must be in a null form, otherwise, it is realized as the overt *one*. The overt and covert version of a pro-NP also have different distributions in English.

Moreover, if both D and CL can be followed by a null pro-NP, as seen in a pronominal such as *they* and a differential CL-NE in NCCs, respectively, we can see a parallelism of these two functional heads in nominals: they must be followed a nominal. As claimed by Panagiotidis (2003b: 283), no functional category is intransitive.

As for the structural relation between a pro-NP and its antecedent, there is no c-command relation. The French *en* is not c-commanded by its antecedent in (79), and the English *one* is also not c-commanded by its antecedent in (80). Similarly, the pro-NP in a differential NE in Mandarin NCCs is also not c-commanded by its antecedent, which is the NP in the subject. Moreover, in our proposed syntactic structure of a comparative construction, the base-position of the subject is closer to the differential NE than the standard DP (see (40b)/(56b)). Thus, in such a construction, the pro-NP in the NE always takes the NP in the closer DP as its antecedent. A dependency that has a local relation but not a c-command relation is also seen in gapping. In (81), for example, the gap in the last clause means 'buys'. It takes *buys*, rather than *sells*, as its antecedent; the former verb is closer to the gap than the latter verb. The dependency of the gap on its antecedent has no c-command relation.

- (81) John sells books, Mary buys records and Bill \_ newspapers.

In this section, we have argued that in a differential NE, an individual CL is always followed by an NP, and this NP is a (null) pro-NP in an NCC.

## 5. Conclusions

In this paper, we have accounted for the following four issues:

- A. A CL-NE cannot occur in a non-*you* version of a positive degree construction because if the parameter is fixed in the context, a predicate must be specific with that particular parameter, but an individual CL in a CL-NE is not specified with a parameter.
- B. When *-le* occurs in an ILP in comparatives, it is used as verb, rather than an aspect marker.

- C. A transitive comparative needs a differential NE because the standard DP needs to be Case-licensed by a verbal element and the verb that introduces a differential NE can raise to do the Case-licensing.
- D. In a differential NE, an individual CL is always followed by an NP, and this NP is a (null) pro-NP in an NCC.

While working on these issues, we have also found that in Mandarin, a parameter word is a nominal in a positive degree construction if an NE occurs, but it is not a nominal in a comparative construction.

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## Abstract

This paper explains a few issues about numeral classifier phrases in positive degree constructions and comparative constructions in Mandarin. First, such a phrase cannot occur as a predicate, following a word such as *gao* ‘tall’ or *zhong* ‘heavy’, unlike a measure term expression. Our account is that if the gradable property is specified in the context, a degree predicate must also be specific with that property. Second, an apparent perfective aspect marker may occur with a differential expression in comparatives, because it is in fact a verb, alternating with the verb *chu* ‘exceed’. Third, a transitive comparative needs a differential expression because the standard DP needs to be Case-licensed by a verbal element and the (implicit) verb that introduces a differential expression is raised to do the Case-licensing. Fourth, in a construction that compares the numbers of two sets of atomic individuals, a classifier may occur without an overt noun in a differential expression because the noun is a null pro-NP.

Keywords: classifier, measure term, comparative, s-selection, pro-NP

### ● Main empirical contributions:

- ◎ It explains a distributive restriction on a numeral classifier phrase in positive degree constructions.
- ◎ It explains interactions between the apparent aspect marker *-le* and a differential phrase in comparatives.
- ◎ It explains the obligatory occurrence of a differential in transitive comparatives.
- ◎ It explains the absence of an overt NP with a classifier in a differential phrase in number comparison constructions.

### ● Theoretical contributions:

It shows the similarities and differences between a numeral classifier expression in its quantity use and a measure term numeral expression.

It presents a new parallelism between the functional category CL and other functional categories: it is never intransitive.