J. Linguistics **56** (2020), 701–743. doi:10.1017/S0022226720000110

On the semantics of classifier reduplication in Cantonese[1]

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(Received 31 October 2019; revised 7 February 2020)

This paper studies prenominal reduplicative classifier in Cantonese, which has been argued to be a distributive quantifier on a par with English *every/each* and Mandarin *mei* 'every', and a plural classifier giving the 'many' reading. The analysis I propose draws heavily on ideas introduced in the cover theory proposed by Schwarzschild (1996) and Brisson (1998, 2003), and ideas introduced by Partee (2004) and others on quantifying determiner *many*. I argue that prenominal reduplicative classifier is a quantifying determiner which is ambiguous between a quantifier type and a modifier type. When it occurs with the distributive quantifier *dou1* 'all', it serves as a modifier, regulating the domain of *dou1*-quantification by imposing a maximizing effect on the nominal it modifies (see e.g. Link 1983; Gillon 1987; Schwarzschild 1996; Brisson 1998, 2003). Without the presence of a distributive quantifier, prenominal reduplicative classifier serves either as a modifier or as a quantifier, giving its NP a weak cardinal reading or a strong proportional reading, respectively. The proposed analysis implies that domain restriction in Chinese is overtly realized in grammatical form by means of the reduplicative classifier (when combined with a distributive quantifier) and that Chinese may have determiners, which is at least true in Cantonese.

KEYWORDS: Cantonese, classifier reduplication, distributive quantifiers, domain restriction, 'many' readings, plurality covers, quantifying determiner

1. INTRODUCTION

Chinese is regarded as a classifier language, that is, a language in which modification of count nouns with numerals always requires a classifier. Apart from appearing between a numeral and a countable noun, Chinese classifiers can also

[1] Various versions of this paper were presented at the 12th International Workshop on Theoretical East Asian Linguistics (July 2019) and the 8th International Conference on Formal Linguistics (November 2018), and the earliest version at the 20th International Conference on Yue Dialects (December 2015). The author thanks the conference participants for all the valuable comments. Sincere thanks go to the three anonymous *Journal of Linguistics* referees for their detailed, important and invaluable comments and suggestions. The author alone is responsible for all potential errors that may remain in the paper. The work described in this paper was partially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No: CityU 143113) and a grant from the City University of Hong Kong (Project No: SRG-Fd 7004489). The author thus acknowledges the generous support of the relevant parties.

appear after determiners like *mei* 'each' and *ji* 'several'. Classifiers are basically considered to be individuators and constitute a special grammatical category, possibly projecting a Classifier Phrase (ClP) (see Cheng & Sybesma 1999, 2005; Li 2011; Rothstein 2017), which is the structure adopted in this paper.

As a special grammatical category, classifiers (CLs) can be reduplicated in three forms: (i) 'CL + CL', like *ge* + *ge*; (ii) 'one + CL + CL', like *yi* + *ge* + *ge*; and (iii) 'one + CL + one + CL', like *yi* + *ge* + *yi* + *ge*. When reduplicated, classifiers are considered to convey various meanings in the nominal domain, which have not been systematically studied until X. Yang (2002), K. Yang (2004, 2015), Cheng (2009), Steindl (2010), N. Zhang (2013), Zhang & Tang (2013, 2018). These authors considered reduplicative classifiers as conveying two readings: (i) a distributive reading on a par with Mandarin *mei* 'every' and English *every/each*, with the presence of *dou* 'all'; and (ii) a plural reading of 'many' without the presence of *dou* (see Cheng 2009; Steindl 2010; N. Zhang 2013; Zhang & Tang 2013, 2018). The two readings are taken to be complementary to each other. Moreover, comparing Cantonese with Mandarin, while various types of classifiers can be reduplicated in Cantonese, including generic classifiers, sortal classifiers, measure classifiers, collective classifiers (see Cheung 1972/2007, Matthews & Yip 1994/2011), classifier reduplication is less flexible in Mandarin. Despite the productivity of reduplication in Cantonese, previous studies are mainly on Mandarin, with limited attention paid to Cantonese (see Cheng 2009).

In light of the above, this paper aims to study Cantonese reduplicative classifiers, focusing on its basic form 'CL + CL'. The paper serves to fill in the gap by providing a clearer semantics for classifier reduplication, through answering the following four questions:

(i) How can the distributive reading and the plural reading of 'many' be derived from the reduplicative classifier semantically?
(ii) If distributivity is assumed to be coming from the reduplicative classifier, how can we account for its co-occurrence with another distributive quantifier, Cantonese *dou1* 'all' (counterpart to Mandarin *dou* 'all')?
(iii) Cantonese *mui5* 'every' (counterpart to Mandarin *mei* 'every') is considered to be a distributive quantifier, which needs to be licensed by *dou1*. If this is the case, is reduplicative classifier semantically analogous to *mui5*?
(iv) If a nominal with reduplicative classifier only indicates plurality but not singularity, does this make reduplicative classifier a plural marker or a plural classifier?

The analysis I propose draws heavily on ideas introduced by Hoeksema (1983), Westerståhl (1984), Partee (2004), and others on quantifying determiners like *many* and *few*, and ideas introduced in the cover theory proposed by Schwarzschild (1996), Brisson (1998, 2003), and others for plurals. I will argue that reduplicative classifier 'CL + CL' is a quantifying determiner. When conveying the 'many' reading, 'CL + CL' is ambiguous between a modifier type

https://doi.org/10.1017/S0022226720000110 Published online by Cambridge University Press

and a quantifier type, with the former giving a weak cardinal reading and the latter a strong proportional reading. On the other hand, when 'CL + CL' occurs with a distributive operator (D-operator) like *dou1* 'all', it forms a licensing relation with *dou1*. As distributive quantification is performed by *dou1*, prenominal 'CL + CL' serves as a modifier-type quantifying determiner, and its presence is to regulate the quantification domain of *dou1*. A maximizing effect would be imposed by the 'CL + CL' on the nominal it modified.

If the above semantics of reduplicative classifier holds, it would lead to the prediction that reduplicative classifier cannot be considered equivalent to Cantonese *mui5* 'every' or English *every/each*, and it cannot be a plural classifier/marker either. As the readings conveyed by 'CL + CL' differ in whether or not *dou1* is present, the following two notations will be used throughout the paper:

(i) [CL + CL]: Reduplicative classifiers without the distributive quantifier *dou1*
(ii) [CL + CL_{dou1}]: Reduplicative classifiers licensed by the distributive quantifier *dou1*

The proposed analysis of reduplicative classifiers lends support to the claim that classifier – single classifier or reduplicative – may be a strategy for determiner building in Chinese. Chinese may not be a covert strategy language in terms of domain restriction, which at the very least, is true in the case of classifier reduplication.

The paper is organized as follows: Section 2 will review previous studies of reduplicative classifiers. In Section 3, I will examine the semantics of reduplicative classifier without *dou1*, with relevant interpretations ambiguous between strong 'many' and weak 'many'. In Section 4, I will propose the semantics of [CL + CL_{dou1}] and demonstrate how it serves as a domain regulator. In Section 5, I will compare [CL + CL_{dou1}] with a plural classifier/marker and Cantonese *mui5* 'every', and argue that [CL + CL_{dou1}] can neither be the former nor an equivalent of the latter. Section 6 presents the conclusions drawn from the semantics of [CL + CL] and [CL + CL_{dou1}] and discusses the theoretical implications of the proposed analysis.

2. Previous studies of reduplicative classifiers

In this section, I will briefly review previous studies that examined reduplicative classifiers. As noted, previous studies are mainly on Mandarin, so examples cited here will be mainly from Mandarin.

2.1 *Reduplicative classifiers conveying distributivity*

Let us start with the distributive reading. Previous analyses, such as those by Cheng (2009), N. Zhang (2013) and Zhang & Tang (2013, 2018), state that reduplicative classifiers give rise to a reading on a par with English *every/each* or

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Chinese *mei* 'every'. The Mandarin sentences in (1) are cited from Cheng (2009) and Zhang & Tang (2013, 2018), and the Cantonese sentences (2a) and (2b) are the author's examples.[2]

(1) (a) ?***Ge-ge*** xuesheng **dou** xie-le baogao. (Mandarin)
CL-CL student all write-PFV report
'Every student wrote a report.'
(Cheng 2009: 70)

(b) Xuesheng **ge-ge** ***(dou)** hen-yonggong. (Mandarin)
student CL-CL all very-hardworking
'Students all work very hard.'
(Cheng 2009: 70)

(c) **Ge-ge** jidan ***(dou)** hen-haochi. (Mandarin)
CL-CL egg all very-delicious
'Every egg is delicious.'
(Zhang & Tang 2013, 2018)

(2) (a) **Go3-go3** hok6saang1 ***(dou1)** se2-zo2 bou3gou3. (Cantonese)
CL-CL student all write-PFV report
'All the students wrote a report.'

(b) Hok6saang1 **go3-go3** ***(dou1)** hou2-kan4lik6. (Cantonese)
student CL-CL all very-hardworking
'All the students work very hard.'

The examples in (2) suggest that Cantonese allows reduplicative classifiers in both prenominal and postnominal positions. However, the same story remains debatable in Mandarin. Cheng (2009) pointed out that Mandarin classifiers cannot be reduplicated, as in (1a), and if reduplicated, as in (1b), [CL + CL] may in fact be adverbial reduplicative classifiers, instead of nominal classifiers. Contrarily, studies like Zhang & Tang (2013, 2018) (see (1c)) and N. Zhang (2013) do accept reduplicative classifiers in the prenominal position. Despite the inconsistencies and the judgements discussed in different papers, (1a) and (2a) are accepted by most native speakers. While the acceptability of prenominal classifier reduplication in Cantonese is unquestionable, for the Mandarin cases, I would follow N. Zhang and Zhang & Tang, who claim that Mandarin [CL + CL] can occur in a prenominal position, a judgment accepted by most native speakers. The grammaticality of sentences like (1a) and (2a) would therefore have no effect on the current paper. Additionally, the occurrence of *dou*/*dou1* is obligatory in

[2] Glossing abbreviations follow the Leipzig Glossing Rules, with some abbreviations added to fit the purpose of the paper: CL = classifier; CL_{PL} = classifier – plural; DES = descriptive expression marker; and SFP = sentence-final particle. The Romanization system for Mandarin Chinese used in this paper is *Hanyu pinyin* and for Cantonese, *Jyutping* (with tones indicated by numbers 1–6). *Jyutping* is a Cantonese Romanization scheme proposed by the Linguistic Society of Hong Kong (1993/2002).

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(1) and (2), with the reduplicative classifiers giving a distributive meaning to the co-occurring NP, as claimed previously.

Focusing on quantificational expressions of the 'every' type, Cheng (2009) further mentioned that the use of classifier reduplication is one way of expressing 'every' in Mandarin.

(3) (a) Tamen **ge-ge** **dou** hen-congming. (Mandarin)
they CL-CL all very-intelligent
'Every one of them is intelligent.'
(Cheng 2009: 53)

(b) **Mei** (yi)-ge xuesheng **dou** lai-le. (Mandarin)
every one-CL student all come-PFV
'Every student came.'
(Cheng 2009: 60)

As (3a) is cited from Cheng (2009), classifier reduplication in the postnominal position is adopted. Both [CL + CL_{dou}] and *mei* 'every' give a distributive reading equivalent to English *every* in the presence of *dou* 'all', leading to the claim that [CL + CL_{dou}] is analogous to *mei*. To account for the co-occurrence of *mei* 'every' with *dou* 'all', following Giannakidou & Cheng (2006) (see also Xiang 2008), Cheng (2009) assumes that *dou* is an iota/maximality operator. *Mei* 'every' provides universal force by introducing sets of individuals, while *dou* 'all', as a maximality operator, operates on these sets and closes the domain. Therefore, if [CL + CL_{dou}] were considered to be analogous to *mei* 'every', it would follow that maximality would be given by *dou*, with distributive force coming from [CL + CL_{dou}].

2.2 *Reduplicative classifiers giving the 'many' reading*

Besides the distributive reading, it has been noted that reduplicative classifiers can convey a plural reading of 'many'. The examples in (4) are from Steindl (2010: 71).

(4) (a) Tian-shang piao-zhe **duo-duo** yun. (Mandarin)
sky-on float-IMP CL-CL cloud
'Many clouds are floating in the sky.'

(b) Lian-shang liu-xia **di-di** yan-lei. (Mandarin)
face-on flow-down CL-CL tear
'Many tears are running down on the face.'

Duo-duo-yun 'CL-CL-clouds' in (4a) and *di-di-yan-lei* 'CL-CL-tears' in (4b) are considered to convey a plural reading of 'many', hence 'many clouds' and 'many tears'. Such a plural reading is usually found when [CL + CL] occurs in the object position and *dou* 'all' is absent. Therefore, the contrast between (1) and (4) suggests that reduplicative classifiers give different readings to the sentence,

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depending on whether it occurs in the subject or the object position. However, the picture of prenominal reduplicative classifiers is not that simple. As will be revealed in Section 3.4, the so-called subject–object asymmetry does not exist.

2.3 *Reduplicative classifiers as plural markers*

N. Zhang (2013) differed from others in considering reduplicative classifiers to be defective plural markers (or UNIT-PLURALITY MARKERS, to use N. Zhang's term). Song (1978) stated that reduplicative classifiers give the meaning of English *many*. Following Song, N. Zhang further argued that the reduplicative classifier[3] *zhi-zhi* 'CL-CL' in (5) is a plural marker, as the nominal modified by it can never have a singular reading and only gains a plural meaning from the reduplicative classifier. The examples in (5) are from N. Zhang (2013: 120).

(5) (a) **Zhi-zhi** mayi ***(dou)** kang-zhe dian
CL-CL ant all carry-IPFV a.bit
shenme-dongxi. (Mandarin)
something
'Every ant is carrying something.'

(b) **Yi-zhi-zhi** mayi **(*dou)** pa-dao-le wo de
one-CL-CL ant all climb-to-PFV my DE
beizi-li. (Mandarin)
cup-in
'Many ants climbed into my cup.'

N. Zhang observed that *zhi-zhi* 'CL-CL' in (5a) occurs with *dou* 'all' and that the occurrence of *dou* would suppress the presence of *yi* 'one', while the opposite is true in (5b). The distribution of Mandarin *dou* and *yi* is accounted for by assuming reduplicative classifiers to be defective plural markers, in the sense that their occurrence needs a formal licenser, either a distributive quantifier or an existential quantifier. According to N. Zhang, *yi*, which occurs to the left of the reduplicative classifiers, is not a numeral, but an existential quantifier. When *yi* is the licenser, the reduplicative classifiers are compatible with either a distributive reading or a collective reading, as seen in (5b), with the 'many' reading coming from the plurality of the reduplicative classifiers. Although Steindl (2010) also notes that [CL + CL] can give a reading of 'many', occurrence of *yi* is not necessary in her analysis. On the other hand, when the distributive quantifier *dou* is the licenser, only a distributive reading is found, which is the reading given in (5a).

[3] N. Zhang used the term REDUPLICATIVE UNIT WORDS (RUWs), which covers both classifiers and measure words. For consistency of terminology, I will stick to the term REDUPLICATIVE CLASSIFIERS throughout the paper.

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At this point, the two central claims for the meaning of reduplicative classifiers have been summarized. We will now move on to examine the semantics of Cantonese [CL + CL].

3. [CL + CL]: REDUPLICATIVE CLASSIFIERS WITHOUT *DOU1*

Mandarin and Cantonese show obvious differences in their classifiers. Cantonese classifiers can combine with NP to give [CL + NP] phrases, hence ClP, which are found in both subject and object positions, with definite and/or indefinite interpretations. Contrarily, [CL + NP] phrases in Mandarin are restricted to object positions (see Wang 2013), which is considered to have the numeral 'one' omitted, with only indefinite interpretation, e.g. *shuo ju-hua* 'say CL-sentence', *xie feng-xin* 'write CL-letter' (see Zhu 1982). As [[CL + CL] + NP] represents reduplication of single classifiers, before accounting for the semantics of [[CL + CL] + NP], we need to briefly mention the semantics of [CL + NP].

3.1 *Cantonese* [CL + NP]

It is widely acknowledged that Cantonese [CL + NP] phrases are related to individuation and definiteness of the relevant N or NP. Krifka (1995) argues that classifier languages morphologically separate the semantic measure function (i.e. the classifier) from the numerals, whereas non-classifier languages have a measure function incorporated into the numerals. In line with this, Cheng & Sybesma (1999) takes classifiers to have the function of individuation. Cheng further proposed that 'aside from the CL(assifier) projection, there is also an IND(ividuation) projection. Cantonese classifiers start out as individuators and move to CL' (Cheng 2009: 73–74). If this is true, when we reduplicate the classifier in Cantonese, what is reduplicated is the individuator and reduplication would therefore yield (sets of) individuals, which is where plurality of [CL + CL] comes from and also the stand taken in this paper. Unlike Cantonese, Mandarin classifiers are not individuators, and the individuator function in Mandarin can be performed by *-zi* in N-*zi* 'N-suffix', as in *yi-zi* 'chair, as pointed out in Borer (2005), Sybesma (2007) and Cheng (2009).

For definiteness, Cantonese [CL + NP] phrases are generally considered to mark specific or definite NPs, as stated in Sybesma (2007) who notes that [CL + NP] phrases in Cantonese can denote definiteness. In fact, the existential meaning expressed by the singular [CL + NP] is usually interpreted as definite when occurring in the subject position, and either as definite or as indefinite when occurring in the object position. The examples in (6) are from Cheng & Sybesma (1999: 511).

(6) (a) **Zek3-gau2** gam1jat6 dak6bit6 teng1waa6. (Cantonese)
CL-dog today special obedient
'The dog is specially obedient today.'

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(b) Ngo5 soeng2 maai5 **bun2-syu1** (lei4-tai2). (Cantonese)
I want buy CL-book come-read
'I want to buy a book (to read).'

(c) Ngo5 zung1ji3 tung4 **zek3-gau2** waan2. (Cantonese)
I like with CL-dog play
'I like to play with the dog.'

The sentences in (6) reveal that classifiers in Cantonese are like determiners and can yield definite or indefinite interpretation. While *zek3-gau2* 'CL-dog' which occurs in the subject position gives a definite interpretation, [CL + NP] in the object position can give either definite or indefinite interpretation, as seen by the indefinite *bun2-syu1* 'CL-book' in (6b) and definite *zek3-gau2* 'CL-dog' in (6c). If this is true, can we infer that definiteness directly comes from [CL + CL] in [[CL + CL] + NP], with [CL + CL] taken as a determiner? How can we account for the 'many' readings given by [[CL + CL] + NP] in the object position, which may not suggest definiteness? Under what conditions, would [[CL + CL] + NP] give a definite reading?

3.2 *Reduplicative classifiers without* dou1*: A quantifying determiner of modifier type and quantifier type*

As mentioned, without *dou1*, [CL + CL] gives the 'many' reading as claimed in Steindl (2010) and N. Zhang (2013). It is well acknowledged that cardinals and 'many' can be adjectives, though appearing in what looks like determiner position. This has been stated as early as Hoeksema (1983), which mentioned that English *many*, as adjectives, are interpreted as cardinal predicates of groups numerals. Along the same line, Westerståhl (1984) pointed out that in the relation between D(eterminer) and NP, D can be syntactically ambiguous between a quantifier type and a modifier type.

The fact that *many* has both adjective-like and determiner-like properties has led to significant controversies regarding its interpretation (see Bennett 1974, Löbner 1987). With ideas developed from Milsark (1977), Carlson (1980), Kamp (1981), Heim (1982) and Link (1983), Partee (2004) argued that *many* is ambiguous between cardinal and proportional readings, and below is the basic idea adopted in this paper.

> There is a cardinal *many* which is adjective-like and patterns with the cardinal number in being able to be used as either an adjective or a determiner, and also a proportional *many* which is only a determiner. (Partee 2004: 51)

If one maps the above with Westerståhl (1984), the quantifier type of D would make it only a determiner, whilst the modifier type of D would make it as either an adjective or a determiner. According to Partee (2004), the two readings of *many* are represented as follows:

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(7) (a) Cardinal: $|A \cap B| > n$
(b) Proportional: $\frac{|A \cap B|}{|A|} \geqslant k$; k a fraction or %

(Partee 2004: 241)

On the cardinal reading in (7a), *many* as a vague cardinal quantifier would have a meaning of *at least n*, like that of the cardinal numbers, and the value of *n* must be one that counts as large in the given context. On the proportional reading in (7b), *many* would give a meaning of *at least k*, with *k* either as a fraction between 0 and 1 or as a percentage, and the value of *at least k* must be one that counts as a relatively large proportion.

Sections 3.3 and 3.4 will show how the morpho-syntactic ambiguity of [CL + CL] accounts for the different readings found in [CL + CL]. The discussion will fall into the two following two parts:

(8) (a) When prenominal [CL + CL] gives a weak cardinal reading of 'many', it can be an adjective or a determiner. The nominal expression it modifies gets cardinal predicate use of a relatively large value *n* in (7a); and
(b) When prenominal [CL + CL] gives a strong proportional reading of 'many', it can only be a determiner, giving a strong partitive reading. This gives to the nominal expression of a value *at least k* in (7b).

3.3 *Morpho-syntactic ambiguities of* [CL + CL]*: A determiner or an adjective*

Consider (4a) and (4b) again,[4] cited from Steindl (2010: 71):

(4) (a) Tian-shang piao-zhe **duo-duo** yun. (Mandarin)
sky-on float-IPFV CL-CL cloud
'Many clouds are floating in the sky.'
Cardinal reading (non-quantificational modifier type): 'The set of clouds that are floating in the sky is of a relatively large value *n*.'
(b) Lian-shang liu-xia **di-di** yan-lei. (Mandarin)
face-on flow-down CL-CL tear
'Many tears are running down her face.'
Cardinal reading (non-quantificational modifier type): 'The set of tears that are running down her face is of a relatively large value *n*.'

Since Steindl's examples are in Mandarin, the discussion here will be primarily of Mandarin. The cardinal readings given in (4a) and (4b), are provided by the author of this paper. As mentioned in Section 2 above, Steindl (2010) regards the

[4] From here onwards, all Mandarin and Cantonese sentences adopted in the current analysis have been cross-checked with native speakers to confirm their acceptability, and the current analysis has been built on the acceptability of relevant sentences.

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[[CL + CL] + NP] construction in (4a) and (4b) as giving a plural reading of 'many'. When [[CL + CL] + NP] occurs in the object position, (4a) and (4b) show that only cardinal reading to its modified nominal can be found. In the case of (4a), the truth condition would be that the cardinality of the set of clouds that are floating in the sky is of a relatively large value *n*. The value of *n* in (4a) is something that is considered large in the given context. That being the case, the 'many' reading given is on a par with that of a vague and indefinite cardinal quantifier, with the vagueness arising from the unspecified values assigned to *n* and the relatively vague value assigned to the cardinality of the set of clouds that are floating in the sky. Contrarily, if the proportional reading were conveyed in (4a), it would need the totality of clouds be measured according to areas in the sky, in order to give more specific values of |A| and |A∩B|. The value in terms of areas that the clouds occupy has to reach *at least k* in order to make the sentence true. However, such a proportional value of *at least k* is vague and not possible to get, according to the judgment of native speakers.

Similarly, the reading of (4b) would be that the cardinality of the set of tears that are running down her face is of a relatively large value *n*, which represents the cardinal reading of indefinite 'many'. To get the proportional reading, it would require the totality of areas which the tears have covered, that is |A∩B|, be measured according to areas of the face, that is |A|. Even one assumes the scenario that the speaker is looking at the face of a particular individual, the value would need to reach *at least k* proportionally in order to have the proportional reading, which again is not possible for (4b).

Generalizing from (4a) and (4b), while English *many* shows ambiguity between the cardinal reading and the proportional reading, such an ambiguity is not clear with Mandarin [[CL + CL] + NP] in the object position. Under such a case, [CL + CL] would be an adjective modifying the NP, giving the weak cardinal reading of indefinite 'many'.

Now, consider the Cantonese examples (9) and (10), with [[CL + CL] + NP] appearing in the object position.

(9) Ngo5 ji5ging1 hang6-gwo3 **go3-go3** gaai1hau2 laa3,
I already walk-past CL-CL street.corner SFP
dou1 wan2-m4-dou3 go3 jau4tung2. (Cantonese)
still find-NEG-arrive CL post.box

Cardinal reading (non-quantificational modifier type): 'The speaker walked past many street corners (, but still cannot find the post box).'

Without knowing exactly where the post-box is, the speaker walked around different street corners and tried to find one. Eventually, s/he failed to find it and uttered (9). Like the case of Mandarin, when the [[CL + CL] + NP] occurs in the object position, it tends to be interpreted as indefinite. This can be understood as the speaker was not pointed to particular areas or streets, making the locations of the post boxes become indefinite to him/her. (9) would be true if the cardinality

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of the street corners passed by the speaker is *at least n*, giving the modifier-type reading of 'many' as defined in (7a). [CL + CL] serves as an adjective under such a case, conveying the weak and indefinite cardinal reading as the default reading.

Consider (10) next.

(10) **Go3-go3** gaai1hau2 *(ngo5) ji5ging1 hang6-gwo3 laa3,
CL-CL street.corner I already walk-past SFP
dou1 wan2-m4-dou2 go3 jau4tung2. (Cantonese)
still find-NEG-arrive CL post.box
Cardinal reading (non-quantificational modifier type): 'The speaker walked past many street corners (which s/he knows) (, but still cannot find the post box).'
Proportional reading (quantifier-type): 'For the set of the street corners given to the speaker, the speaker passed many of them(, but still cannot find the post box) (over or at least equal to *k*, where k is the percentage perceived by the speaker or the addressee to be "many").'

This example includes a sentence with *go3-go3-gaai1hau2* 'CL-CL-street.corner' topicalized. As mentioned in Sui & Hu (2017), [CL + CL + N] in Mandarin is projected into DP and licensed by the [+topic] feature. As *go3-go3-gaai1hau2* is topicalized, along the line of Sui & Hu's [+topic] feature analysis, it is proposed that the nominal structure is moved to occupy the specifier position of Top(ic)P, which allows it to be licensed by the [+topic] feature through Specifier–Head agreement. The TopP under such a case is in line with Sui & Hu's DP, with both as a phrasal structure licensed by [+topic] feature. The internal structure of the nominals would take the assumption of Cheng & Sybesma (1999, 2005), Li (2011) and Rothstein (2017), which considers [CL + CL] occupying the CL(assifier) Head position, hence ClP structure. Licensed by the [+topic] feature, the [[CL + CL] + NP] will have a definite interpretation. Unlike (9), this would be interpreted under the scenario that the speaker was pointed to particular areas or streets, making the locations of the post boxes become known and definite to him/her. S/he then walked past many street corners, with the existence of a relatively large number *n* emphasized. Regardless of whether it is determiner-like, as in (10), or adjective-like, as in (9), as what is conveyed is the cardinal reading, be it definite or indefinite, [CL + CL] under such a case is non-quantificational.

However, with [[CL + CL] + NP] topicalized, (10) is possible to receive the proportional reading. To clearly present the proportional reading, we can treat the prenominal [CL + CL] in the same manner as an operator in the tripartite structure proposed by Kamp (1981) and Heim (1982) for quantificational (proportional) reading, namely [OP] [RESTRICTOR] [MATRIX]. Assume that the addressee instructed the speaker to walk around a particular area of the street, which includes 10 street corners, and the speaker uttered the sentence in (10) above. Such a reading would require a certain proportion of the set of street corners, namely a set of 10, satisfying the restrictor [Street-corner(x)] also satisfy the matrix [Pass(x)],

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giving a strong partitive reading of "many of the street corners out of the 10 in the area that were passed by the speaker". This will be a case where the speaker was given some street corners as stated in the restrictor [Street-corner(x)], and with those street-corners given, the speaker still cannot find the post box. The partitive property is also the distinguishable feature between the cardinal reading and the proportional reading, namely that no partitive reading will be given under the cardinal reading, which is non-quantificational. Under the tripartite structure, [CL + CL] can only be an operator, giving (10) the reading of [OP_{CL+CL}] [Street-corner(x)] [Pass(x)]. As will be further argued in Section 3.4, the quantificational [CL + CL] under such a reading is a determiner, if Q position is uniformally called D position, and will be in line with what has been stated in Partee (2004).

Now, the question is what will happen if [[CL + CL] +NP] occurs in the subject position? Consider (11).

(11) Hou2do1-nin4 lau4 laa3, daan6 **dung6-dung6** daai6haa6
many-year building SFP but CL-CL block
tai2-lok6 zung6-hai6 hou2-san1. (Cantonese)
see-down still-be very-new
Cardinal reading (non-quantificational modifier type): 'Despite the many years of the buildings, a relatively large number of blocks (which we know) still look very new.'
Proportional reading (quantifier-type): '(Out of a total of 46 blocks,) despite the many years of the buildings, many of them still look very new (over or at least equal to *k*, where *k* is the percentage perceived by the speaker or the addressee to be "many").'

For (11), [CL + CL] *dung6-dung6* 'CL-CL' is used to modify the NP *daai6haa6* 'blocks', giving the plural reading of 'many', with *dung6-dung6-daai6haa6* 'CL-CL-block' occupying the subject position. The cardinal 'many' reading conveyed by [[CL + CL] + NP] tends to have a definite interpretation, with the existence of a relatively large number *n* emphasized.[5] With Cantonese taken to be topic-prominent, the definite reading can be attributed to the movement of the subject [[CL + CL] + NP] to the [Spec,TopP] position, licensed by the [+topic] feature through Spec–Head agreement. This is similar to the case of (10) where the [[CL + CL] + NP] is preposed from the object position.

Like (10), proportional reading is possible for *dung6-dung6-daai6haa6* 'CL-CL-block' under the following scenario. Assume that the speaker and the addressee know that in this area, there are 46 blocks of buildings, and the speaker

[5] It was pointed out by an anonymous *JL* referee that [CL + CL + NP] in the subject position would be supposed to be an indefinite expression when expressing the 'many' reading. The author would like to thank him/her for the precious comments. When they occur in the subject position, they would not meet the general licensing condition of indefinite NPs in Mandarin, e.g. they cannot be bound by the existential *you* 'there-be', as shown in the Mandarin examples.

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uttered (11). The quantified NP with the prenominal [CL + CL] is paraphrasable by the partitive 'many blocks out of a total of 46', as seen in the translation. The proportional reading conveyed in (11) will then give a tripartite structure of '[OP_{CL+CL}] [building(x)] [we-can-see (x)]' and would require a certain proportion of the set of buildings satisfying the restrictor [building(x)] also satisfy the matrix [we-can-see (x)]. This would give a strong partitive reading to the common noun *daai6haa6* 'blocks', with the totality of the NP obtained from the context.

In sum, although the values of *n* and *k* as defined in (7) are context-dependent. However, the truth or falsity of individual readings are determined truth-conditionally, hence operating at the semantic level. The ambiguity of the 'many' readings given by prenominal [CL + CL] has to do with it being a quantifying determiner. When [CL + CL] gives the modifier-type cardinal reading, it behaves like English numerals, hence as an adjective or a determiner. As an adjective, [[CL + CL] + NP] gives an indefinite reading and as a determiner, licensed by a [+topic] feature, a definite reading. Quantifier-type proportional readings will be possible if the [[CL + CL] + NP] is licensed by the [+topic] feature, [CL + CL] would then be a determiner and a tripartite structure of [OP_{CL+CL}] [restrictor] [matrix] is triggered.

3.4 *Deriving different readings of* [[CL + CL] + NP]

Riding along the different readings discussed in Section 3.3, this section derives the structural representations of [[CL + CL] + NP]. We will start with the quantifier-type reading of [CL + CL], followed by its modifier-type readings. When it is of a quantifier type, [[CL + CL] + NP] gives a quantifier phrase (QP), with its syntax shown in (12).

(i) *You **ge-ge** xuesheng zuo-zhe.
there.be CL-CL student sit-IPFV

(ii) *You **ben-ben** shu fang zai-zhuo-shang.
there.be CL-CL book put at-table-on

However, (i) and (ii) are ungrammatical even without *you* 'have', as in **Ben-ben shu fang-zai zhuoshang* and **Ge-ge xuesheng zuo-zhe*. Both sentences are acceptable only with *dou* 'all', that is with the reduplicative classifier as a domain regulator licensed by the distributive quantifier *dou*. Even though (i) and (ii) are acceptable, the locative predicate *fang-zai-zhuoshang* 'put-at-table-on' and the presence of durative marker in *zuo-zhe* 'sit-IMP' have made the subjects to be interpreted as specific or definite, instead of indefinite expressions. Existential *you* 'there-be' is therefore predicted to be incompatible with these definite expressions, hence predicting the sentence to be unacceptable.

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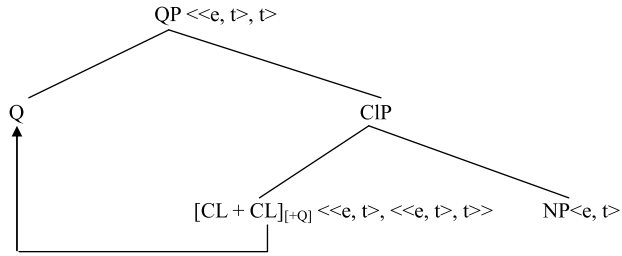
(12)



With tripartite structure of '[OP_{CL+CL}] [restrictor] [matrix]' triggered, [CL + CL] would take the quantifier type, namely <<e, t>, <<e, t>, t>>, which combines with an NP of type <e, t>, giving a quantifier of type <<e, t>, t>. Syntactically, for reduplication, Travis (2001, 2003) pointed out that phonological reduplication is achieved by the checking of a quantity feature on a reduplicative head through head movement. Without going into complicated syntactic structure, at this point, I will simply assume [CL + CL] as a single unit, with Cl(assifier)P projected. The syntax of (12) represents a simple version, which is derived based on two theoretical assumptions: (a) previous studies calling the Q position uniformly D position (see Matthewson 2001, Gillon 2008), with QP taken as DP; and (b) following Travis, when [CL + CL] is of a quantifier type, the quantity feature on the [CL + CL] head is checked through head movement. With these two assumptions put in place, with [CL + CL] bearing the quantity feature, the [Q] feature is checked through movement from [CL + CL] Head to the Q Head position of QP. Moreover, recall that proportional reading is possible only when [CL + CL] is licensed by [+topic] feature. If the Q position is called uniformly as a D position, the licensing of [CL + CL] by the [+topic] feature to give the proportional reading naturally follows. First, QP is projected due to the semantics of [CL + CL] as a quantifying determiner of the quantifier-type, which carries the [+Q] feature. Second, the [+topic] feature is to ensure that there exists a definite set satisfying the restrictor part of the tripartite structure.

Contrarily, in the case of [CL + CL] serving as a quantifying determiner of modifier type, [CL + CL] gives a reading like numerals. It is a NP-modifier, and to be more specific, a type-preserving modifier of type <<e, t>, <e, t>> which combines with a nominal argument of type <e, t>. Cardinal readings would be given under such a case. To account for the definite reading of [[CL + CL] + NP] in the topic position and the indefinite reading in the object position, the following structures are assumed:

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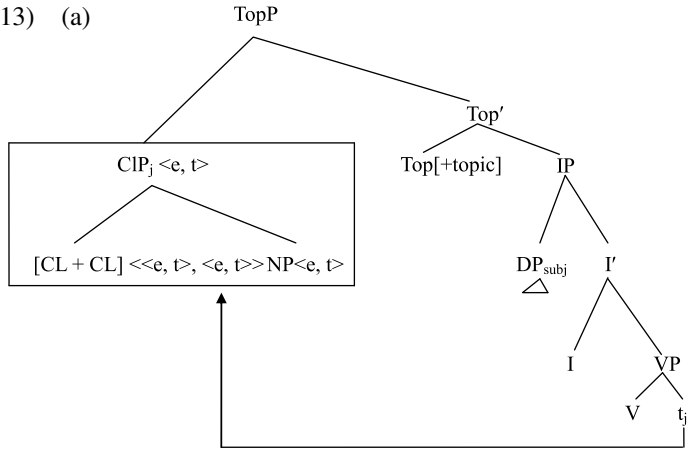
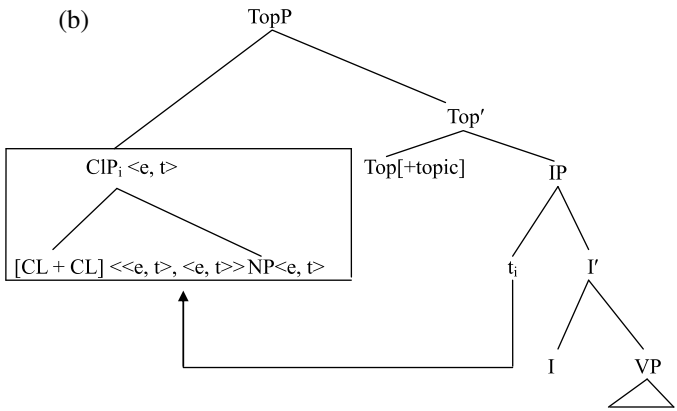
(13) (a)



(b)



According to an earlier proposal in Matthewson (2001), a DP is of type e. The structures in (13a) and (13b) are consistent with Etxeberria & Giannakidou's (2010, 2014) proposal of the definite determiner argued to be a type-preserving modifier and DP of type <e, t>. The diagram in (13a) represents a structure which the object ClP is topicalized, and (13b) a structure in which the subject ClP is moved to [Spec,Top(ic)P]. Regardless of whether it is (13a) or (13b), the ClP would give a definite reading through Spec–Head agreement with the [+topic] feature of the Top(ic) Head. Unlike (12), which involves a quantity feature, as the feature is a [+topic], the readings given in (13a) and (13b) are still cardinal readings. This is the case of a definite cardinal reading given by [CL + CL +NP] in (10) and (11) above.

On the other hand, (14) demonstrates the case where [[CL + CL] + NP] stays in-situ, with no topicalization, as in (9).

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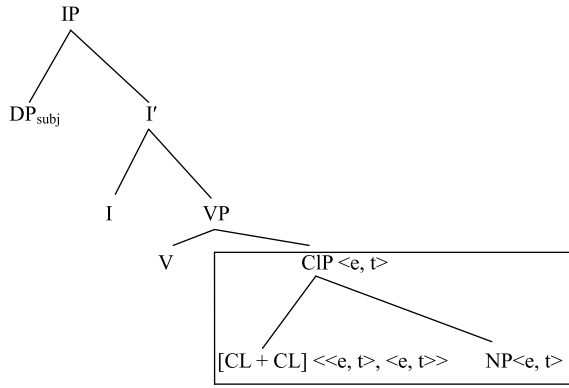
(14)



As no [+topic] feature is involved, [[CL + CL] +NP] would give an indefinite cardinal reading. The syntax is shown in (14), with [CL + CL] as an adjective on a par with English cardinal *many*. Regardless of whether it is (13) or (14), [CL + CL] functions as a type-preserving modifier of type <<e, t>, <e, t>>, which combines with a nominal argument of type <e, t>, giving '[CL + CL] + NP' a type of <e, t>. The only difference is whether it is licensed by the [+topic] feature, giving definite or indefinite reading.

Generalizing, without *dou1*, [[CL + CL] + NP] has its syntax ambiguous among (12), (13) and (14), with its quantifier-type and modifier-like readings derived accordingly. Table 1 summarizes the different readings.

Position of [[CL + CL] + NP]	Reading
Object position	Cardinal reading • indefinite reading of [[CL + CL] + NP] • [CL + CL] as modifier-type quantifying determiner
Topicalized position	Cardinal reading • definite reading of [[CL + CL] + NP] • [CL + CL] as modifier-type quantifying determiner Proportional reading • definite reading of [[CL + CL] + NP] • [CL + CL] as quantifier-type quantifying determiner

Table 1
A summary of different readings of [[CL + CL] + NP].

Table 1 shows the distribution of the 'many' readings given by [CL + CL]. The ambiguity of the 'many' readings of [CL + CL] can be attributed to the nature of quantifying determiner, which leads to the readings described in (8a)

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and (8b), which I will not repeat here (see Section 3.2). When [[CL + CL] + NP] is licensed by [+topic] feature in the topic position, it would demonstrate an ambiguity between the definite weak cardinal reading as described in (8a) and the proportional reading as described in (8b). On the other hand, the 'many' reading which has the [[CL + CL] + NP] in the object position, would convey an adjective-like reading. [[CL + CL] + NP] would be indefinite under such a case, due to the failure to be licensed by [+topic] feature. This gives an indefinite weak cardinal reading as described in (8a), accounting for the observation made in Steindl and others.

Before we end this section, a few points need to be briefly mentioned. First, along the line of Travis (2001, 2003), Yip (2015) assumes that classifier reduplication in Cantonese is a kind of phonological reduplication, and classifiers under such a case undergo movement from CL to D, hence resulting in a definite DP (see also Simpson 2005). Yip's analysis of classifier reduplication is close to the analysis proposed in this paper. However, it should be noted that Yip's analysis did not recognize the 'many' reading of [CL + CL] and focuses on [CL + CL] with the distributive quantifier *dou1*. Therefore, if we merely follow the assumption of definiteness of [CL + CL] coming from the CL-to-D movement, without recognizing the role of [+topic] feature, the indefinite 'many' reading of object [[CL + CL] + NP] would be coerced.

Second, rethink the seeming subject–object asymmetry stated in previous analyses like K. Yang (2004, 2015), N. Zhang (2013), namely that [[CL + CL] + NP] occurring in the object position would give the 'many' reading, whilst that occurring in the subject position would give the distributive reading. At this point, it is clear that the subject–object asymmetry does not exist. Cardinal 'many' reading is in fact possible in both subject and object positions, differing only in being definite or indefinite.

Third, at the beginning of Section 3, it is mentioned that Mandarin [CL + NP] is restricted to its occurrence in the object position, with indefinite reading only. If Mandarin has no definite [CL + NP], a related question is whether Mandarin has definite [[CL + CL] + NP]. Our stand is that nominal classifier [CL + CL] in Mandarin is acceptable, and if [[CL + CL] + NP] is licensed by a [+topic] feature, what we have shown in Cantonese would also apply in Mandarin. The underlying (parametric) difference between Mandarin and Cantonese is the productivity of reduplicative classifiers. This is a complicated question which the current analysis would fail to give a satisfactory answer.

4. [CL + CL_{dou1}]: A QUANTIFYING DETERMINER OF MODIFIER TYPE

As mentioned in Section 1, when reduplicative classifier occurs with *dou1* 'all', *dou1* holds a licensing relation with [CL + CL_{dou1}], with maximality guaranteed on the modified NP. I will argue that under such a case, while *dou1* serves as a distributive quantifier, [CL + CL_{dou1}], as a quantifying determiner, demonstrates its adjective-like characteristics, which serves as a modifier to regulate the

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quantification domain of *dou1*. However, before going into the semantics of [CL + CL_{dou1}], I would need to examine the distributive interpretation of *dou1*, which is an issue of controversy.

Distributivity is widely described as the meaning associated with *dou* 'all' in Mandarin, with limited studies on Cantonese *dou1* 'all', which is assumed to be equivalent to Mandarin *dou*. Therefore, this section will focus on Mandarin *dou*.

Consider the contrast between the following two sentences:

(15) (a) Tamen mai-**le** yi-liang che. (Mandarin)
they buy-PFV one-CL car
'They bought a car.'
(b) Tamen **dou** mai-le yi-liang che. (Mandarin)
they all buy-PFV one-CL car
'They all bought a car.'

While (15a) asserts that the entire group of people denoted by the subject NP collectively bought a car, the addition of *dou* 'all' in (15b) suggests that each of them bought a car of his own. In other words, *dou* 'all' provides a distributive reading. The meaning given by *dou* 'all' in (15b) has led previous studies, such as Lee (1986) and F-h. Liu (1990), to analyze *dou* as a distributive quantifier. Lin (1998) further argued that *dou* 'all' is the overt realization of the generalized distributive operator, which was proposed along the lines of Schwarzschild (1996). It is only if *dou* is taken as a generalized distributive operator (Part) that (16) can be accurately interpreted.

(16) Naxie ren **dou** shi fuqi. (Mandarin)
those people all be husband-and-wife
'Those people are all husbands and wives (couples).'
(Lin 1998: 227)

What *dou* 'all' does in (16) is to distribute pairs of people within the set. (16) yields the correct interpretation only if it is read under the formal definition of covers and plurality covers stated by Schwarzschild (1996: 69) as follows:

(17) (a) C is a plurality cover of A iff C covers A and no proper subset of C covers A.
(b) C covers A if:
1. C is a set of subsets of A
2. Every member of A belongs to some set in C
3. ∅ is not in Cov.

Drawing on (17), Lin (1998) argued that as a generalized distributive operator, *dou* 'all' quantifies over a set whose members are pairs to the plurality cover, accounting for the intermediate reading or the reading of subpluralities of (16).

Contrary to the quantificational analysis of *dou* 'all', recent studies such as Xiang (2008), Cheng (2009), Liao (2011) and M. Liu (2017) indicate that the

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basic semantics of *dou* 'all' is neither quantificational nor distributive. Among these studies, Cheng, in her very first paper (with Giannakidou, see Giannakidou & Cheng 2006), and later in Cheng (2009) analyzed *dou* 'all' as an external determiner that provides contextual domain restriction. This analysis explains the maximality reading of the *mei* . . . *dou* 'every . . . all' construction and by extension *dou* 'all' serving as a maximality operator (see also Xiang 2008). M. Liu (2017), a very recent study, adopts a unified analysis for *dou* 'all'. M. Liu (2017) proposes that *dou* 'all' is a focus particle, which has the semantics of English *even*, with distributive and collective readings arising from varieties of alternatives operating according to Rooth's (1985) alternative semantics. With such an assumption in place, M. Liu generalizes that distributive *dou* 'all' is a trivialized 'even' *dou* (or 'even'-less *dou* to use his term), which occurs only if *dou* (with stress on *dou*) is associated with a sum-based alternative set and distributive readings are analyzed by a covert distributive operator DIST on VP. As *dou* 'all' is 'even' *dou*, the 'even' presupposition of *dou* in a distributive context cannot possibly be met, unless the referent of *dou*'s associate is the maximal among its alternatives. This makes 'even'-less *dou* require maximality of *dou*'s associate, referred to as *DOU*'S MAXIMALITY EFFECT in M. Liu. Put it in another way, M. Liu's analysis of distributive *dou* 'all' is in line with or at least supports the maximality operator proposed in Xiang (2008) and Cheng (2009).

These accounts have provided comprehensive and sophisticated analyses to unify different readings of *dou*, which shed lights on its semantics. However, to account for the semantics of reduplicative classifiers, I will take an analysis of *dou1* which can better account for the 'many' reading and the distributive reading of reduplicative classifiers mentioned in Section 2. To start off, assuming *dou1* as a maximality operator or a focus particle would in one way or another be forced to claim that the [CL + CL] giving rise to the 'many' reading and the [CL + CL_{dou1}] giving rise to the so-called distributive reading are different. That is to say, with *dou1* assumed to be a determiner giving definiteness to its associate or as a maximality operator imposing maximality on its associate, [CL + CL] would at most be reduced to an operator imposing exhaustivity within the maximal set given by *dou1* on the NP. This cannot be the same as the [CL + CL] giving the 'many' reading to its modified NP. It would therefore be difficult to connect [CL + CL] with [CL + CL_{dou1}] and the two readings given by them, which is theoretically not attractive for any analyses of reduplicative classifiers.

On the other hand, along the line of Lee (1986), Liu (1990), Lin (1998) and others, if one assumes that distributivity comes from *dou* 'all' or Cantonese *dou1*, it would be possible to come up with an analysis of reduplicative classifier which is able to connect the two readings of reduplicative classifier. If *dou1* is the distributive quantifier, [CL + CL_{dou1}] cannot be a quantifier, and will be taken to be a modifier. This fits in what is assumed under the current analysis, namely that reduplicative classifier is a quantifying determiner, which is possible to demonstrate modifier-like characteristics. Therefore, the two readings of the reduplicative classifier can be connected by appealing to its dual role as a

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quantifier and as a modifier, which at the very least, has already been demonstrated in the ambiguity between cardinal 'many' and proportional 'many' in Section 3. The proposed account of [CL + CL_{dou1}] would then represent another realization of reduplicative classifier as a quantifying determiner of modifier type.

Additionally, to further support that distributivity comes from *dou1* all', consider one basic fact of reduplicative classifier given in (4) and (5) in Section 2 above. Steindl (2010) used (4a) and (4b) to argue for a plural reading of 'many' for reduplicative classifier and N. Zhang used (5b) to argue for a similar reading (see Section 2). Without the distributive quantifier *dou* 'all', (4a) and (4b) do not convey any distributive reading. Similarly, putting aside the issue whether [CL + CL] is a plural classifier or not, which I will come back to in Section 5, N. Zhang also pointed out that distributive reading of [CL + CL] can only be conveyed through the licensing of *dou* (see (5a)). Without *dou1*, the prenominal reduplicative classifier only gives a plural reading in (5b). This supports that distributivity cannot be coming from the prenominal reduplicative classifier, but from *dou1*, unless one still insists that [CL + CL] and [CL + CL_{dou1}] are different types of classifier reduplication. Finally, as shown in Section 3, plurality in fact come from the reduplicative classifier and definiteness from [CL + CL] licensed by [+topic] feature, making [[CL + CL_{dou1}] + NP] in fact not relying on *dou1* for definiteness and plurality.

In sum, since the current analysis focuses on reduplicative classifier, if the traditional view of *dou1* as a distributive quantifier would have the advantage of connecting the two readings of reduplicative classifier, and with additional facts supported, I would go along the traditional view of *dou1* as a distributive quantifier.

4.1 *Domain restriction and cover theory*

Section 3 has accounted for [CL + CL] without the presence of *dou1* 'all'. With the assumption of *dou1* as a distributive quantifier put into place, we can then examine the semantics of [CL + CL_{dou1}], which will be shown to be in line with what has been argued in Section 3.

To begin with, regardless of whether the distributive quantifier *dou1* exists or not, reduplicative classifiers remain as quantifying determiners. The semantics of reduplicative classifiers with *dou1* 'all' will be elaborated in Section 4.3. The basic idea is that [CL + CL_{dou1}], as a quantifying determiner, demonstrates non-quantificational characteristics and serves as a type-preserving modifier. It acts on its co-occurring NP, which allows *dou1*, as a distributive quantifier, to distribute over the nominal set denoted by the NP. Additionally, distributive quantification by *dou1* with and without [CL + CL_{dou1}] shows a difference in that the presence of [CL + CL_{dou1}] will give a maximizing reading to the associated NP under *dou1*'s distributive quantification. Based on theoretical assumptions regarding domain restriction and cover theory, I will argue that the role of [CL + CL_{dou1}] is to help partition or structure the contextually restricted domain of *dou1*'s distributive

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quantification, to ensure that it is over a good-fitting cover. This would result in a maximizing effect on the co-occurring NP, which is otherwise absent. All these would only be possible if one assumes that [CL + CL_{dou1}] assigns a value to a domain selection variable Cov relating to the restricted set, such that the distribution of *dou1* 'all' will not be down to the atoms, but to sub-pluralities of the plural NP via covers. It is also due to such a role of [CL + CL_{dou1}] that accounts for its obligatory licensing by a D-operator *dou1*.

As mentioned, the proposed analysis draws heavily on ideas introduced under the cover theory, so I will briefly review some of the important theoretical assumptions associated with domain restriction and cover theory. To start off, generalized quantifiers often presuppose the existence of a syntactic and semantic constituent comprising the quantificational element and a restrictive argument, with determiner quantifiers such as English *every*, *some*, *most*, denoting second-order relations between two sets. The first argument is the set denoted by the common noun phrase, and this set restricts the quantifier, or supplies the domain of quantification, hence restricted quantification. In an early treatment of plural quantifier phrases in a Montague grammar framework, Bennett (1974) proposed treating *many* and *few* as context-dependent cardinal quantifiers only, with a possibly different context allowed for different interpretations of cardinality. Von Fintel (1994) proposed that the domain of quantification is pragmatically constrained and that 'contextual restriction is captured by interpreting the determiner relative to a contextually supplied set which is intersected with the common noun argument' (von Fintel 1994: 30). Von Fintel called this set the RESOURCE DOMAIN; and Westerståhl (1984) referred to it as the CONTEXT SET.

A quantificational element is indexed with a new index C, the resource domain variable, which is supposed to evoke context and generally is the most salient resource domain. Later studies such as Stanley & Szabó (2000), Matthewson (2001), Martí (2002), Stanley (2002), Etxeberria (2004, 2009), Giannakidou (2004), Gillon (2008), Etxeberria & Giannakidou (2010, 2014) and many others follow a similar line in considering the domain of quantification to be restricted linguistically or by pragmatic information through contextual variables. However, it is generally acknowledged that domain restriction does not work on the internal structure of the set that restricts the set denoted by the NP, and that all it does is provide a set that is contextually restricted so that the quantifier quantifies over a contextually restricted set of whatever the NP denotes.

The idea of distributivity is later extended to distributing down to sub-pluralities, as illustrated in sentences like (18).

(18) The men are hitting each other.

(Fiengo & Lasnik 1973: 452)

Fiengo & Lasnik (1973) stated that (18) might be considered true even if the reciprocity brought by *each other* holds within subpluralities of the plurality denoted by *the men*, giving the intermediate reading of distributivity. The concept

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of subpluralities then led to the interpretive principle of partition within the pluralities, which is a kind of cover. Following Higginbotham (1981), Schwarzschild (1996) proposes that the D-operator (which he calls PART, for partition) is always accompanied by a context-dependent domain selection variable, which he calls Cov, because the value assigned to the variable takes the form of a COVER of the universe of discourse. The formal definitions for covers and plurality covers by Schwarzschild have been given, and I will not repeat here (see (17) in Section 4).

Brisson (1998, 2003) also drew on Schwarzschild's cover concept, proposing to distinguish good-fitting covers from ill-fitting ones, based on her analysis of English *all* and plural noun phrases. Brisson observed that speakers may allow exceptions to (19a), but they will not do so for (19b). Both examples are cited from Brisson (2003: 130).

(19) (a) The girls jumped in the lake.
(b) **All** the girls gathered in the hallway.

A maximizing effect is given by *all* to *the girls* in (19b), which is absent in (19a).

To account for the maximizing effect, Brisson defines a GOOD FIT relation between a cover and a definite DP denotation (i.e. a set): 'the cover is a good fit if every element of the set is in a cell of the cover that is a subset of that set' (Brisson 2003: 141). This is formally defined as follows:

(20) *Good fit*
For some cover of the universe of discourse Cov and some DP denotation X, Cov is a good fit with respect to X iff $\forall y[y \in X \rightarrow \exists Z[Z \in Cov \ \& \ y \in Z \ \& \ Z \subseteq X]]$

(Brisson 2003: 141)

The function of *all* is to ensure that the value assigned to Cov is a good fit with respect to the subject DP, hence eliminating ill-fitting covers and making sure that a good-fitting cover is given to the sentence. This accounts for the maximizing effect observed in (19b) with *all* but not in (19a).

4.2 *Maximizing effect and prenominal* [CL + CL_{dou1}]

With the help of cover theory and good-fitting cover, I will now propose an analysis to account for the occurrence of prenominal reduplicative classifiers with the distributive quantifier *dou1* 'all'.

To start off, consider (21) below. The prenominal [CL + CL_{dou1}] *zou2-zou2* 'CL-CL' in (21) relies on the presence of *dou1* 'all', or the sentence will be unacceptable.

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(21) **Zou2-zou2** (hok6saang1) ***(dou1)** waa4-zo2 jat1-fuk1 waa2.
CL-CL student all draw-PFV one-CL picture

(a) *(bat1gwo3 jau6 jat1-zou2 mou2). (Cantonese)
but have one-group NEG
'All the groups have collaborated on a picture(, *but one group has not done so).'

(b) (bat1gwo3 m4 hai6 cyun4bou6 hok6saang1 dou1 waa4-zo2,
but NEG be all students all draw-PFV
jau6di1 jap6-m4-dou2 zou2). (Cantonese)
have.some enter-NEG-arrive group
'All the groups have collaborated on a picture(, but not all students have done the drawing, as some of them failed to get into any groups).'

What I want to show here is that (21) requires all the groups to have collaborated on a picture. (21b) allows for cases in which there are students who were not in any groups and therefore did not participate in the collaboration. (21) suggests that although the NP *hok6saang1* 'students' denotes a plural set of students, with the presence of *zou2-zou2* 'CL-CL', *hok6saang1* is divided in different cells, i.e. they are considered as groups, not individuals. Therefore, *dou1* 'all' in (21) does not distribute over individual students within the plural set, but only over groups of students. This is only possible if it is assumed that the domain of *dou1*-quantification has been restricted by the prenominal reduplicative classifier *zou2-zou2* 'CL-CL', which assigns the plurality cover of the distributive quantifier *dou1* to a set whose members are groups. Therefore, the restriction on the NP *hok6saang1* 'students' by *zou2-zou2* 'CL-CL' allows for exceptions for students, but not for groups, as shown by the acceptability of (21b), but not (21a).

To account for this, we need to spell out clearly what a 'maximizing effect' is. It can be understood clearly through the contrast illustrated in (22), between [[CL + CL_{dou1}] + NP] and [CL_{PL} + NP] (i.e. NP with the plural classifier CL_{PL}).

(22) (a) **Go3-go3** hok6saang1 **dou1** gaau1-zo2 gung1fo3,
CL-CL student all submit-PFV assignment
(*bat1gwo3 jau6 jat1-go3 mou5-gaau1). (Cantonese)
but have one-CL NEG-submit
'All the students have submitted their assignments(, *but one has not done so).'

(b) **Di1-hok6saang1/hok6saang1 dou1** gaau1-zo2 gung1fo3,
CL_{pl}-student/students all submit-PFV assignment
(bat1gwo3 jau6 jat1-go3 mou5-gaau1). (Cantonese)
but have one-CL NEG-submit
'Every student has submitted his assignment(, but one has not done so/except for one who has not done so).'

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The NP *hok6saang1* 'students' is modified by the prenominal reduplicative classifiers *go3-go3* 'CL-CL' in (22a) and by the plural classifier *di1* in (22b), with both distributively quantified by *dou1* 'all'. However, *di1-hok6saang1* 'CL_{PL}-student' in (22b) allows for or at least is more natural regarding exceptions among the students, and the same reading is found when *di1-hok6saang1* is replaced by the bare plural *hok6saang1* 'students'. In contrary, a maximizing effect is found in *go3-go3-hok6saang1* 'CL-CL-student' in (22a), meaning that speakers would not allow any students to fail to satisfy the condition stated by the predicate in the first clause. (22a) and (22b) only differ in the use of the prenominal reduplicative classifier and the plural classifier. (22) clearly shows that the maximizing effect over the subject NP of (22a) can only be contributed by the prenominal reduplicative classifier, not by *dou1* 'all', which is present in both sentences. If *dou1* is assumed to be a maximality operator, (22a) and (22b) should result in the same reading in terms of the maximizing effect stated, contrary to what we see. Therefore, there are grounds to claim that the distributive interpretation of the subject NP comes from *dou1* 'all', making *dou1* 'all' quantificational. And it is only when the subject NP is modified by the prenominal [CL + CL_{dou1}] that no exceptions are allowed, making prenominal [CL + CL_{dou1}] more likely to be the item contributing the maximizing effect.

Moreover, for *dou1* to perform distributive quantification, its associated NP must denote a closed set, hence the need for the associated NPs to be definite plurals. A related issue here is that if *dou1* is a distributive quantifier, definiteness cannot be coming from *dou1*. Along the lines of Section 3, while it is clear that [CL + CL_{dou1}], as a quantifying determiner, gives plurality to the common noun, the definiteness effect of [[CL + CL_{dou1}] + NP] can be satisfied by having it licensed by [+topic] feature. (23) illustrates that distributive quantification of *dou1* can reach up to topic position.

(23) **Saang1gwo2** ngo5 **dou1** zung1ji3 sik1 ge3. (Cantonese)
fruits I all like eat SFP
'As for fruits, I like them all.'

This example shows that when the object *saang1gwo2* 'fruits' is preposed to the topic position, *dou 1* can quantify over it to give a universal reading. If this is true, there are grounds to conclude the following: licensed by the [+topic] feature, [CL + CL_{dou1}] gives the modified NP a definite reading, making [[CL + CL_{dou1}] +NP] on a par with English definite plurals.

4.3 [CL + CL_{dou1}] *as a domain regulator*

On the basis of Section 4.2, the following three semantic properties of [[CL + CL_{dou1}] + NP] can be identified:

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(i) [[CL + CL_{dou1}] + NP] denotes definiteness and plurality, meaning that [[CL + CL_{dou1}] + NP] can serve as definite plurals for *dou1* 'all' to perform distributive quantification.

(ii) Prenominal [CL + CL_{dou1}] does not serve as a distributive quantifier, which explains why it can co-occur with the distributive quantifier *dou1* 'all' without violating the PROHIBITION AGAINST VACUOUS BINDING (see de Swart 1993). When the prenominal reduplicative classifier is licensed by *dou1*, distributivity in fact comes from *dou1*. This is what gives [[CL + CL_{dou1}] + NP] the distributive reading as claimed previously.

(iii) A maximizing effect is imposed on the nominal if it is modified by the reduplicative classifier [CL + CL_{dou1}], which is otherwise absent.

The first two properties naturally follow if one assumes that prenominal [CL + CL_{dou1}] is a quantifying determiner. First, for (i), the property of [[CL + CL_{dou1}] + NP] denoting definiteness and plurality in fact comes from reduplicative classifiers as a quantifying determiner, which has been pointed out in Section 4.2. Second, without *dou1*, as argued in Section 3, as a quantifying determiner, [CL + CL] modifies the nominal, giving [[CL + CL] + NP] the 'many' NP reading. Therefore, distributivity must be coming from *dou1* not the reduplicative classifiers, hence Property (ii).

Property (iii) leads us to argue that [CL + CL_{dou1}] is a quantifying determiner that operates on a definite plural to ensure a maximizing effect on distributive quantification by *dou1*. The maximizing effect on the NP is achieved through assuming the presence of cells or covers within the contextually restricted quantification domain (see Section 4.1 above) and its licensing by a D-operator *dou1*, so as to guarantee a maximal collection of the plural set. I will hypothesize that this can be done through ensuring that the value assigned to Cov is a good fit. As given in (13a, b) and (14), when [CL + CL] serves modifier-type quantifying determiner, it is ambiguous between a determiner (see (13a, b)) and an adjective (see (14)). Owing to the Leftness Condition of *dou1* (see Lee 1986, Liu 1990), quantification by *dou1* is generally to the left NP. Therefore, when licensed by *dou1*, the syntax given earlier in (13b) applies, and is adapted as (13b′) to include *dou1* 'all', assumed to be an adverb.

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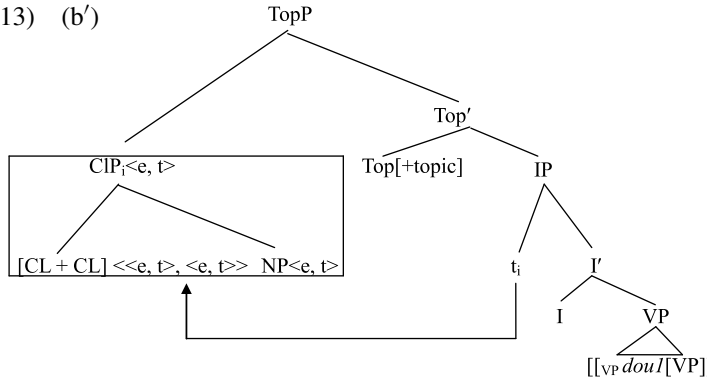
(13) (b′)



When *dou1* is present, as a distributive quantifier, it requires its associated NP be D-linked to a finite set for distributive quantification. The syntax in (13b′) suggests that licensed by [+topic] feature, [[CL + CL$_{dou1}$] + NP] is definite, giving the domain for *dou1* to perform distributive quantification. The [CL + CL$_{dou1}$] is taken to be a type-preserving modifier, modifying the NP of type <e, t>, resulting in the ClP of type <e, t>.

To account for the maximizing effect on the NP, I will adopt Brisson's (2003) definition of a good-fitting cover, as already given in (20) above. Brisson's definition of a good-fitting cover works further on the cover assignment to ensure that the value assigned to Cov includes a maximal number of individuals. Those covers that fail to include a maximal number are considered ill-fitting covers and will be eliminated and not be assigned to Cov. As [CL + CL$_{dou1}$] functions as a modifier type of quantifying determiner through modification on the NP, [CL+CL$_{dou1}$] ensures a good-fitting cover to the NP.

Assuming (13b′) and (20), the distributive quantification of *dou1* under Cov is as in (24).

(24) (Dou1(P))((CL-CL$_{dou1}$)(X)) = 1 iff {y: y ∈ X & ∃Z[Z ∈ Cov & y ∈ Z & Z ⊆ X]} ⊆ P,
where X is the denotation of NP$_{plural}$ and Cov is the context-dependent domain selection variable determining the plurality cover of X.
(adapted from Brisson 2003: 141)

The denotation of NP$_{plural}$ is a set of singularities based on the universe of discourse with a set of possible covers Cov as defined by Schwarzschild (1996). [CL + CL$_{dou1}$] serves to ensure that the value assigned to Cov is a good fit with respect to the definite plural, through structuring the contextually restricted quantification domain denoted by the plural set X. The structuring is to ensure that every member y of X belongs to some set Z in the plurality cover Cov of X. Therefore,

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[CL + CL_{dou1}] can be considered to be a DOMAIN REGULATOR[6] that acts further on the contextually restricted domain by eliminating ill-fitting covers or making good-fitting covers more salient, to create a maximizing effect on Cov.

To make the role of [CL + CL_{dou1}] explicit, contrast (24) with (25).

(25) (Dou1(P))(X) = 1 iff {y: y ∈ X & C} ⊆ P, where X is the denotation of NP_{plural} and C is a contextual variable.

(25) is a preliminary translation of *dou1* 'all' taken as a distributive quantifier.[7] Without the presence of [CL+ CL_{dou1}], the plural set X denoted by the NP_{plural} is operated by the resource domain variable C (to use von Fintel's term), which would restrict the set such that it denotes a specific and contextually relevant set of individuals. The main difference between (25) and (24) is that without the domain selection variable Cov, *dou1* distributes over to members of the set of singularities denoted by NP_{plural}, which may simply be an unstructured set in the contextually restricted quantification domain. In that case, *dou1* 'all' may not always trigger a maximizing effect, with the possibility of non-maximality conveyed via pragmatic weakening and exception is allowed, as shown in the contrast between (22a) and (22b) above.

To illustrate how this works, consider (26).

(26) (a) Keoi5dei1 jau6 sei3-go3 zai2 loeng5-go3 neoi5,
they have four-CL sons two-CL daughters
di1-zai2 dou1 ci5 lou5dau6,
CL_{pl}-son all look-like father
(bat1gwo3 sai1-zai2 ci5 aa2maa1). (Cantonese)
but the-youngest-son look-like mother
'They have four sons and two daughters. The sons look like the father(, except for the youngest one, who looks like the mother instead).'

[6] Tomioka & Tsai (2005) used a similar term in their study of Mandarin *quan* 'all' in the *quan-dou* 'all-all' construction, and they also took *quan* in *quan-dou* to be neither distributive nor quantificational. The current analysis of classifier reduplication follows a line of argument similar to Tomioka & Tsai's, with the distinction between a DOMAIN REGULATOR and a DOMAIN RESTRICTOR further highlighted. As will be mentioned later, [CL + CL_{dou1}] relies on Cov, which regulates the quantification domain by giving a structured set (domain regulator), whilst a domain restrictor relies on a contextual variable C, which only serves to give a contextually restricted but unstructured set.

[7] The author would like to thank Paul Law for the useful discussion on the topic. The author takes the sole responsibility for any potential errors that may arise.

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(b) Keoi5dei1 jau6 sei3-go3 zai2 loeng5-go3 neoi5,
they have four-CL sons two-CL daughters
go3-go3 zai2 **dou1** ci5 lou5dau6,
CL-CL son all look-like father
(*bat1gwo3 sai1-zai2 ci5 aa2maa1). (Cantonese)
but the-youngest-son look-like mother
'They have four sons and two daughters. All the sons look like the father(, *but the youngest one looks like the mother instead).'

In (26a), assume that *John* is the father, the four sons are *Peter*, *Sam*, *Richard* and *Tom*, and the universe of discourse is U in (27b). *Dou1* 'all' will distribute the property of 'looking-like John' over the definite plural *zai2* 'sons'. (26b) is translated as in (27a), with the possible covers I, M, N, R given in (27b), and (27b) is interpreted as in (27c). (Example (27d) will be discussed below.)

(27) (a) (Dou1(look.like.the.father′))((Cov)(the.sons′))
(b) U = {a, b, p, s, r, t. . . }
[|the_sons′|] = {p, s, r, t},
where p is *Peter*, s is *Sam*, r is *Richard* and t is *Tom*.
I: {{p}, {s}, {r}, {t}, {a, b}}
M: {{p}, {s}, {t}, {r, a, b}}
N: {{p, s, r, t}, {a, b}}
R: {{p, s}, {r, t, a}}
(c) ∀x [x ∈ [|Cov|] & x ⊆ [|the.sons′|] → x ∈ [|look.like.the.father′|],
where Cov is a context-dependent domain selection variable depending on the value assigned to a contextual domain variable C.
(d) ∀x [|x ∈ [|the.sons′|] & C|] → x ∈ [|look.like.the.father′|]],
where C is the resource domain variable

Without the prenominal [CL + CL_{dou1}], the contextual variable in (25) can be considered as the resource domain variable C (to use von Fintel's term). This would restrict the set such that the plural set X denoted by the NP_{plural} denotes a specific and contextually relevant set of individuals, including the four sons, e.g. {a, b, c, d, p, s, r, t}. If the analysis so far is correct, without the prenominal [CL + CL_{dou1}], (26a) is interpreted as in (27d), seen above.

(27d) has the resource domain variable C operating on a set like {a, b, c, d, p, s, r, t} to reduce the plural set X denoted by the NP_{plural} into a more specific, contextually relevant set {p, s, r, t}, with an unstructured set of singularities of the four sons. I, M, N and R involve cover assignment and would not be for (26a), which would need the domain selection variable Cov, not C. Without Cov to structure the set, non-maximality or exception is allowed in the distributivity of *dou1* to the unstructured set of contextually relevant entities, as evidenced by the naturalness of (26a), with the final phrase 'except for the youngest one, who looks like the mother instead' suggesting exception. *Dou1* would simply distribute

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over the unstructured set, with the possibility of exceptions or non-maximality conveyed via pragmatic weakening.

In (26b), by contrast, with the inclusion of the prenominal reduplicative classifier *go3-go3*, the domain selection variable Cov is introduced. [CL + CL_{dou1}] now operates on the plural set X denoted by the NP_{plural} to ensure that the value assigned to Cov is a good fit with respect to the subject NP. The value-assignment of Cov is determined by the context and the semantics of the predicate, with Cov being the context-dependent variable that is associated with the distributive quantifier *dou1*, and the role of the contextual domain variable C minimized here (see Brisson 1998).

With the predicate being 'looking like the father', to ensure a good-fitting cover that allows a distributive reading, the value given to Cov will be I {{p}, {s}, {r}, {t}, {a, b}}, and x must be a member of the covers assigned to the variable Cov ($x \in$ [|Cov|]) and a subset of [|the sons|] ($x \subseteq$ [|the.sons′|]), as given in (27c). *Dou1* 'all' then distributes the property denoted by the predicate 'looking like the father' over the plurality cover which consists of four singleton sets, guaranteeing a maximal collection, as evidenced by the oddness of (26b) with the final clause suggesting exception. Along the line of Brisson (1998), since {a, b} is not a subset of the set [|the.sons′|], there is no question of whether it will make (26b) true or not, so it can be eliminated. As p, s, r, t fall into four singleton cells, the union of the four sets of cells is equivalent to the set of sons, and Cov I constitutes a good-fitting cover.

In the case of (27b), M, N and R would not be good-fitting covers, for different reasons. For M, r (Richard) is in the same cell with a and b, who are not sons of the father (John), and the set {r, a, b} is not a subset of [|the.sons′|], the set {p, s, r, t}. As there is no cell containing *Richard* that satisfies the restriction of the quantifier stated in (27c), (27b) may be true whether *Richard* looks like his father or not, which does not meet the maximality requirement of the quantified NP. For N, because the cover is a single-cell plurality cover {{p, s, r, t}}, it can only be a good-fitting cover if it gives a collective reading to (26b). This is eliminated by the semantics of the predicate 'look-like-the father', which needs a distributive reading. For R, the problem is similar to the problem with M: r (Richard) and t (Thomas) are in another set, {r, t, a}, which is not a subset of the set of [|the.sons|]. There is no cell containing r and t that satisfies the requirement of [CL + CL_{dou1}].

Now, contrast (26) with (28), which involves a slightly different predicate. In (28), again assume that *John* is the father, the four sons are *Peter*, *Sam*, *Richard* and *Tom*, and the universe of discourse is U in (29b). *Dou1* 'all' will distribute the property of 'looking-like' over a plurality cover of {x, y}. (28) is translated as in (29a), with the possible covers I, M, N, R given in (29b), and (28) is interpreted as in (29c).

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(28) Keoi5dei1 jau6 sei3-go3 zai2 loeng5-go3 neoi5,
they have four-CL sons two-CL daughters
go3-go3 zai2 *(**dou1**) saang1-dak1 hou2-ci5 (daai6-gaa1),
CL-CL son all look-DES very-like each-other
(*bat1gwo3 jau6 jat1-go3 jyun4cyun4 m4-ci5). (Cantonese)
but have one-CL completely NEG-alike
'They have four sons and two daughters. All the sons look like each other(, *but one does not look like [the others]).'

(29) (a) (Dou1(look.like′))((Cov)(the.son′, the.son′))
(b) U = {m, j, p, s, r, t. . .}
[|the_sons′|] = {p, s, r, t},
where p is *Peter*, s is *Sam*, r is *Richard* and t is *Tom*.
I: {{p}, {s}, {r}, {t}, {m}, {j}}
M: {{p, s}, {p, r}, {p, t}, {s, r}, {s, t}, {r, t}}
N: {{p, s}, {p, r}, {p, t}, {s, r}, {s, t}, {r, m}, {s, j}}
R: {{p, s}, {p, r}, {p, t}, {s, r}, {s, t}, {r, t},{p, p}, {s, s}, {r, r}, {t, t }}
(c) ∀x,y [x,y ∈ [|Cov|] & x,y ⊆ [|the.son, the.son|] → <x,y> ∈ [|look.like′|],
where Cov is the context-dependent domain selection variable.

Unlike (26), (28) has the predicate being 'look like (each other)', with (28) translated as (29a) and interpreted as (29c). Although 'look like' has a distributive reading, *dou1* 'all' cannot distribute over the atomic individuals of the plural set {{p}, {s}, {r}, {t}}, as in (26). With (28) interpreted to contain a covert *daai6-gaa1* 'each-other', the predicate requires that distributivity goes down to the level of subpluralities, with distributivity over a pair of individuals. Consider the possible covers I, M, N, R given in (29b). The cover I therefore cannot be assigned to Cov in (29c).

For the cover N, assume that m is *Mary* and j is *Janet*, the two daughters of the father. (28) only concerns the four sons. Within the set of the four sons, it does not include the two daughters. If r (Richard) and s (Sam) form a cell with the daughters m and j, {r, m} and {s, j} cannot be subsets of the set {p, s, r, t}. Since {r, m} and {s, j} fail to satisfy the quantifier restriction stated in (29c), to ensure a maximal collection of individual pairs, the cover N would not be assigned to be the value of Cov in (29c).

R cannot serve as a cover for Cov, either. With (28) interpreted to contain a covert *daai6-gaa1* 'each-other', to ensure that every set is a subset of the plurality cover Cov, subsets in which x and y have the same value cannot be considered to be proper subsets <x, y> generated from the set {p, s, r, t}. Therefore, R cannot be assigned to Cov. The distributive quantifier *dou1* 'all' then distributes the property 'looking like' denoted by the predicate over to the six-cell plurality cover of {x, y} with x≠y, i.e. M. The interpretation given in (29c) will ensure a maximal collection of individual pairs, deriving the maximizing reading of all four sons

looking like each other, as evidenced by the oddness of adding the clause which suggests exception.

We can see that the presence of [CL + CL_{dou1}] rules out the possibility of pragmatic weakening by assigning a value to the context-dependent domain selection variable Cov, which ensures a good-fitting cover. Without [CL + CL_{dou1}], quantification by *dou1* 'all' alone, as in (26a), would allow the possibility of pragmatic weakening. The reason is that as the function of C is merely to reduce the plural set X denoted by the NP_{plural} into a more specific, contextually relevant set, as represented in (27d), without structuring that set into different cells for maximality via covers assigned by Cov. Moreover, in line with Brisson, among good-fitting covers, a distinction should be made between those that give a distributive reading and those that give a collective reading, which is determined by the predicate, as mentioned in (26b) and (28).

Generalizing from what we have so far, there are grounds to analyze the prenominal reduplicative classifier as a quantifying determiner. Without *dou1* 'all', [CL + CL] is a weak quantifier on a par with English *many* and is presuppositional only in proportional reading, which is given by the tripartite structure triggered. When *dou1* is present, *dou1*, as a distributive quantifier, requires its associated NP be D-linked to the closed set for *dou1* to perform distributive quantification. [CL + CL_{dou1}] would serve as a modifier-type determiner that helps regulate the quantification domain of *dou1* 'all'. It performs a type-preserving function by taking its co-occurring nominal argument of the predicate type <e, t> and returning it a predicative argument of type <e, t>, which allows *dou1*, as a distributive quantifier, to operate on it. The maximizing effect in fact comes from the reduplicative classifier [CL + CL_{dou1}], which helps to regulate the context-dependent quantification domain of *dou1* via covers. The presence of the prenominal reduplicative classifier ensures the plurality cover denoted by the nominal argument is a good-fitting one.

5. [CL + CL_{dou1}] VS. PLURAL CLASSIFIER AND [*mui5 . . . dou1*]

As mentioned in Section 2, [CL + CL_{dou1}] has been argued to be a plural marker, as in N. Zhang (2013), or to give rise to a reading on a par with English *every*/*each* or Chinese *mei* 'every', as in, for example, Cheng (2009), Zhang & Tang (2013, 2018). Before concluding the paper, I will argue that [CL + CL_{dou1}] cannot be a plural classifier, and cannot be entirely analogous to Cantonese [*mui5 . . . dou1*] '[every . . . all]', either.

5.1 [CL + CL_{dou1}] *cannot be a plural classifier or marker*

Despite the fact that plurality does come from the reduplicative classifier, I will argue that prenominal [CL + CL_{dou1}] cannot be the plural classifier in the way as claimed in N. Zhang, as it is by nature a quantifying determiner. Relying on *dou1* to be a distributive quantifier, [CL + CL_{dou1}] serves to regulate the restricted

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quantification domain, with a maximizing effect found on the modified NP. Such an effect is not found in plural classifiers or markers, of which their presence does not rely on any quantifiers.

To further show the difference between [CL + CL_{dou1}] and a genuine plural classifier, I appeal to the Cantonese prefix *di1-*, which is widely taken to serve the same function as the Mandarin plural suffix *-men*. Both are attached to the noun to mark plurality, hence plural markers.

Consider (30).

(30) (a) **Di1**-hok6saang1 **go3-go3 dou1** gaau1-zo2 gung1fo3,
CL_{pl}-student CL-CL all submit-PFV assignment
(*bat1gwo3 jau6 jat1-go3 mou5-gaau1). (Cantonese)
but have one-CL NEG-submit
'All the students have submitted their assignments(, *but one has not done so).'

(b) **Di1-**hok6saang1 **dou1** gaau1-zo2 gung1fo3,
CL_{pl}-student all submit-PFV assignment
(bat1gwo3 jau6 jat1-go3 mou5-gaau1). (Cantonese)
but have one-CL NEG-submit
'Every student has submitted his assignment(, except one/but one has not done so).'

The example in (30a) shows the co-occurrence of *di1-* and the reduplicative classifier *go3-go3* 'CL-CL' with *dou1* 'all'. If one assumes that [CL + CL_{dou1}] is a pure plural classifier or a plural marker, without differentiating the two, we have a problem because the co-occurrence of *di1-* and *go3-go3* 'CL-CL' in (30a) would mean that we have two plural markers operating on the same NP, *hok6saang1* 'students'. However, their co-occurrence can be adequately accounted for if we assume that *di1-* is the plural marker, and *go3-go3* 'CL-CL', as a domain regulator, regulates the domain of [*di1-hok6saang1*]. [CL + CL_{dou1}] takes scope over [*di1-*NP] to give ClP, and the ClP would then move to the [Spec,TopP] to allow it to be licensed by the [+topic] feature of Top(ic) Head. *Dou1* would then perform distributive quantification over the ClP in the topic position.

Although plurality and definiteness can be regarded to be coming from [CL + CL_{dou1}], (30a) and (30b) clearly show that [CL + CL_{dou1}] cannot be a simple plural classifier. While a maximizing reading is found in (30a), it is absent in (30b), with the only difference lying on the presence of [CL + CL_{dou1}] in the former but not in the latter. In N. Zhang's analysis, reduplicative classifiers are considered to be reduplicative unit words, expressing unit-plurality. However, the analysis of reduplicative classifiers as counting units cannot explain the maximizing effect found in (30a), as plural markers only express plurality and do not impose maximality on the nominal they modify. The only counter-argument would be that the maximizing reading in fact comes from *dou1* 'all', but this

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would again lead us back to two basic questions. First, if *dou1* 'all' already gives a maximal reading to the sentence, what is the role of [CL + CL_{dou1}]? Second, if both Cantonese *di1-* and [CL + CL_{dou1}] are plural markers or classifiers, why is it that [CL + CL_{dou1}] is licensed by *dou1* for maximality, but non-maximality is found in Cantonese *di1-* with *dou1*?

In sum, although definiteness and plurality may be coming from the reduplicative classifier, [CL + CL_{dou1}] cannot be taken as a pure plural classifier or marker, without recognizing its role as a domain regulator (see Section 4.3). It is [CL + CL_{dou1}] as a domain regulator that makes its basic semantics different from that of plural classifiers or plural markers.

5.2 [CL + CL_{dou1}] *vs.* [*mui5 . . . dou1*]

Cheng (2009) stated that '[classifier] reduplication yields an interpretation comparable to *mei* and the presence of *dou* is obligatory' (Cheng 2009: 69). In this section, I will show that [CL + CL_{dou1}] cannot be semantically equivalent to [*mui5 . . . dou1*] '[every . . . all]'. As previous analyses generally are on Mandarin *mei* 'every', with Cantonese *mui5* 'every' assumed to be equivalent, I will start with a brief review of some previous analyses of Mandarin *mei*.

5.2.1 *Previous studies of Mandarin* mei *'every'*

To account for the co-occurrence of *mei* 'every' with *dou* 'all', Cheng (2009) assumes that *mei* provides a universal force introducing sets of individuals for the maximality operator *dou* 'all' to operate on. Similar analyses which assume the quantificational force comes from *mei* 'every' not *dou* 'all' in the [*mei . . . dou*] construction are also found in Huang (1996) and R. Yang (2001). Huang stated that '*mei* is a Skolemized universal quantifier and it requires a lexically overt variable within its scope to license this Skolemized quantification. *Dou* is a sum operator over events' (Huang 1996: 39).[8] R. Yang proposed that *mei* 'every' is a universal quantifier, which is said 'to denote the functional from a property P to a generalized quantifier introducing the maximal sum individual X such that its atomic part each has the property P and the sum X is contained in the set of

[8] Representation given in Huang (1996) is shown below:

(i) EVERY (P, f(P)) is true iff for every $P' \subseteq P$, P' is a subset of $f(P')$, where f(P) is constructed from P by a total skolem functional.
(Huang 1996: 25)

(ii) {x: DOU Pred (x)} = {x: AT(Pred(x, e)) and DOU(e, Pred)}, where DOU(e, Pred) is true iff e is an event of minimum size consistent with the semantics of Pred.
(Huang 1996: 39)

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Q-denoting individuals' (R. Yang 2001: 93).[9] Analyses like those of Huang, R. Yang and Cheng basically consider that in the [*mei* . . . *dou*] construction, the universal quantificational force comes from *mei* 'every', not *dou* 'all'.

Lin (1998) proposed a slightly different analysis of *mei* 'every'. Lin assumes that *mei* 'every' denotes a function which takes a predicate of type <e, t> as its argument and returns the maximal collection of the individuals denoted by the predicate. That is, instead of assuming *mei* 'every' to be of type <<e, t>, <<e, t>, t>>, the semantic type of *mei* 'every' is assumed to be <<e, t>, e>.[10] Under such an assumption, the universal interpretation of *mei* 'every' will be coming from its role as a functor generating a union set of the individuals. However, Luo (2011) pointed out that 'in Lin's analysis, *mei* "every" is in fact taken to be a determiner, not a quantifier, as *mei* "every" is analyzed as an operator of type <<e, t>, e>, rather than the quantifier type of <<e, t>, <<e, t>, t>>. If one adopts Lin's semantics, [*mei*-CL-NP] would denote a plural individual forming the distributable domain for *dou* and is distributively quantified by *dou*' (Luo 2011: 118). Lin's analysis may to a certain extent avoid the problem of assuming both *mei* 'every' and *dou* 'all' are distributive or universal quantifiers, but at the same time, as stated by Luo, empirical problems arise if *mei* 'every' is assumed to be not inherently distributive. As Huang (1996) notes, *mei* 'every' can occur alone without *dou* 'all', when the object is an indefinite NP. In such a case, Lin's claim that *mei* 'every' lacks distributive force encounters problems.

The fact that *mei* 'every' can occur alone without *dou* 'all' when the object is an indefinite NP makes it impossible to deny the quantifier role of *mei* 'every'. Therefore, to compare *mui5* 'every' with [CL + CL_{dou1}], I will adopt the assumption that *mui5* 'every' is a quantifier that is the source of the distributive force in the [*mui5* . . . *dou1*] construction.[11] With such an assumption in place, let us move on to compare [*mui5* . . . *dou1*] construction with [[CL + CL] . . . *dou1*].

5.2.2 *Non-maximality and* [*mui5* . . . *dou1*]

If the claim that prenominal [CL + CL_{dou1}] serves to regulate domain restriction via covers stands, one would predict that it cannot be the same as *mui5* 'every'. This is in contrary to the analogy between reduplicative classifiers and *mei* drawn

[9] Representation given by R. Yang (2001) is shown below:

(i) $[|\text{meil}|] = \lambda P \lambda Q(\exists X(\forall x(x \in X \leftrightarrow P(x)) \wedge Q(x)))$

(R. Yang 2001: 93)

[10] Representation of *mei* given by Lin (1998) is shown below.

(i) $\|\textbf{mei}\|$ = that function f such that for all $P \in D_{<e, t>}$, $f(P) = \cup\|P\|$

(Lin 1998: 238)

[11] This paper does not intend to examine the semantics of *mei* 'every'. Therefore, I simply adopt previous analyses of *mei*, which take *mei* or *mui5* to be quantificational or distributive, on a par with English *every*.

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previously, as the former, serves as a modifier under such a case, while the latter is a distributive quantifier. This is what I will argue in this section.

Previous analyses have generally assumed D(eterminer)-quantifier *mei* 'every' to be on a par with English *every*. The sentences below reveal that neither *mei* nor prenominal reduplicative classifiers are analogous to English *every* in their occurrence with collective predicates.

(31) (a) *__Every__ girl gathered in the hallway.

(b) Xia-ke-le, **mei** ge xuesheng **dou** weizai-laoshi-shenbian
after-class-PFV every CL student all gather-at-teacher-beside
wen wenti(, dan you ji-ge mei-zai). (Mandarin)
ask question but have several-CL NEG-at-there
'After class, every student gathered around the teacher for questions(, except for a few who were not there).'

(c) **Go3-go3** saam1-nin4kap1 hok6saang1 *__(dou1)__ zeoi6
CL-CL three-grade student all gather
hai2-cou1coeng4(, ?bat1gwo3 jau6
at-sports.ground but have
di1 m5-hai6-dou6). (Cantonese)
CL_{PL}NEG-at-there
'All the grade-three students gathered at the sports ground(, *but some were not there).'

(d) Saam1-nin4kap1 hok6saang1 *__(dou1)__ zeoi6 hai2-cou1coeng4,
three-grade students all gather at-sports.ground
(bat1gwo3 jau6 di1 m4-hai6-dou6). (Cantonese)
but have CL_{PL} NEG-at-there
'Every grade-three student gathered at the sports ground(, except for some who were not there).'

The ungrammaticality of (31a) shows that English *every* cannot combine with collective predicates, which is not the case for *mei* 'every' or prenominal [CL + CL_{dou1}]. (31c) reveals that a similar sentence sounds odd with a prenominal reduplicative classifier. While maximizing is found in the [CL + CL_{dou1}] construction, it is not possible in the [*mei* . . . *dou*] construction, which shows the major difference between *mei* 'every' and [CL + CL_{dou1}]. From here, I will assume Cantonese *mui5* 'every' to be similar to Mandarin *mei* 'every'. Therefore, sentences in (31) show that while no maximizing effect is found on the common noun in the [*mei* . . . *dou*] construction, a maximal reading is found on the definite plural modified by the [CL + CL_{dou1}] in (31c). Such a claim is further supported by (31d), in which the absence of the prenominal reduplicative classifier means that the second clause, which suggests exceptions, is acceptable. This reveals that while distributive quantification is performed by *dou1* 'all', a maximizing effect is triggered by the presence of [CL + CL_{dou1}], but not by *mei*/*mui5* (see (31b)), or *dou1* alone (see (31d)).

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Furthermore, as mentioned, Huang (1996) observed that when the object is an indefinite, *mei* 'every' can occur alone without *dou*. Relevant examples are as follows:

(32) Ban-li **mei** ge xuesheng ***(dou)** xuan-le na-suo
class-in every CL student all select-PFV that-CL
xuexiao. (Mandarin)
school
'Every student in the class has selected that school.'

(33) (a) Xi-li de **mei** ge jiaoshou dijiao-le yi-fen
dept-in DE every CL professor submit-PFV one-CL
jingfei shenqing. (Mandarin)
grant application
'Every professor in the department submitted a grant application.'
(Luo 2011: 112)

(b) Xi-li de jiaoshou **dou** dijiao-le yi-fen
department-in DE professors all submit-PFV one-CL
jingfei shenqing. (Mandarin)
grant application
'The professors in the department each submitted a grant application.'
(Luo 2011: 112)

When the object is definite, the co-occurrence of *dou* 'all' with *mei* 'every' is obligatory, as shown in (32). However, with the indefinite object *yi-fen-jingfei-shenqing* 'one-CL-grant-application', *mei* 'every' in (33a) can occur without *dou* 'all' and convey the same quantificational meaning as (33b), where *dou* is present. Cheng's (2009) analysis of [*mei* ... *dou*] presents an insightful means of solving the puzzle of the obligatory co-occurrence of the two. However, if *mei* is what gives a universal force to sets of individuals, it becomes difficult to explain the indefinite–definite asymmetry mentioned in Huang (1996).

While (33a) supports the quantificational nature of *mei* 'every', one would predict that when [CL + CL_{dou1}] is used to modify the subject NP, it would still rely on the licensing of *dou1* 'all' for the maximizing effect, regardless of whether the object is definite or indefinite. This prediction is borne out in (34a, b), from Mandarin and Cantonese, respectively.

(34) (a) **Ge-ge** jiaoshou **dou** dijiao-le yi-fen
CL-CL professor all submit-PFV one-CL
jingfei shenqing. (Mandarin)
grant application
'All the professors have submitted a grant application.'

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(b) **Go3-go3** gaau1sau6 **dou1** dai6-zo2 jat1-fan6
CL-CL professor all submit-PFV one-CL
ging1fai3 san1ceng2. (Cantonese)
grant application
'All the professors have submitted a grant application.'

Both (34a) and (34b) show the obligatory occurrence of *dou* 'all' and *dou1* 'all' when prenominal reduplicative classifiers occur to modify the NP for the maximizing effect. This further supports my analysis of [CL + CL_{dou1}] and the idea that the prenominal reduplicative classifier cannot be treated on a par with *mui5* 'every' in such a case. Moreover, one point to note is that under the current analysis, the set resulting from the contextual domain restriction by *mui5* 'every' and *dou1* 'all' alone is an unstructured set of contextually relevant things. A maximizing effect is not necessary in cases like (32) and (33), as maximality resulting from Cov relies on [CL + CL_{dou1}], which is absent in *dou*/*dou1* 'all' alone and [*mei*/*mui5* . . . *dou*/*dou1*] here.

To sum up, the proposed analysis of [CL + CL_{dou1}] lead to a prediction that without involving Cov, pragmatic weakening of the contextually restricted domain by the resource domain variable C allows a non-maximality reading of relevant quantifiers, which is the case predicted in quantification by *mui5* 'every' with *dou1* 'all'. Brisson pointed out that the contextual variable C works differently in determiner quantification and distributive quantification. With *mui5* 'every' taken to be a determiner quantifier, the function of C here is to reduce the set that the CN denotes to a more specific, contextually relevant set, without further partitioning the set into different cells. Such partitioning would require Cov. The set resulting from the contextual domain restriction is an unstructured set of contextually relevant things, which explains why a maximizing effect is not necessary in distributive quantification by [*mui5* . . . *dou1*]. A maximality reading may still be found when no pragmatic weakening occurs. Cov, not C, is involved in the distributive quantification by *dou1* 'all' in [CL + CL_{dou1}], and distributive quantification requires the value assigned to Cov to give a good-fitting cover with a maximizing effect on the nominal modified by [CL + CL_{dou1}].

Finally, one underlying difference between *mui5* and [CL + CL_{dou1}] is that while *mui5* is a determiner-quantifier, [CL + CL_{dou1}] in the current analysis is a type-preserving modifier, which is originated from the ambiguity of quantifying determiner as a modifier type and a quantifier type. The two overlap in the sense that both involve quantifying meaning, but differ in their underlying semantic type under such a case: *mui5* being of the quantifier type of <<e, t>, <<e, t>, t>> and prenominal [CL + CL_{dou1}] is a quantifying determiner of the modifier type, viz' a type of <<e, t>, <e, t>>. This makes the two in fact not comparable to each other. Even if quantifier raising is possible with *mui5* as a quantifier, leading to relevant scope interpretation, this would not be possible for [CL + CL_{dou1}] as a modifier, with [CL + CL_{dou1}] restricted to operating on the NP it modifies.

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6. Conclusions and theoretical implications

In this paper, I have argued that prenominal reduplicative classifier is a quantifying determiner, with their semantics governed as follows:

(35) (a) [CL + CL] – reduplicative classifiers without *dou1*
Prenominal [CL + CL] serves as a quantifying determiner to convey the 'many' reading, which is ambiguous between a modifier type and a quantifier type, with the former giving a weak cardinal reading and the latter a strong proportional reading.

(b) [CL + CL_{dou1}] – reduplicative classifiers licensed by *dou1*
When prenominal [CL + CL_{dou1}] occurs with a distributive operator (D-operator) like *dou1* 'all', the two form a licensing relation. As distributive quantification is performed by *dou1*, prenominal [CL + CL_{dou1}] serves as a modifier-type quantifying determiner. Its presence serves to regulate the quantification domain of *dou1*, with a maximizing effect imposed on the nominal modified by the prenominal [CL + CL_{dou1}].

Table 1 in Section 3.4 above summarizes different readings of [CL + CL]. With [CL + CL_{dou1}] included, Table 1 is now revised as Table 2.

Position of [[CL + CL]/[CL+CL_{dou1}] + NP]	Reading
Object position	Cardinal reading • indefinite reading of [[CL + CL] + NP] • [CL + CL] as modifier-type quantifying determiner
Topicalized position	Cardinal reading • definite reading of [[CL + CL] + NP] • [CL + CL] as modifier-type quantifying determiner Proportional reading • definite reading of [[CL + CL] + NP] • [CL + CL] as quantifier-type quantifying determiner
Topicalized/subject position	Maximizing effect imposed on the modified NP • definite reading of [[CL + CL_{dou1}] + NP] • [CL + CL_{dou1}] as modifier-type quantifying determiner

Table 2
A summary of different readings of
[[CL + CL] + NP] and [[CL + CL_{dou1}] + NP].

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The two statements in (35) have at least three implications. First, domain restriction has always been considered to be done in pragmatics only, although recent studies by Von Fintel (1994, 1998), Stanley & Szabó (2000) and Stanley (2000, 2002) have taken an opposing view and suggested that domain restriction is done in grammar. The current paper has taken the view that the domain of strong quantifiers like *dou1* 'all' is contextually restricted, and contextual restriction is part of syntax/semantics. Moreover, focusing on other languages, Giannakidou (2004) has briefly mentioned that a language that does not employ overt definite or indefinite articles (like Chinese) is likely to be a covert strategy language, with domain restriction done covertly. In my analysis, [CL + CL_{dou1}] is licensed by a distributive quantifier for maximizing effect. The semantics of [CL + CL_{dou1}] states that the prenominal reduplicative classifier under such a case serves to overtly restrict the distributive quantification of *dou1*. The proposed analysis implies that domain restriction in Chinese is overtly realized in grammatical form by means of the reduplicative classifier (when combined with a D-operator), which is at least true in the case of Cantonese.

The above supports that Chinese may be an overt strategy language. It is in fact possible for domain restriction to be done through linguistic means, and Cheng (2009) has already argued that domain restriction is fulfilled in the overt syntax in Chinese. Von Fintel (1994, 1998), Stanley (2000, 2002), Stanley & Szabó (2000), Martí (2002, 2009), Etxeberria (2004, 2009), Giannakidou (2004) and others basically hold that domain restriction cannot be done solely in pragmatics. Following their line of analysis, if one assumes a syntactic and semantic analysis for domain restriction, the current analysis reveals that both grammar and pragmatics are needed to account for domain restriction in Chinese.

Second, the heterogeneity of the meanings of reduplicative classifiers calls for a finer classification within the family of expressions that are claimed to be universal quantifiers. Previous analyses of Chinese quantification have identified a family of universal quantifiers (e.g. *souyou* 'all', *mei* 'every', *dou* 'all', *quan* 'all'). The case of reduplicative classifiers, claimed to be distributive quantifiers, clearly shows that if Partee's classification is followed, quantifying determiners do demonstrate modifier characteristics. Licensed by *dou1*, prenominal reduplicative classifiers can serve as a modifier affecting the quantification of the D-operator by restricting or regulating its domain. That is to say, although Chinese, a classifier language, is assumed to have its classifier occupying the determiner position (see Cheng & Sybesma 1999, Simpson 2005), prenominal reduplicative classifiers do demonstrate determiner-like and adjectival-like characteristics. Without *dou1*, a prenominal reduplicative classifier behaves like English *many*, as described in (35a). This can be understood as follows: (i) there is a cardinal prenominal [CL + CL], which can be taken as an adjective or a modifier type, giving a cardinal reading, and (ii) there is a proportional prenominal [CL + CL], which is more like a determiner or a quantifier type, giving the proportional reading. Licensed by a distributive quantifier *dou1* 'all', the prenominal reduplicative classifier performs the role described in (35b). Under such a case, [CL + CL_{dou1}] serves as

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a modifier, with the distributive force coming from the D-operator. If the dual role of quantifying elements as modifiers and quantifiers is recognized, then within the family of universal quantifiers identified in Chinese, some seeming quantifiers may be modifiers, playing a much richer role than previously expected. The co-occurrence of these quantifiers is indeed not uncommon (e.g. [*quan* 'all' + *dou* 'all'] and [*mei* 'every' + *dou* 'all'] (Mandarin Chinese); and prenominal [CL + CL_{dou1}], [*mui5* 'every' + *dou1* 'all'] (Cantonese)), which calls for a need of a finer classification of quantifying elements in Chinese.

Third, Chinese, a classifier language, is assumed to have its classifier occupying the determiner position (see Cheng & Sybesma 1999, Simpson 2005). The current study of reduplicative classifiers as quantifying determiners has made clear that classifiers, be it single classifiers or reduplicative classifiers, may be a strategy for determiner building. This would further consolidate the theoretical claim that Chinese may have determiners, which at the very least, can be further concluded from the current study.

Finally, many types of reduplication have been described and discussed in the literature (see Inkelas 2014, Downing & Inkelas 2015, Inkelas & Downing 2015, Melloni & Basciano 2018). Verbal and adjectival reduplications in Mandarin have been briefly covered in these studies, with the former showing a diminishing function and the latter an increasing function (see Melloni & Basciano 2018). Classifier reduplication represents reduplication of monosyllabic units in the form of AA, and reduplicative classifiers are said to have a distributive or plural meaning (see Inkelas 2014, Downing & Inkelas 2015, Inkelas & Downing 2015, Melloni & Basciano 2018). In Mandarin and Cantonese, reduplication of classifiers demonstrates less structural effect, with ClP assumed for both reduplicative classifiers and single classifier (see Cheng & Sybesma 1999, Simpson 2005). However, while adjectival reduplication which is more related to lexical factors and verbal reduplication be a syntactic phenomenon involving units in the vP domain (see Basciano & Melloni 2017), the current study shows that reduplicative classifier shows significant interpretive effects on the modified nominals. The outputs of the reduplicative process affect the semantic domains of quantification and domain restriction, leading to the plural reading or the maximal reading of the nominals. Further work will be needed to examine in detail how to situate the effect of reduplicating a classifier among different types of reduplication in Chinese, without limiting to Mandarin and Cantonese, and to extend it to natural language at large.

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