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The Structure of Multiple Classifier Constructions and Some Related Theoretical Issues

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Abstract: This paper addresses multiple classifier constructions (MCCs) in terms of internal structure and derivation. Based on a summary of the major features of MCCs, the paper proposes that MCCs are composed of DP and NumP. The combination of the two numeral-classifiers denotes a complete structure, which presents the pattern of double numeral-classifiers. DP serves as the head while NumP serves as the complement. There is no coordination but topic-comment relation between the embedded DP and NumP. The embedded DP c-commands NumP. NumP moves across the board to the specifier position of the external DP to give rise to various types of MCCs. Movement of the classifier of MCCs is triggered by numeral gapping. Based on this, it is argued that all MCCs must be of this nature in terms of the underlying structure. This contention can provide a reasonable solution to many long-standing puzzles related to MCCs.
Keywords: multiple classifier constructions (MCCs), noun deletion, numeral gapping, feature checking, genitivization

1. Introduction

Multiple classifier constructions (MCCs) refer to a special noun phrase in which two classifiers are stacked together. Its linear order is "numeral + individual classifier + demonstrative + kind classifier + noun". The individual classifier usually follows the numeral while the kind classifier usually follows the demonstrative. The positions of the classifiers cannot be interchanged. Although an MCC consists of more than one classifier, there is no mark of linkage in it. Therefore, it is conceived of as describing a single concept of quantity and functions like a single constituent. It is noteworthy that there must almost always be (at least) one NP shared by all the classifiers in an MCC. At present, the focus of research is mainly on the structural properties, internal constituents, semantic interpretation mechanism and constraints of MCCs (Liao & Wang, 2011; Zheng Weina, 2015). How to integrate them into the framework of generative grammar and provide a plausible account for

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it is a subject that is of theoretical value and practical significance. Since scope property is characteristic of classifiers, the analysis and interpretation of MCCs must be related to the scope of classifiers. What is the interactive relationship between the two classifiers inside MCCs? How are they represented syntactically? How are the scopes of the two classifiers determined? What factors influence the semantic interpretation and structural analysis of MCCs? What syntactic principles and constraints is the interaction between the classifiers, the numeral and the demonstrative subject to? These questions, however, remain unsolved.

Due to this, the goal of this paper is to carry out further research into MCCs in the framework of generative grammar in order to analyze the internal structure of MCCs and their derivation process. After all, MCC is a syntactic phenomenon, and its generation must be subject to syntactic rules first and foremost. Therefore, the research of MCCs should start with syntax. Only in this way can we find the syntactic laws and constraints related to MCCs.

The paper is organized as follows. Section 2 presents a criticism of some relevant explanations concerning MCCs. Section 3 addresses the syntactic features of MCCs. Section 4 addresses the syntactic analysis of MCCs. Section 5 addresses the mechanism of interaction of the left peripheral deletion, numeral gapping and generation of MCCs. Section 6 addresses genitivization, NP deletion and the overt raising of NumP. Section 7 is the conclusion.

2. Some relevant explanations and their problems

Liao & Wang (2011) propose that the Chinese bare noun denotes a set, and its semantic type is <e, t>. The classifier is equal to an operator ∪. The function of the classifier is to decompose the semantics of the noun, and its semantic type is <<e, t>, <e, t>>. Based on this, the semantic structure of MCCs can be shown as below.

(1) $[_{\text{IClP},<e,t>}$ Num, <<e, t<e, t>>$[_{\text{ICl'},<e,t>}$ ICl, <<e, t>,<e, t>>$[_{\text{PartP},<e,t>}$ Part, <e, <e, t>>$[_{\text{DP},<e>}$ D, <<e, t>, e> $[_{\text{KClP},<e,t>}$ Num, <<e, t>, <e, t>>$[_{\text{KCl'},<e,t>}$ KCl,<<e, t>, <e, t>> NP, <e, t>]]]]]]

As (1) shows, the analysis solves the problem of the mismatch of semantic types and unites the semantic type of kind classifiers and non-kind classifiers. It is, however, still problematic. Firstly, it fails to understand the Blocking Principle correctly. According to Chierchia (1998b:360), only the overt syntactic operation can block the covert semantic operation, but not vice versa. Liao & Wang (2011), however, argue that if the bare noun per se represents an entity whose semantic type is <e>, the demonstrative, such as *zhè* 'this' or *nà* 'that', is redundant. This claim implies that the overt semantic operation will block the overt syntactic operation. It seems that their argument is not in conformity with the Blocking Principle. Secondly, its analysis of the classifier is self-contradictory. On the one hand, the function of the classifier is to decompose ambiguity, and its semantic type is <<e, t>, <e, t>>. On the other hand, it is a functional operator ∪. According to Chierchia (1998b), however,

the semantic type of an operator is <e, <e, t>>, and its function is to shift the type to a set of atoms. Hence Liao & Wang's (2011) analysis of the classifier is self-contradictory. Thirdly, the analysis regards MCC as a partial construction, which lacks semantic and structural support. In terms of semantics, a partial construction has typical partial semantics while MCCs have none. In terms of structure, a partial construction contains a signal word denoting partiality, such as *de* (AUX) in Chinese, while MCCs have none. Fourthly, the analysis cannot testify the reasonableness of the empty category projection PartP. Along the line of Boucher (2005), only when the overt constituent occurs in the head or specifier position of the projection of a functional category can the projection of a functional category be activated. Rather, only in this case can the projection of a functional category exist. There is, however, no overt constituent in the projection of the empty category PartP proposed in Liao & Wang (2011). In effect, it is completely an empty category. As a result, there is no reason for the existence of PartP.

Zheng Weina (2015) proposes that the semantic type of the Chinese bare noun is <e>. The function of the classifier is equal to a semantic shift operator, and its semantic type is <e, <e, t>>, a projection from kind to a set of atoms and from entity to property (Chierchia, 1998a, 1998b; Jiang Li, 2012). MCCs are a special form of numeral-classifier noun constructions. Under the circumstance of semantic license, the concepts they refer to are identical. The kind classifier shares the same semantic type with other classifiers. In the same vein, numerals that occur in MCCs are identical semantically. Based on this, the semantic structure of MCCs can be shown as below.

(2) a. $[_{\text{IClP, <e, t>}}$ Num, <<e, t <e, t>> $[_{\text{ICl', <e, t>}}$ ICl, <e, <e, t>> $[_{\text{DP, <e>}}$ Spec ø$[_{\text{D', <e>}}$ D, <<e, t>, e> $[_{\text{KClP <e, t>}}$ Num, <<e, t>, <e, t>> $[_{\text{KCl', <e, t>}}$ KCl, <e>, <e, t>> NP, <e>]]]]]]

b. $[_{\text{ClP, <e, t>}}$ NumP, <<e, t><e, t>> $[_{\text{Cl', <e, t>}}$ Cl, <e, <e, t>> $[_{\text{KClP, <e>}}$ Demp, <<e, t>, e> $[_{\text{KClP, <e, t>}}$ NumP, <<e, t>, <e, t>> $[_{\text{KCl', <e, t>}}$ KCl, <e, <e, t>> NP, <e>]]]]]

The analysis proposed in (2), however, is also problematic. First, the semantics of MCCs is not identical to that of the numeral-classifier noun construction. Secondly, the semantic types of the numerals that occur in MCCs are not identical. In effect, the first numeral is indefinite and unspecific, whereas the second numeral is characterized by definiteness and specificity. Thirdly, though there must be a classifier between the numeral and the noun, the demonstrative merges with the noun directly, with no classifier occurring between them. For example, *zhè shū* (this book, 'this book'), *zhè rén* (this person, 'this person'), *zhè shì* (this matter, 'this matter'), *zhè shān* (this mountain, 'this mountain'), and *zhè dìfang* (this place, 'this place') are all grammatical constructions. Obviously, Zheng Weina's (2015) generative analysis of MCCs cannot reveal the facts of Chinese language.

3. The syntactic features of MCCs

3.1 A strict linear ordering of classifiers

The classifier that denotes individual precedes the classifier that denotes kind, which then precedes a noun. The classifiers that occur in MCCs cannot be identical with regard to form and semantics. Since the selection of the classifiers depends on the noun, there is semantic selection relation between them. The first classifier can occur in any form while the second classifier can occur in the form of *zhǒng* (KCl) only.

3.2 Presence/absence of numerals

Numerals must occur overtly in front of the individual classifier. In contrast, they may occur overtly or covertly in front of the kind classifier. Specifically, the numeral may occur covertly in front of the kind classifier when it is *yī* 'one', which is a default value, whereas it must occur overtly in front of the kind classifier when it is *èr* 'two' or more than *èr* 'two'.

3.3 Differences in definiteness or specificity

Usually, the classifier denoting individual cannot be preceded by the demonstrative *zhè* 'this' or *nà* 'that'. In contrast, the classifier denoting kind must be preceded by the demonstrative *zhè* 'this' or *nà* 'that'. Hence the construction with the individual classifier is characterized by indefiniteness or unspecificity, whereas the construction with the kind classifier is characterized by definiteness or specificity. It is noteworthy that if two demonstratives occur in an MCC, they cannot be identical with regard to form and semantics. For example, **zhè sān běn zhè zhǒng shū* (this three ICl this KCL book, 'the three books of this kind') is less acceptable, for two identical demonstratives occur in the MCC, which results in phonological disharmony, as a consequence of which it sounds odd. In contrast, *nà sān běn zhè zhǒng shū* (that three ICl this KCL book, 'the three books of this kind') is well-formed and acceptable, for the demonstratives that occur in the MCC are not identical with regard to form and semantics and hence no phonological harmony is violated. This suggests that phonological factors have an effect on the grammaticality of MCCs.

3.4 Multiple semantic interpretation

Generally speaking, MCCs tend to be given a collective interpretation. Hence they differ from distributive or existential classifier constructions, such as *měi gè rén sān běn shū* (each ICl person three ICl book, 'three books for each person'), and *yī gè rén sān běn shū* (one ICl person three ICl book, 'three books for a person'). Also, they differ from single classifier constructions (SCCs), such as *sān běn shū* (three ICl book, 'three books'), or partial constructions, such as *zhè xiē shū zhōng de sān běn* (these books of AUX three ICl, 'three books of this kind'). In terms of distributive or existential classifier constructions, the numeral is not preceded by determiners, such as demonstratives. The two classifiers belong to the category of individuals, and hence they can have distributive interpretation. In SCCs, the numeral-classifier can be preceded by the demonstrative. In partial constructions, the

numeral-classifier is not preceded by the demonstrative, but the expletive *de* (AUX) must be contained. In contrast, MCCs do not have partial semantics or case features.[①] The noun must be preceded by the demonstrative *zhè* 'this' or *nà* 'that'. In addition, the definite NP allows collective interpretation[②] and is characterized by monotonicity[③], which is similar to partial case.

3.5 Multiple features of the noun

The definite NP is characterized by topicality when it occurs in front of the numeral-classifier. When it occurs behind the numeral-classifier, it has head features. As a result, the definite NP has specific and identical semantics. For example, *sān běn zhè zhǒng shū* (three ICl this KCl book, 'three books of this kind') is not identical to *sān běn shū* (three ICl book, 'three books'), for the former has specific semantics, which expresses a limited set, whereas the latter has specific and unspecific semantics, which expresses an unlimited set. The definite NP implies that the noun concept which it refers to is characterized by homogeneity and identicality, whereas the indefinite NP implies that the noun concept that it refers to is characterized by non-homogeneity and unidenticality.

4. The structure of MCCs

The current research of MCCs focuses on the structural properties, internal constituents, semantic interpretation mechanism and constraints of MCCs. Some questions concerning MCCs, however, remain unsolved. What representations do they have? What are the factors that determine the representations? What is the syntactic-semantic interface of MCCs? Why is the demonstrative indispensable to MCCs? How should MCCs be analyzed? These questions are worth taking into account.

It is noteworthy that only two types of MCCs are grammatical with regard to the linear order, as illustrated below.

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① In terms of semantics, a partial construction has typical partial meanings. It represents a part of a known set of plurality. In contrast, an MCC represents an unknown set of plurality and hence it lacks typical partial meanings. In terms of structure, the partial construction has the marker *de* (AUX) while the MCC does not have such a marker (Zheng Weina, 2015).

② The collective interpretation is a group anchored by an individual. An intervening classifier prevents an N from realizing the plural feature. Languages with a collective morpheme and those with a regular plural morpheme vary only by one structural difference: the presence/absence of a head classifier. It is possible to maintain a one-to-one mapping between syntax and semantics cross-linguistically: the same structures yield the same meanings and the same meanings are derived from the same structures (cf. Huang *et al*., 2009:290-298).

③ Along the lines of Schwarzschild (2006) and Liao & Wang (2011), when a measure phrase is combined with the measured noun in a partitive construction, the interpretation will be a monotonic one; when a measure phrase is combined with the measured noun as an attributive modifier, the interpretation will be a non-monotonic one. The monotonic condition holds between the individual and the kind classifiers. Therefore, the interpretations of MCCs are always monotonic.

(3) a. *zhè* *zhǒng* *shū* *sān* *běn*
this KCl book three ICl
'three books of this kind'
b. *sān* *běn* *zhè* *zhǒng* *shū*
three ICl this KCl book
'three books of this kind'
c. **sān* *zhǒng* *zhè* *běn* *shū*
'three KCl this ICl book'
d. **zhè* *zhǒng* *sān* *běn* *shū*
this KCl three ICl book
e. **sān* *běn* *shū* *zhè* *zhǒng*
three ICl book this KCl
f. **shū* *zhè* *zhǒng* *sān* *běn*
book this KCl three ICl
g. **shū* *sān* *běn* *zhè* *zhǒng*
book three ICl this KCl

(3a) is an SV construction. The post-posed numeral-classifier construction is adjacent to the preceding numeral-classifier construction after the verb is deleted, as shown below.

(4) a. *Zhè* *zhǒng* *shū* ~~*mǎi*~~ *sān* *běn*
this KCl book buy three ICl
b. *Zhè* *zhǒng* *shū* *sān* *běn*
this KCl book three ICl
(5) a. *Zhè* *zhǒng* *shū* ~~*sòng*~~ *sān* *běn*
this KCl book send three ICl
b. *Zhè* *zhǒng* *shū* *sān* *běn*
this KCl book three ICl

Sān běn zhè zhǒng shū is a natural modifier-head construction. For example, *Sān běn zhè zhǒng shū dōu nòng zāng le*. *Zhè zhǒng shū* can also be the subject which is adjoined to the preceding numeral-classifier. In this case, its phonetic form is weak and short. It follows that the modifier-head construction derives from the SV construction. In terms of MCCs, the construction "NumP + DP" derives from the construction "DP + NumP". It follows that it is a path of structural evolution which is quite universal in Chinese. It is the nominalization of the statement construction that makes sense.

An anonymous reviewer argues that other types of classifiers besides the kind classifier can occur in DP, as shown in (6). Moreover, the numeral can occur between the demonstrative and the kind classifier, as shown in (7).

(6) *Tā mài-le 200 xiāng nà yī chē yīngtáo, ér zhè yī chē yīngtáo yī xiāng dōu méi mài chūqù .*
3SG sell-PST 200 Cl that one Cl cherry but this one Cl cherry one Cl all not sell AUX
'He sold 200 boxes of cherries on that truck, but as far as the cherries on this truck are concerned, he sold nothing.'

(7) *Tā hē-le sān wǎn nà sān zhǒng tāng .*
3SG drink-PST three Cl that three KCl soup
'He drank three bowls of soup of the three kinds.'

In effect, *Tā mài-le 200 xiāng nà yī chē yīngtáo* is acceptable on condition that it is used in a casual colloquial style. In terms of semantics, it is concerned with two circumstances. In the first place, it means that as far as the cherries on that truck are concerned, he sold 200 boxes. In this case, the numeral-classifier construction *nà yī chē yīngtáo* is a syntactic adjunct which is adjoined to the topic. Accordingly, it is weak phonetically. In the second place, it means that he sold the cherries, the number of which was 200. The numeral-classifier construction functions as the description of *nà yī chē yīngtáo.* Accordingly, 200 boxes of cherries on that truck is a modifier-head construction in terms of syntax. As far as *Tā hē-le sān wǎn nà sān zhǒng tāng* is concerned, it has only one usage, that is, the numeral-classifier construction functioning as the adjunct. Since the information of quantity conveyed by the construction *nà sān zhǒng tāng* is more prominent than the information of reference, strong mutual interference arises between it and the preceding numeral-classifier construction. Furthermore, *yī* in *nà yī chē yīngtáo* weakens, as a result of which the information of reference is more prominent than the information of quantity and hence the degree of interference decreases. It must be pointed out that the co-occurring classifiers in the examples cited by the anonymous reviewer are both vessel-denoting classifiers. They are different from the kind classifiers that are addressed in the paper.

It is noteworthy that the demonstrative precedes the kind classifier, which then precedes the noun. The demonstrative, the kind classifier and the noun constitute an inseparable syntactic object. Likewise, the numeral and the individual classifier constitute an inseparable syntactic object. Therefore, we argue that the basic structure of MCCs is shown as follows.

(8) demonstrative + kind classifier + noun + numeral + individual classifier

Based on (8), we argue that the surface order "numeral + individual classifier + demonstrative + kind classifier + noun" results from movement of "numeral + individual classifier" as a whole.[①] To put it differently, the numeral and the individual classifiers are

[①] It is believable that the construction "numeral-classifier + noun" results from movement of the construction "noun + numeral-classifier". What makes sense is the nominalization of the statement construction. In effect, it is a path of structural evolution which is quite universal in Chinese. Furthermore,

base-generated in a position behind the noun. So the basic order of the classifier construction is "noun + numeral + classifier". This hypothesis is based on the following evidence. First, the original classifier construction in Chinese is "noun + numeral + classifier". The "numeral + classifier + noun" construction did not appear until the Wei and Jin Dynasties. Moreover, it did not become common until the Tang Dynasty (Hashimoto, 1977). To put it differently, the numeral and the classifier in Ancient Chinese did have the features of lexical categories and hence they occurred at the end of the construction in terms of surface order, which corresponds to its underlying structure. In Modern Chinese, they have become functional categories and hence they have the feature [+D]. They occur in front of the noun in terms of surface order. Second, in terms of classifier constructions in Tibeto-Burman languages, classifier constructions occur in the form of "numeral + classifier + noun", "noun + numeral +classifier", "noun +classifier + numeral", "classifier + noun + numeral" and "classifier + classifier + noun". The "numeral + classifier + noun" construction usually occurs in languages that have close contact with Chinese. This suggests that their original constructions should be "noun + classifier" or "noun+ numeral + classifier" (Yang Yongzhong, 2020). Therefore, the basic structure of classifier constructions is "noun + numeral + classifier". All types of classifier constructions are based on this structure and generated by means of movement of the classifier and movement of the numeral. Therefore, we argue that the structure of MCCs should be analyzed as below.

(9) a. $[_{DP}\ [_{DP}$ D KCl N$]\ [_{NumP}$ Num ICl$]]$

b. $[_{DP}\ [_{NumP}$ Num ICl$]_i\ [_{DP}$ D KCl N$]t_i]$

As (9) shows, "numeral + individual classifier" moves as a syntactic object. Thus, such ungrammatical constructions as *zhè zhǒng sān běn shū* (this KCl three ICl book, 'three books of this kind') cannot be generated. The individual classifier always occurs behind the numeral while the kind classifier always occurs behind the demonstrative, and the noun always occurs behind the kind classifier. It follows that the demonstrative, the kind classifier and the noun constitute an inseparable syntactic object. The demonstrative phrase consisting of the demonstrative *zhè* 'this' and the kind classifier *zhǒng* (KCl) modify the noun. This suggests that the numeral-classifier combination cannot be inserted into the demonstrative phrase. In terms of structure, the ungrammaticality of *zhè zhǒng sān běn shū* (this KCl three ICl book, 'three books of this kind') is due to the ungrammaticality of movement of the demonstrative and the ungrammaticality of movement of the numeral-classifier phrase. The c-commanded constituent cannot move across the c-commanding constituent and occupy the preceding position. Otherwise, an ungrammatical construction would arise. The constituent

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the construction "numeral-classifier + noun" results from the construction "$noun_1$+ numeral-$noun_2$". The construction "numeral + $noun_2$ + $noun_1$" is the prerequisite for and a sign of the quantification of $noun_2$.

that is in a c-commanding position constitutes a barrier, which may obstruct movement of the object that is c-commanded. According to the Condition on Extraction Domain (Huang, 1982), both the movement of the demonstrative phrase and the movement of the numeral-classifier phrase are forbidden because neither the demonstrative phrase nor the numeral-classifier is a verb complement or the specifier of the verb complement. Hence the operation of movement cannot take place. It must be pointed out that the linear positions of the constituents in the surface structure are determined by the positions of the constituents in the underlying structure. Rather, they are determined by the relationship of c-command. It is self-evident that the numeral-classifier phrase in MCCs can select only the demonstrative phrase that has complete syntactic-semantic features as its complement. It cannot select the demonstrative phrase that has incomplete syntactic-semantic features as its complement. Quantity number expressions behave differently from non-quantity ones with respect to scope interaction. A quantity number expression does not enter into scope relations with another one. The quantity and non-quantity number expressions differ in their possibilities of coreference with/binding of pronouns and scope interaction. These distinctions will follow naturally from their structural differences. The D of a DP is generally the locus of reference. If a quantity-denoting phrase does not have a D in its structure, it is expected that it does not enter into coreference or binding relations. Moreover, a number phrase does not quantify over individuals and does not interact with another expression in terms of scope (Huang *et al*., 2009:276-277). Furthermore, there is a certain licensing relationship between D and Num-Cl, which is actually the matching relationship between the referential property of D and the agreement feature of Num-Cl. As for D, this feature cannot be interpreted and hence it must be checked. To be checked needs to match the agreement feature of Num-Cl (Yang Yongzhong, 2018, 2021), as illustrated below.

(10) a.	*liǎng*	*běn*	*zhè*	*zhǒng*	*shū*
	two	Cl	this	KCl	book
b.	**liǎng*	*běn*	*zhè*	*shū*	
	two	Cl	this	book	
c.	**liǎng*	*běn*	*zhǒng*	*shū*	
	two	Cl	KCl	book	

As (10) shows, the demonstrative phrase must match the numeral-classifier phrase, which assigns the numeral and demonstrative, which function as the probe, multiple matching capabilities, viz., *zhè zhǒng shū* (this KCl book, 'this kind of book'), *liǎng běn shū* (two ICl book, 'two books'), and *liǎng běn zhè zhǒng shū* (two ICl this KCl book, 'two books of this kind'). The noun is the common goal that both the numeral and the demonstrative probe. This suggests that only when the noun and the demonstrative are selected can the relationship of matching be established. Otherwise, an ill-formed construction which has

incomplete features would be yielded. The "numeral + individual classifier" combination and the "demonstrative + kind classifier + noun" combination constitute two different sets and depict different semantic features. In this case, the relationship between the two sets is one of determination which needs to be licensed by a semantic connection. In terms of logical semantics, such a semantic connection is represented as the fact that there exists an intersection between the two sets represented by the head and the determiner, respectively. Semantic differences are associated with the occurrence or non-occurrence of the demonstrative in front of the individual classifier. If the individual classifier is preceded by the demonstrative, then the numeral-classifier combination is characterized by definiteness and specificity. In contrast, if the individual classifier is not preceded by the demonstrative, the numeral-classifier combination is characterized by indefiniteness and unspecificity. Obviously the demonstrative in MCCs modifies and determines NP. It is noteworthy that the numeral-classifier within the construction only represents the quantity of the kinds of NP. It does not represent the quantity of the whole construction. Nor does it show whether the whole construction has specific features, as illustrated in (11).

(11) a. $[_{DP1}$ Spec$[_{D\cdot}$D1$[_{NumP1}$ *sān běn*$[_{DP2}$ Spec$[_{D\cdot}$ *zhè zhǒng*$_i[_{NumP2}$ t$_i$ $[_{NP}$ *shū*]]]]]]]

b. $[_{DP1}$ Spec$[_{D\cdot}$D1$[_{NumP1}$ *sān běn*$[_{DP2}$ Spec$[_{D\cdot}$ *zhè*$[_{NumP2}$ *liǎng* $[_{NP}$ *shū*]]]]]]]

If the kind of *shū* 'book' is *yī* 'one', it occurs in the overt form, as shown in (11a), but if the kind of *shū* 'book' is *èr* 'two', it occurs in the covert form, as shown in (11b). In both cases, however, the number of *shū* 'book' is *sān* 'three'. It is self-evident that the demonstrative only determines the scope of the kind of *shū* 'book', but it does not determine its number. Furthermore, there is relevance between the linear position of the classifier and the strength of the feature of the numeral. If the numeral-classifier combination has strong number features, the classifier precedes the noun. In contrast, if the numeral-classifier combination has weak number features, the classifier follows the noun. Take for example *sān běn zhè zhǒng shū* (three ICl this KCl book, 'three books of this kind') and *zhè zhǒng shū sān běn* (this KCl book three ICl, 'three books of this kind'). Obviously the construction *sān běn zhè zhǒng shū* (three ICl this KCl book, 'three books of this kind') stresses that the number of *zhè zhǒng shū* (this KCl book, 'this kind of book') is *sān* 'three', and the unit of classification is *běn* (ICl). By contrast, the construction *zhè zhǒng shū sān běn* (this KCl book three ICl, 'three books of this kind') stresses that the item of enumeration is *shū* 'book', and the number is *sān* 'three'. NumP composed of the numeral and the individual classifier cannot modify the noun directly. In effect, it must establish connections with the noun by means of DP composed of the demonstrative, the numeral, and the kind classifier, so as to subcategorize features to the noun and realize the agreement between the numeral and the noun at the conceptual-intentional level. The default numeral *yī* 'one' positioned in front of the kind classifier occurs covertly, as a consequence of which the kind classifier *zhǒng* (KCl)

moves leftward to merge with D and constitutes a bigger syntactic object, viz., *zhǒng* (KCl) merges with *zhè* 'this' to give rise to *zhè zhǒng* 'this KCl', otherwise, the derivation would crash. This syntactic derivation mechanism has the following theoretical implications. Firstly, the demonstrative positioned in front of the kind classifier cannot be deleted, otherwise, the kind classifier would have nothing to depend on, which would give rise to ungrammatical MCCs. Secondly, the kind classifier must merge with the demonstrative to form a syntactic object, which further merges with the noun to form a bigger syntactic object. Thirdly, only when the default numeral is *yī* 'one' can the kind classifier move, otherwise it must stay in situ. Take for example *sān běn zhè liǎng zhǒng shū* (three ICl this two KCl book, 'three books of the two kinds'). The kind classifier phrase *liǎng zhǒng* 'two KCl' and the demonstrative *zhè* 'this' are in different positions in a hierarchical structure and hence *liǎng zhǒng* 'two KCl' cannot move. Fourthly, only when the numeral takes the overt form of *yī* 'one' or more than *yī* 'one' can DP be segmented. Therefore, we argue that the approach gives a plausible account of the governing category of the genitive and the determiner as well as variable binding, and hence it overcomes the shortcomings of conventional approaches to MCCs. Furthermore, it can account for why D and Num must share the same noun, but they do not necessarily share the same determiner. Sharing the noun is a striking feature of MCCs and a necessary condition of generation of MCCs. Sharing the determiner, however, is not a necessary feature of MCCs. Whether sharing the determiner takes place in an MCC depends on the governing power and scope (viz., governing category) of D and Num as well as the occurrence or non-occurrence of the determiner (Yang Yongzhong, 2010, 2019).

Different from Liao & Wang (2011) and Zheng Weina (2015), we argue that MCCs are ambiguous in terms of semantic interpretation. To put it differently, they allow distributive and collective semantic interpretation. As in Chierchia (1998b), the domain of individuals contains sorted individuals: x_{in} refers to a variable over atomic singular individuals, x_p a variable over plural individuals, and x_k a variable over kind terms. With the sorted variables, Chinese nouns are inherently of type <e, t>. According to Dayal (2004) and Zamparelli (1998), the denotations of NPs are taken to be ambiguous with respect to the sort of entity in the set. Specifically, denotations of a noun are ambiguous on several levels. One level consists of atomic singular individuals and one or more levels may consist of kind terms. To put it differently, denotations of a noun should include every dimension of the information/concepts associated with the noun. The numeral then chooses the plural/singular member(s) in that set with corresponding cardinality (Liao & Wang, 2011). Therefore, if the specific NP contains a numeral meaning two or more than two, then, MCCs allow distributive and collective interpretation, as illustrated in (12).

(12)	*sān*	*bēi*	*zhè*	*liǎng*	*zhǒng*	*yǐnliào*
	three	ICl	this	two	KCl	drink

'three glasses of drinks of the two kinds'

(a. *zhè*	*liǎng*	*zhǒng*	*yǐnliào*	*gè*	*sān*	*bēi*)
this	two	KCl	drink	each	three	ICl
(b. *zhè*	*liǎng*	*zhǒng*	*yǐnliào*	*gòng*	*sān*	*bēi*)
this	two	KCl	drink	in-all	three	ICl

It follows that MCCs in this case are ambiguous, as shown in (13).

(13) a. [$_{DP}$ [$_{DP}$ *sān* *bēi* [$_{DP}$ *zhè liǎng zhǒng yǐnliào*]]] (ambiguous)
three ICl this two KCl drink

b. [$_{DP}$ [$_{DP}$ *yǐnliào*$_i$[$_{DP}$ *sān* *bēi*[$_{DP}$ t$_i$[$_{DP}$ *zhè liǎng zhǒng* t$_i$]]]]]
drink three ICl this two KCl

c. [$_{DP}$ [$_{DP}$ *sān* *bēi*$_i$[$_{DP}$ *yǐnliào*$_j$[$_{DP}$ t$_i$[$_{DP}$ *zhè liǎng zhǒng* t$_j$]]]]]
three ICl drink this two KCl

In effect, such ambiguity shown in (12)-(13) can also be found in English and German equivalents, as shown in (14) and (15).

(14) a. [$_{DP}$ [$_{DP}$ *three glasses of*[$_{DP}$ *drinks of the two kinds*]]] (ambiguous)
b. [$_{DP}$ [$_{DP}$ *drinks*$_i$ [$_{DP}$ *three glasses of*[$_{DP}$ t$_i$[$_{DP}$ *of the two kinds* t$_i$]]]]]
c. [$_{DP}$ [$_{DP}$ *three glasses of* $_i$[$_{DP}$ *drinks*$_j$[$_{DP}$ t$_i$[$_{DP}$ *of the two kinds* t$_j$]]]]]

(15) a. [$_{DP}$ [$_{DP}$ *drei Gläser*[$_{DP}$ *Getränke von dieser zwei Sorten*]]] (ambiguous)
b. [$_{DP}$ [$_{DP}$ *Getränke*$_i$[$_{DP}$ *drei Gläser*[$_{DP}$ t$_i$[$_{DP}$ *von dieser zwei Sorten* t$_i$]]]]]
c. [$_{DP}$ [$_{DP}$ *drei Gläser*$_i$[$_{DP}$ *Getränke* $_j$[$_{DP}$ t$_i$[$_{DP}$ *von dieser zwei Sorten* t$_j$]]]]]

According to (14) and (15), the English and German numeral noun constructions that correspond to Chinese MCCs can be interpreted distributively and collectively. If, however, there is no numeral between the demonstrative and the kind classifier, or the default numeral is *yī* 'one', then, MCCs are not ambiguous, as shown in (16)-(18).

(16) a. [$_{DP}$ [$_{DP}$ *sān* *bēi*[$_{DP}$ *zhè (yī)* *zhǒng* *yǐnliào*]]] (unambiguous)
three ICl this (one) KCl drink

b. [$_{DP}$ [$_{DP}$ *yǐnliào*$_i$[$_{DP}$ *sān* *bēi*[$_{DP}$ t$_i$[$_{DP}$ *zhè (yī)* *zhǒng* t$_i$]]]]]
drink three ICl this (one) KCl

c. [$_{DP}$ [$_{DP}$ *sān* *bēi*$_i$[$_{DP}$ *yǐnliào*$_j$[$_{DP}$ t$_i$[$_{DP}$ *zhè (yī)* *zhǒng* t$_j$]]]]]
three ICl drink this (one) KCl

(17) a. [$_{DP}$ [$_{DP}$ *three glasses of*[$_{DP}$ *drinks of this kind*]]] (unambiguous)
b. [$_{DP}$ [$_{DP}$ *drinks*$_i$ [$_{DP}$ *three glasses of*[$_{DP}$ t$_i$[$_{DP}$ *of this kind* t$_i$]]]]]
c. [$_{DP}$ [$_{DP}$ *three glasses of* $_i$ [$_{DP}$ *drinks*$_j$[$_{DP}$ t$_i$[$_{DP}$ *of this kind* t$_j$]]]]]

(18) a. [$_{DP}$ [$_{DP}$ *drei Gläser*[$_{DP}$ *Getränke von dieser Sorte*]]] (unambiguous)
b. [$_{DP}$ [$_{DP}$ *Getränke*$_i$[$_{DP}$ *drei Gläser*[$_{DP}$ t$_i$[$_{DP}$ *von dieser Sorte* t$_i$]]]]]
c. [$_{DP}$ [$_{DP}$ *drei Gläser*$_i$[$_{DP}$ *Getränke*$_j$[$_{DP}$ t$_i$[$_{DP}$ *von dieser Sorte* t$_j$]]]]]

Obviously, there is an internal correlation among distributive interpretation, plural

specific NPs and ambiguous interpretation. Specific NPs are not ambiguous, whereas MCCs are ambiguous. Ambiguity results from distributive interpretation and collective interpretation. In brief, as long as the numeral occurring in front of the kind classifier is not the default numeral *yī* 'one', but *èr* 'two' or more than *èr* 'two' instead, then, MCCs may be ambiguous. If the semantic number of the "numeral + individual classifier" construction is more than that of the "numeral + kind classifier" construction, then, MCCs can only be interpreted collectively. If the semantic number of the "numeral + individual classifier" construction is equal to or less than that of the "numeral + kind classifier" construction, then, MCCs can be interpreted distributively or collectively. The above analysis can be summarized as (19).

(19) a. Num + ICl > Num + KCl (collective interpretation)

b. Num + ICl ≤ Num + KCl (collective interpretation or distributive interpretation)

When the numeral preceding the kind classifier is equal to or more than *èr* 'two', the embedded DP containing the kind classifier is characterized by discreteness, for the numeral being equal to or more than *èr* 'two' implies that the set is *èr* 'two' or more than *èr* 'two'. Each set is equal to an individual. In contrast, when the numeral preceding the kind classifier is *yī* 'one' or occurs covertly, the embedded DP containing the kind classifier is characterized by being convergent. It implies that there is only one set, which is equal to an individual. Therefore, the embedded DP containing the kind classifier is not characterized by discreteness. Correspondingly, MCCs can only be interpreted collectively. Only when the embedded DP is characterized by dispersibility can MCCs be interpreted in a distributive way. This is why MCCs are ambiguous when the specific NP contains *èr* 'two' or numerals more than *èr* 'two'.

5. Left peripheral deletion, numeral gapping, and generation of MCCs

According to the above discussion, MCCs include two numerals, both of which can modify the noun, respectively, to give rise to two nominal phrases, viz., the embedded DP and NumP. Therefore, we argue that MCCs are composed of two nominal phrases. The conjunction, which serves as the medium of linking, has been deleted in the process of word building to give rise to left peripheral deletion, as a result of which MCCs are generated. The process of the derivation can be shown as below.

(20) [$_{DP}$ DP NumP]

It follows that MCCs should be regarded as a double DP structure, which is headed by the embedded DP and takes NumP as its complement. There is no coordination between the embedded DP and NumP. Instead, there is a topic-predicate relationship between them.[①]

[①] Huang (1988), Pan Guoying (2012), and Yang Yongzhong (2015) argue that the complement has the function of predication.

The embedded DP c-commands NumP, which moves to the specifier position of the external DP across the board to give rise to the surface order of MCCs, as shown in (21).

(21) $[_{DP}[_{DP}$ D KCl NP$][_{NumP}$ Num ICl$]]$ → $[_{DP}[_{NumP}$ Num ICl$]_i$ $[_{DP}$ D KCl NP$]$ $t_i]$[①]

NumP, as a whole, moves to the specifier position of the external DP while the embedded DP stays in situ. It is noteworthy that MCCs are not coordination or adjunction constructions, but topic-predicate constructions. D and Num of MCCs project to the embedded DP and NumP, respectively. Both DP and NumP are contained in the same external DP and they share the possessor and its determiner. D and Num share the same NP, but they do not share the same determiner. Sharing NP is typically characteristic of MCCs and it is a necessary condition of generation of MCCs, whereas sharing the determiner is not a necessary feature of MCCs. Sharing NP means that DP and NumP within an MCC share the same NP. To put it differently, the MCC is a complex numeral-classifier structure formed by two numeral-classifier phrases which select for the same subject. There is no syntactic marking available for the specification of the relation between the classifiers. Semantically, a specific relation holds between the described concepts. Whether sharing the determiner takes place depends on the governing power of D and Num and their domain as well as the occurrence of the determiner. The embedded DP, however, dominates NumP. Furthermore, D modifies NP directly. NumP, which serves as the predicate, modifies NP indirectly, as a consequence of which it is in a subordinate position. The approach correctly predicts that NumP cannot be modified by the demonstrative and the possessive pronoun, as illustrated in (22).

(22) a. $[_{DP}[_{DP}$ *zhè zhǒng shū*$][_{NumP}$ *sān běn*$]]$
this KCl book three ICl

b. $^{*}[_{DP}[_{DP}$ *zhè zhǒng shū*$][_{NumP}$ *nà sān běn*$]]$
this KCl book that three ICl

c. $^{*}[_{DP}[_{DP}$ *zhè zhǒng shū*$][_{NumP}$ *wǒde sān běn*$]]$
this KCl book my three ICl

Therefore, left peripheral deletion is the prerequisite to the generation of MCCs via the

[①] Huang *et al*. (2009) argue that common nouns, in contrast to proper names and pronouns, are not base-generated in D or Spec of DP. Instead, they are base-generated in N. Accordingly, we expect that the order of [noun + number + classifier] cannot be base-generated. It cannot be derived by movement of N to D, either. This movement is ruled out by the Head Movement Constraint (Travis, 1984), which disallows movement of one head across another. This claim is, however, not true. The following data are well-formed and grammatical.

(i) a. *liǎng běn xiǎoshuō* b. *xiǎoshuō liǎng běn*
two Cl novel novel two Cl

(ii) a. *liǎng běn zhè zhǒng shū* b. *zhè zhǒng shū liǎng běn*
two ICl this KCl book this KCl book two Icl

As (i)-(ii) show, the order of [noun + number + classifier] can be base-generated. The order of [number + classifier noun] results from movement of the syntactic object "number + classifier".

combination of two nominal phrases. In terms of the whole structure, since an MCC has only one DP, viz., external DP, headed by the embedded DP, D consisting of the determiner *zhè* 'this' and the kind classifier *zhǒng* (KCl) modifies the noun directly. And the determiner, the kind classifier, and the noun constitute an inseparable syntactic object. To put it differently, NumP consisting of the numeral and the individual classifier cannot be inserted into the embedded DP, as shown in (23).

(23) a. $^{*}[_{DP}[_{DP}$ *zhè zhǒng* $[_{NumP}$ *sān běn*$]_i$ *shū*$]$ $t_i]$
this KCl three ICl book

b. $^{*}[_{DP}[_{DP}$ *zhè*$[_{NumP}$ *sān běn*$]_i$ *zhǒng shū*$]$ $t_i]$
this three ICl KCl book

NumP cannot modify N directly. In effect, it must be based on the medium of the embedded DP in order to establish connections with the noun. Only in this way can it assign subcategorization features to N and reach a conceptual-intentional agreement with it. The default numeral *yī* 'one' in front of the kind classifier occurs in the null form, which forces the kind classifier to move leftward to merge with D. Otherwise, the derivation would crash. It follows that the determiner occurring in front of the kind classifier cannot be deleted, or else there would be nothing for the kind classifier to depend on, as a consequence of which ungrammatical MCCs would be generated. Moreover, the kind classifier must merge with the determiner to constitute a syntactic object which merges with the noun to form a bigger syntactic object. Only when the default numeral occurs in the form of *yī* 'one' can the kind classifier move. Otherwise, it must stay in situ.

(24) a. $[_{DP}[_{DP}$ *zhè*$[_{NumP}$ *yī zhǒng shū*$][_{NumP}$ *sān běn*$]]]$
this one KCl book three ICl

b. $[_{DP}[_{DP}$ *zhè*$[_{NumP}$ *sān zhǒng shū*$][_{NumP}$ *sān běn*$]]]$
this three KCl book three ICl

As (24) shows, the numerals *yī* 'one' and *sān* 'three' merge with the kind classifier *zhǒng* (KCl). They can form a grammatical syntactic object without movement. Then, the syntactic object continues to merge with the noun *shū* 'book' to form bigger syntactic objects *yī zhǒng shū* (one KCl book, 'a kind of book') and *sān zhǒng shū* (three KCl book, 'three kinds of books'), respectively. This suggests that only when the numeral occurs in the overt form of *yī* 'one' or more than *yī* 'one' can the embedded DP be separated.

Obviously, the null numeral in the classifier construction must be syntactically constrained. To put it differently, it must be licensed. Therefore, supposing that the demonstrative is a condition that can license the null numeral, we can infer that the grammaticality of MCCs with the null numeral is associated with the occurrence of the demonstrative. All MCCs with the demonstrative can license the null numeral. The non-occurrence of the default numeral *yī* 'one' may be due to the dual compression of the demonstrative and the subsequent classifier,

as a consequence of which its phonetic form weakens and then disappears, which is similar to a syntactic empty category. When the operation at the level of syntax comes to an end, the operation procedure reaches the phonological level, in which some pure phonological operation may take place. Hence the non-occurrence of the default numeral *yī* 'one' can be regarded as a pure phonological operation. This is a reflection of the economy principle of natural languages at the level of phonology.

According to Yang Yongzhong (2011), only when NP projects to DP can the free variable contained in the construction be bound and the referential feature be licensed. Only in this way can MCCs be grammatical. The referential feature of NP can be realized in different forms in different languages. As a distributive operator, the demonstrative requires that the sorting key word be a set of plurality and the constituent that is distributed can only be a definite NP, which is bound by the existential quantificational operator, whereas an indefinite NP cannot serve as a distributed constituent. NP does not have any referential feature before it projects to DP. Hence it represents property instead of an entity. Only when it is preceded by a demonstrative can NP project to DP. In this case, the free variable contained in the construction can be bound, the referential feature can be licensed, and MCCs can be grammatical, for DP results from the projection of D after the referential feature has been licensed. The demonstrative can be regarded as a phrase-level operator, which can bind the variable in its c-command domain.

6. Genitivization, NP deletion, and the overt raising of NumP

According to the above-mentioned analysis, the primary reason for movement of the kind classifier of MCCs is the numeral gapping, due to which, the kind classifier KCl becomes isolated. As a consequence, it has to move, which further causes the noun N to become isolated. Therefore, the noun N must move together with the kind classifier KCl to merge with D. Different from the covert movement of KCl and N, NumP raising, which results from N deletion, is overt. NumP raising takes place for the purpose of establishing connections with N to modify it. The deletion of the conjunction results in the deletion of the left peripheral of the phrase NumP. According to the postulation that MCCs share the same noun, the noun of the phrase NumP must be deleted. Rather, the two co-referential objects must merge to form a syntactic object, which gives rise to the surface order. NumP assigns genitive features to the noun by means of the embedded DP. In this case, NumP raising can be regarded as a genitivization operation. NumP can be followed by the expletive *de* (AUX), whereas the embedded DP cannot, as illustrated below.

(25) a.	*sān*	*bēi*	*de*	*zhè*	*zhǒng*	*yǐnliào*
	three	ICl	AUX	this	KCl	drink

b.	**zhè*	*zhǒng*	*yǐnliào*	*de*	*sān*	*bēi*
	this	KCl	drink	AUX	three	ICl

As (25) shows, NumP can be genitivized, whereas the embedded DP cannot, which is different from the syntactic representations of NP/DP in usual circumstances. Consider the following data.

(26) a.	*fángwū*	*de*	*mén*		
	house	AUX	door		
	'the door of the house'				
b.	*zhè*	*zhuàng*	*lóu*	*de*	*mén*
	this	ICl	building	AUX	door
	'the door of this building'				

The embedded DP cannot genitivize NumP. In effect, the embedded DP can neither c-command nor govern NumP because NumP is not in the governing category of the embedded DP. The syntactic position of NumP is higher than that of the embedded DP.[①] NumP is base-generated behind the embedded DP. It moves to the position preceding the embedded DP for the purpose of transforming a topic construction into a nominal phrase, as shown in (27).

(27) DP (topic)-NumP (predicate)
→NumP (determiner)-DP (head/noun complement)

As (27) shows, NumP moves as a syntactic object. The constituents inside it, however, cannot be extracted, otherwise the island conditions would be violated (cf. Ross, 1967).

It needs to be pointed out that since genitivization operation is actually a process of establishing determination relation, it needs to be semantically licensed regardless of the head noun movement or base-generation. In view of logical semantics, the semantic connection is embodied by the intersection of DP and NumP. In the framework of the Minimalist Program, genitivization operation is actually a feature assignment operation to establish an agreement relation between the probe and the target [Along the line of Carstens (2016), bottom-to-top construction of syntactic objects often creates configurations in which an uninterpretable feature has a match in its sister, as a consequence of which agree must probe downward. Only locality between an uninterpretable feature and its valuer determines whether valuation can apply]. Some features of the lexical items involved in the syntactic derivation have been determined before the derivation takes place while others need to be

① The syntactic position of the numeral and the individual classifier is higher than that of the determiner. It is merely second to the genitive, as illustrated below.

a. $[_{DP}\,[_{D}\,[_{NumP}$ *sān* *běn*$_i$$[_{DP}$ *zhè zhǒng shū* $t_i]]]]$ b. $[_{DP}$ *wǒde*$[_{D'}\,[_{NumP}$ *sān* *běn*$_i$$[_{DP}$ *zhè zhǒng shū* $t_i]]]]$
three ICl this KCl book my three ICl this KCl book

c. $[_{DP}$ *wǒde* $[_{D'}$ *nà*$[_{NumP}$ *sān* *běn*$_i$$[_{DP}$ *zhè zhǒng shū* $t_i]]]]$
my that three ICl this KCl book

assigned in the course of the syntactic derivation. If the lexical items in the phase are transferred without having been assigned, uninterpretable features will lead to the crash of the derivation (Chomsky, 2000, 2007). The assignment and non-assignment of grammatical features correspond to the interpretability and uninterpretability of grammatical features, respectively. Along the line of Chomsky (2001), only uninterpretable features enter the derivation without values, and they are distinguished from interpretable features by virtue of this property. Transfer of syntactic objects to the interfaces for interpretation must remove uninterpretable features for convergence. Hence the interpretability of a feature must be encoded at the CI (Conceptual-Intensional) interface as valuation in the lexicon, which allows narrow syntax to further change feature values, i.e., unvalued features becoming valued ones. Though semantics is invisible to narrow syntax, the lexical valuation of a feature is a formal property which can be detected by narrow syntax. It is noteworthy that transfer and feature valuation must occur simultaneously for convergence so that transfer can see which feature goes from lexically unvalued to syntactically valued and hence it can remove these features in the syntactic object it sends to the interface in order to guarantee that CI converges (Richards, 2007; Chou & Fernández-Salgueiro, 2020). Therefore, the features which have not been assigned need to be assigned in the derivation of narrow syntax (Chomsky, 2004).

In accordance with this line of analysis, the ø-features of nouns and pronouns are interpretable, but their case features are uninterpretable, which need to be assigned in the syntactic derivation in order to establish the agreement relation between the probe and the target. In this case, the lexical items containing the probe and the target must be active[①] (Yang Yongzhong, 2010). The noun N in NumP is constrained syntactically. To put it differently, the semantic property of N in NumP must be licensed. The semantic reference of the deleted N and the semantic reference of the embedded DP are identical and hence they have the same semantic value. The semantic reference property of the noun in the embedded DP determines the semantic reference property of the deleted N. It follows that the syntactic and semantic features of N that occurs covertly must be licensed by the noun in the embedded DP that occurs overtly. If N in NumP that occurs covertly cannot be licensed syntactically, then, the construction is ungrammatical. Num and D of MCCs share N. The constituent of Num that is modified must occur covertly in view of syntax. According to Kayne (1994) and Nunes (1995:31-32), deletion is applied due to linearization. The form of

[①] A goal G is eligible for agreement if and only if G has at least one uninterpretable feature (Chomsky, 2000, 2001). Put differently, a nominal is introduced into the syntax with an unvalued uninterpretable case feature. It is eligible for agreement for as long as it has this uninterpretable case feature. Once it is valued for case, the uninterpretable case feature is deleted to avoid crash at the LF interface and the nominal is no longer available for agreement (Atlamaz & Baker, 2018).

the empty category in elliptical structures is base-generation of the null form. Only the constituent chosen by the head can occur in the null form. The null category in elliptical structures occurs for the purpose of satisfying the selection property of the head (cf. Li, 2005; Yang Yongzhong, 2013). Both NumP and the embedded DP are the maximal projections headed by Num and D, respectively. They are the heads of the two maximal projections. Therefore, they can take corresponding constituents as their complements. N in NumP that occurs covertly must be licensed by Num in terms of formal features. Moreover, it must be licensed by the noun complement of the embedded DP in terms of semantics.

It must be pointed out that features which need to be checked must match the checking mechanism. NumP is a lexical constituent, whereas DP is a functional constituent. They must match each other. Whether matching succeeds depends on the checking of proper local restraints. This suggests that NumP and DP require feature agreement and morphology agreement as well as semantic relevance and lexical relevance.[①] The feature matching constraint requires the lexical category to move to the corresponding position of the functional domain to check the features that match the functional category (Chomsky, 1995:228-229). In order to guarantee that the category that receives checking moves exactly to its feature-checking domain, movement must follow the Feature Matching Criterion, as shown in (28).

(28) Feature Matching Criterion

X moves to Y, and it can only move to Y, Y has features that match X (He Honghua, 2004; Yang Yongzhong, 2012).

It is suggested that NumP can cross over the specifier position of the embedded DP to move to the specifier position of the external DP without violating the Minimalist Link Condition (cf. Chomsky, 1995:311). The reason for this lies in that their features do not match each other. Nevertheless, according to the principle of cyclic derivation, NumP must move to the specifier position of the embedded DP to check its strong feature [+Q] before it moves to the specifier position of the external DP to check its features.

(29) a. $[_{DP}[_{D'}[_{NumP}$ Num $ICl_i[_{Num'}$ $t_i[_{DP}$ $t_i[_{DP}$ $[_{D'}$ D $KCl_j[_{NP}$ t_j $t_i]]]]]]]]$

b. $[_{DP}[_{D'}[_{NumP}$ *sān běn*$_i[_{Num'}$ $t_i[_{DP}$ $t_i[_{DP}$ $[_{D'}$ *zhè zhǒng shū*$_j[_{NP}$ t_j $t_i]]]]]]]]$

three ICl this KCl book

Along the line of Rizzi (1991), the specifier position of the functional category is essentially an A-position, i.e., argument position. It has features that match the features of NP. If this approach is correct, then, the specifier positions of the categories NumP and the embedded DP are both A-positions. NumP movement from its base-generated position to the

① The connection between the modifier and the modified must be licensed semantically (Yang Yongzhong, 2010).

specifier position is A-movement. In the same vein, movement of the specifier of NumP to the position of the external DP after checking its strong features is also A-movement. It is noteworthy that the specifier position is an A-position, which has L-related features, viz., lexical-semantic features. NumP moves from its base-generated position to the specifier position of the embedded DP, which forms a chain, of which the head and the tail are both L-related positions. The head c-commands the intermediate trace and the tail. As (29) shows, *sān běn* 'three ICl' first moves to the specifier position of the embedded DP to check its strong features, viz., θ-feature, including person, gender, number, definiteness and specificity. *Zhè zhǒng* 'this KCl' moves out of NP and occupies the head position of DP to check its θ-features, viz., person, gender, number, definiteness, and specificity. *Sān běn* 'three ICl' continues to move to the specifier position of NumP to check its strong feature [+Q].

The next question is why only NumP can move to the specifier position of the external DP while the embedded DP cannot. What are the constraints? We argue that the reason lies in the following respects. Firstly, the embedded DP contains kind classifiers which cannot occur between D and NumP. Otherwise, the derivation may not converge. Secondly, the embedded DP has checked its θ-features in the embedded D position, as a consequence of which it cannot move further. In contrast, NumP has not checked its number feature in the specifier position of the embedded DP and hence it needs to move further to the specifier position of NumP. Thirdly, there is a numeral *yī* 'one' in front of the kind classifier. Generally speaking, the determiner can only move to the position D of the external DP alone, whereas the kind classifier, together with the null numeral *yī* 'one', pied-pipes to the specifier position of NumP of the external DP. In this case, the derivation may crash, for the specifier position of NumP has been occupied by the numeral phrase, as a consequence of which it can contain no kind classifier and no null numeral *yī* 'one'. Even if the determiner moves alone, the construction is ungrammatical, for the kind classifier and the null numeral *yī* 'one' depend on the determiner. The kind classifier, the numeral, and the determiner constitute a syntactic object that cannot be separated. It follows that it is the kind classifier and the null numeral *yī* 'one' that constrain movement of the determiner. If no kind classifier and no null numeral *yī* 'one' occur, then, the determiner can occur in front of the numeral phrase. Nevertheless, such a construction is not an MCC, but an SCC instead, as illustrated in (30) and (31).

(30) SCCs

a.	*zhè*	s*ān*	*běn*	*shū*
	this	three	ICl	book
b.	**shū*	*zhè*	s*ān*	*běn*
	book	this	three	ICl

c. *zhè*	*shū*	*sān*	*běn*	
this	book	three	ICl	

(31) MCCs

a. *sān*	*běn*	*zhè*	*zhǒng*	*shū*
three	ICl	this	KCl	book
b. *zhè*	*zhǒng*	*shū*	*sān*	*běn*
this	KCl	book	three	ICl
c. **zhè*	*zhǒng*	*sān*	*běn*	*shū*
this	KCl	three	ICl	book

Only the kind classifier can occur between the determiner and the noun, whereas both the individual classifier and the kind classifier can occur between the numeral and the noun. As the contrast between (30) and (31) shows, NumP takes scope over the embedded DP, but the embedded DP cannot cross over NumP. The embedded DP takes scope only over NP, whereas NumP takes scope over the whole embedded DP which contains NP. In terms of features, NumP has number features as well as unspecific and indefinite features while the embedded DP has definite and specific features but no number features. To put it differently, the former has strong quantificational features while the latter has weak quantificational features. Strong features must be checked. Otherwise, the derivation would not converge. In view of semantics, NumP has unspecific meanings and quantificational concepts, whereas the embedded DP has specific meanings and non-quantificational concepts.

According to the Phase Impenetrability Condition (PIC), the domain of H (head) is not accessible to operations outside the phase, only H and its edge (viz., specifiers and adjuncts to H or HP) are accessible to such operations. To put it differently, the operation except HP (head phrase) cannot access the constituents within the scope of the head H. But it can access H and its edge, viz., the specifier of HP or the constituent adjoined to HP. Once a phase is formed, the constituents can only be moved out of it, but no constituent can be moved into it. The accessibility of HP and its edge depends on the next strong phase, as shown in (32) (Chomsky, 2000, 2001, 2004; Dai Manchun, 2003:147).

(32) $[_{ZP}\ Z\ldots[_{HP}\ \alpha[H\quad YP]]]$

The intuition underlying the PIC is that once a given syntactic object has been judged convergent, it is taken to be ready and does not participate in any other syntactic computations. To put it differently, the computational system does not backtrack to reevaluate a previous convergent verdict under new scenarios. Since only active constituents (i.e., constituents with unvalued [-interpretable] features) may participate in a checking/ agreeing relation, if a syntactic expression is judged convergent, all of its constituents are by definition inactive for further computations (Hornstein *et al*., 2005:348-349).

Let's take for example *sān běn zhè zhǒng shū* (three ICl this KCl book, 'three books of

this kind'). Its derivation is shown below.

(33) *sān běn*[$_{DP}$ ~~*sān běn*~~[$_{D}$ *zhè zhǒng*[$_{NP}$ *shū*][$_{NumP}$ ~~*sān běn*~~]]]

As (33) shows, *sān běn* 'three ICl' moves to the edge of the embedded DP before spell-out, for the embedded DP has no corresponding feature [+Q] to match the feature [+Q] of *sān běn* 'three ICl'. Consequently, *sān běn* 'three ICl' cannot check its relevant features. The interpretable features of *sān běn* 'three ICl' are the target that the next probe D can access. The surface order is generated by means of derivation of the next external DP[①] (Dai Manchun, 2003:147-148).

(34) a. *sān běn*[$_{DP}$ ~~*sān běn*~~[$_{D}$ *zhè zhǒng*[$_{NP}$ *shū* ~~*sān běn*~~]]] (head moving out)

b. *sān běn*[$_{DP}$ ~~*sān běn*~~ [$_{D}$ *zhè zhǒng*[$_{NP}$ ~~*sān běn*~~ *shū*]]] (head moving out)

As (34) shows, *sān běn* 'three ICl' in the embedded DP bears interpretable features while the external DP has no corresponding functional category that bears the same features. Due to feature triggering, *sān běn* 'three ICl' moves to the edge of the embedded DP to be the target of the probe D, waiting for the probe D of the next higher phase DP that bears corresponding features to match it. D is the head of the strong phase, for it bears θ-features. A-movement that is related to θ-features crosses over D instead of staying at the edge of the embedded DP. Interaction across phases can take place at the edge of the subordinate phase. The probe D can operate with different targets to delete the uninterpretable features of *zhè zhǒng* 'this KCl', which causes *sān běn* 'three ICl' to move and assign sub- categorization features to *shū* 'book'. To put it differently, it assigns numeral features to *shū* 'book'. Feature checking involves triple matching,[②] viz., the matching between the probe D and *zhè zhǒng* 'this KCl', the matching between the probe D and *sān běn* 'three ICl', and the matching between the probe D and *shū* 'book'. *Zhè zhǒng* 'this KCl' and *shū* 'book' do not arouse interference in the derivation of the phase. However, *zhè zhǒng* 'this KCl' can obstruct movement of *sān běn* 'three ICl', for *zhè zhǒng* 'this KCl' and *shū* 'book' match firstly, as a result of which it is first recognized by language computation. Since the trace cannot pied-pipe, it may obstruct movement. No operation, or rather, no matching operation can take place in inert traces. When the pied-piping category *sān běn* 'three ICl' is situated at the highest point of the cyclic derivation of the phase, its PF (phonological form) is realized and gains semantic expression (Chomsky, 2001; Dai Manchun, 2003:147-158).

(35) *sān běn*[$_{β}$ ~~*sān běn*~~[$_{DP}$ [$_{DP}$ [$_{α}$ ~~*sān běn*~~[$_{D}$ *zhè zhǒng* [$_{DP}$ *shu* ~~*sān běn*~~]]]]]]

As (35) shows, *sān běn* 'three ICl' moves covertly to the position [Spec DP], and hence it

① See Svenonius (2004) and Bošković (2014) for a detailed discussion of the status of DP.

② Feature checking (or valuation) is obtained by means of the operation agree, which operates between the c-commanding item, viz., the probe, and the c-commanded item, viz., the goal. The probe bears interpretable features and searches its c-command domain for an active constituent bearing the uninterpretable counterparts of its unvalued features (Cyrino & Espinal, 2020).

c-commands *zhè zhǒng shū* (this KCl book, 'this kind of book') at LF (logical form), which affects semantics. To put it differently, the scope of *sān běn* 'three ICl' may be bigger than that of *zhè zhǒng shū* (this KCl book, 'this kind of book'). Another interpretation is that the scope of *zhè zhǒng shū* (this KCl book, 'this kind of book') is bigger than that of *sān běn* 'three ICl', for base-generation and *zhè zhǒng shū* (this KCl book, 'this kind of book') in the phase DP c-commands *sān běn* 'three ICl'. Therefore, *sān běn zhè zhǒng shū* (three ICl this KCl book, 'three books of this kind') has double meanings, viz., specific and unspecific meanings. Furthermore, when the Num in NumP is smaller than the Num in the embedded DP, only distributive interpretation is allowed. In contrast, when the Num in NumP is equal to or bigger than the Num in the embedded DP, both distributive and collective interpretations are allowed. This suggests that the quantity of Num constrains the selection of semantic interpretation. The reason lies in that NumP takes scope over the embedded DP. If the Num in NumP is smaller than the Num in the embedded DP, then the NumP takes a narrow scope and the embedded DP takes a wide scope. In this case, there is a limited number of possibilities of matching between the NumP and the embedded DP. In contrast, if the Num in NumP is equal to or bigger than the Num in the embedded DP, NumP may take a narrow scope or a wide scope. In this case, there is an unlimited number of possibilities of matching between the NumP and the embedded DP. Obviously the intersection relationship between classifiers and the interpretation of the scope are subject to the local conditions of syntax, as a consequence of which the scope of quantifiers is confined to the closed domain in which they are positioned and is subject to the island conditions (cf. Johnson, 2000).

It is noteworthy that the scope of NumP is bigger than that of the embedded DP, which serves as the complement of NumP. The embedded DP contains a kind classifier, which is adjacent to the noun and agrees with it in terms of gender, number and person. The classifier inside NumP denotes more general semantic properties and has no direct semantic connection with the noun. In contrast, the classifier inside the embedded DP is directly associated with the noun. Therefore, in the syntactic derivation, NumP checks the feature [+Q] only, whereas the embedded DP checks the θ-features. Moreover, it must agree with and match the noun. The kind classifier cannot precede the other classifiers. Instead, it must be adjacent to the noun. Rather, it must precede or follow the noun. NumP bears the uninterpretable feature [+Q], which must be checked in the derivation. If NumP which bears uninterpretable features enters PF and LF, the derivation will crash.

According to the phase theory, the derivation can access the lexicon in a way of successive cyclicity. To put it differently, it can access a certain lexical item repetitively, which is not at odds with sentence construction. The head H of the phase PH can assign the features EPP (Extended Projection Principle) and P (peripheral) (Chomsky, 2000). What makes difference here is that the constituent that moves to the edge of the phase does not receive

evaluation/interpretation and transfers the phonological information to the system PF.[①] The c-command relationship arising from merger is a basic syntactic relationship. The order at PF completely depends on remerger/movement, which raises the relevant category with some overt or covert features to the corresponding specifier position with the capability of attracting F, i.e., feature. The asymmetrical c-command relationship deriving from merger determines the order of the constituents in MCCs (cf. Dai Manchun, 2003:93-94).

Furthermore, at LF, all constituents of a phase are uniform in terms of feature composition. To put it differently, every constituent of a phase has the same set of features which are visible at LF. In principle, there are two possible ways for the phase to become uniform, either its head somehow gains unchecked features, or the feature of the copy is eliminated. The first possibility can be easily discarded, for gaining an uninterpretable feature is at odds with one of the main purposes of the mapping from the numeration to LF, which is to eliminate uninterpretable features. Exploring the second possibility, we can formalize the convention suggested by Chomsky (1995:303). We argue that deletion targets a single feature per application. Since no uninterpretable feature survives at LF, Full Interpretation is satisfied and the derivation converges as desired. This is a natural assumption to make: if Full Interpretation at LF could simply trigger deletion of uninterpretable features, no movement operation would ever be necessary. The intuition is that the system need not care about the feature composition of phases in overt syntax, because phases are not PF objects. To put it differently, overt syntax only cares about what is relevant to PF and LF (cf. Nunes, 2004:70-74). In effect, LF movement takes place at the phase level. The moved constituent does not receive interpretation and transfers the phonological information to the system PF.

Based on the above discussion, we argue that all categories enter syntactic structure by means of derivation. The ways of derivation include merger and remerger/movement, of which the former is a basic operation, while the latter is an operation of feature checking. All lexical incorporations introduce categories with corresponding features into syntactic structure. Movement or remerger of any category results from merger of the given lexical items and the relative functional categories. The relationship of c-command resulting from merger is a basic relationship of syntax. The order at PF completely depends on movement or remerger, which raises the relative category to the corresponding specifier position with the attracting feature F. The position of merger is determined by semantics. The categories that enter syntactic structure by means of merger change their order via movement. The overt or covert selection serves as a parameter setting, which embodies the surface difference of sentence structure. Movement or remerger is based on the structural constitution of

[①] As Carstens (2016) points out, every uninterpretable feature must seek valuation in its sister on merge. If an uninterpretable feature fails to be valued before phasal transfer, the result is a PF crash owing to unclarity as to how a phase should be pronounced.

functional categories. After base-generation takes place, lexical items enter structure. All categories and lexical items bear strong or weak features and hence their matching capabilities can attract (cf. Dai Manchun, 2003:60-112).

7. Conclusion

MCC is a linguistic phenomenon worth studying. They are widely found in Chinese. How to integrate them into the framework of generative grammar and to provide a plausible account for it is a subject of theoretical value and practical significance. Classifiers are characterized by scope property. The analysis and interpretation of MCCs must be related to the scope of classifiers. What is the interactive relationship between the two classifiers inside MCCs? How are they represented syntactically? How are the scopes of the two classifiers determined? What factors influence the semantic interpretation and structural analysis of MCCs? What syntactic principles and constraints is the interaction between the classifiers, the numeral, and the demonstrative subject to? In order to answer the questions mentioned above, this paper addresses MCCs in terms of internal structure and derivation. It finds the universal features that are hidden behind MCCs. MCCs are composed of two classifiers, which can modify the noun, respectively, to form two nominal phrases, viz., the embedded DP and NumP. Therefore, MCCs are generated by means of merger of two nominal phrases. In effect, generation of MCCs undergoes deletion of the conjunction that serves the function of linking and the left peripheral deletion. The primary reason for movement of the kind classifier of MCCs is numeral gapping. The ambiguity of MCCs is owing to the scope of classifiers. This approach can provide a plausible account for the scope of the genitive and the determiner of MCCs as well as variable binding. It overcomes the shortcomings of conventional explanations of MCCs. Furthermore, it can account for the other features of MCCs. It correctly predicts that NumP cannot be modified by the demonstrative and the possessive pronoun.

Abbreviations

3	Third Person	$_i$	Identical Reference
α	A Phase	ICl	Individual Classifier
θ	Theta-Role	KCl	Kind Classifier
Ø	Empty Constituent	LF	Logical Form
AUX	Auxiliary Word	MCC	Multiple Classifier Construction
CI	Conceptual-Intensional	N	Noun
D	Determiner	Spec	Specifier
DP	Determiner Phrase	t	Trace
e	Entity	t_i	Trace with the Identical Reference
GEN	Genitive Case	NP	Noun Phrase
H	Head	Num	Numeral
HP	Head Phrase	NumP	Numeral Phrase

PartP	Partitive Phrase	v	Light Verb
PIC	Phase Impenetrability Condition	YP	Maximal Projection Headed by a Constituent Y
PST	Past Tense	Z	Constituent Differing from X or Y in a Phrase if It Is Composed of X, Y and Z
Q	Quantification		
SCC	Single Classifier Construction	ZP	Maximal Projection Headed by a Constituent Z
SG	Singular		

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