How to reconcile maximal and non-maximal Mandarin *mei*: distributivity without maximality[1]

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Abstract. Traditionally translated as 'each', Mandarin *mei* has been regarded as a strong candidate for universal quantifiers due to its purported ability to express *maximality* and distributivity. But *mei*'s status has been debated as it canonically co-occurs with *dou*, which also appears to enforce maximality in a manner similar to *all*. This paper presents novel data showing that *dou*, rather than *mei*, is responsible for expressing *maximality*. The existence of distributive items like *mei*, which enforce distributivity but do not require maximality, underscores the need to distinguish maximality from distributivity as a separate semantic property, as recently argued by Haslinger et al. (2025).

Keywords: Mandarin *dou*, *mei*, Distributivity, Maximality.

1. Introduction

Universal quantifiers (UQs) appear to be omnipresent in natural languages, yet their realization in Mandarin remains a matter of debate. Mandarin *mei* has been considered a strong contender due to its ability to express both *maximality* and distributivity by ensuring (a) a distributive interpretation and (b) the absence of exceptions. This is partly reflected in its English translations. Traditionally rendered as 'each', *mei* selects for a 'numeral + classifier + noun' complex (henceforth NumP [2]), as illustrated in (1).

(1) mei yi *(ge) haizi
MEI one CLF kid
'each kid'

Sentence (2) containing *mei* has only a distributive reading, meaning that (2) can express only that the property of eating one apple holds for each kid individually.

(2) mei (yi) ge haizi chi le yi ge pingguo
MEI one CLF kid eat PRF one CLF apple
'Each kid ate one apple.' ✓ DISTRIBUTIVE, ✗ CUMULATIVE, ✗ COLLECTIVE

Just like English *each*, *mei*, as a distributive universal, is also considered to contribute a maximality effect: it requires that the property denoted by the VP hold of the maximal plurality contributed by the restrictor. Consider (2) as an example. Assuming that the NumP *yi ge haizi* 'one CLF kid' denotes a predicate of pluralities of kid(s) whose cardinality is 1, as in (3a), then in a context with three kids, the **maximal element** of its denotation – according to the definition in (4)– would be $a+b+c$, the plural individual that includes every single kid. [3]

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[2]Note that 'Num' in NumP refers exclusively to cardinal numerals throughout this work, rather than to the grammatical category of NUMBER, which encodes plurality or singularity.

[3]In this work, I follow the assumptions of many previous studies (Landman 1989; Link 1983; Schwarzschild 1996) that the domain of entities D_e is closed under sum formation ('$+$') and partially ordered based on the mereological part-of relation ('$\sqsubseteq$'). For an overview of mereological semantics, see Champollion and Krifka (2015).

(3) $[\![yi\ ge\ haizi]\!] = \lambda x.\#(x) = 1 \wedge {*}\mathsf{kid}(x)$

(4) **Maximality**
For any set P, x is the maximal element of P iff $x \in P \wedge \forall y(y \in P \rightarrow y \sqsubseteq z)$

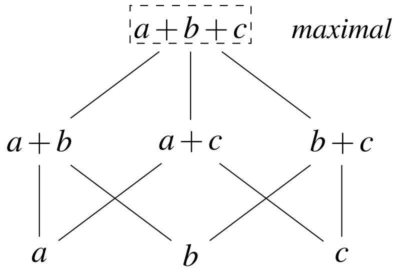


Figure 1: Maximal element of 'one CLF kid'

According to the definition of maximality in (4), sentences like (2) containing *mei* should not allow for exceptions—that is, no child should fail to satisfy the property of eating one apple. This is indeed the attested meaning of the *mei*-sentence in (2): (2) is false in non-maximal scenarios like (5a) but true in scenarios like (5b).

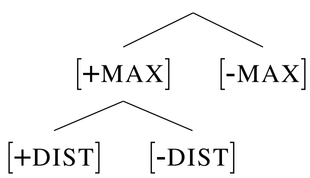
(5) CONTEXT: Jane is trying to get each of her three children, Anna, Bea, and Carina, to eat one apple after lunch.
a. SCENARIO 1: Anna ate one apple, Bea ate one apple, Carina didn't eat any apples.
b. SCENARIO 2: Anna ate one apple, Bea ate one apple, Carina ate one apple.

In natural language, certain expressions, such as English numeral-modified plural NPs, enforce maximality while allowing for non-distributive interpretations. Distributive universals like *every* and *each* impose both distributivity and maximality, whereas definite plurals impose neither. See Figure 2 for an overview. [4]

This raises the following empirical questions: Is the gap of [+DIST], [-MAX] attested? Can we identify any lexicalized UQ that allows for a non-maximal interpretation?

If no such UQ exists, this would indicate a geometric relationship between the semantic properties of distributivity and maximality, as illustrated in (6). This structure suggests an implicational universal: [+DIST] UQs must also be [+MAX], but not necessarily *vice versa*.

(6) **A radically-simplified semantic-feature geometry**



But is distributivity inherently incompatible with non-maximality? To the best of my knowledge, this question has not been extensively explored in the literature, with the exception of

[4] Note that I use [+DIST] and [-DIST] to distinguish obligatorily distributive from non-obligatorily distributive expressions—that is, expressions that allow for both distributive and collective/cumulative interpretations. In other words, [+DIST] and [-DIST] are non-symmetric.

Maximality (MAX)

Distributivity (DIST)		
	[**+DIST**], [**+MAX**] e.g. *every*, *each*	[**-DIST**], [**+MAX**] e.g. *three*
	[**+DIST**], [**-MAX**] ?	[**-DIST**], [**-MAX**] definite plurals

Figure 2: A potential paradigm gap?

Haslinger et al. (2025), who argue against such an incompatibility. Counter-evidence comes from the German distance-distributive element *jeweils*: experimental findings by Haslinger et al. (2025) indicate that some speakers accept *jeweils*-sentences in non-maximal distributive scenarios, such as the one in (7a). In (7a), an exception is present—one box does not contain two magnets. Nonetheless, (7b) is judged as true in this scenario.

(7) a. SCENARIO: Anna distributed 9 strong magnets, which should not be stored together, in 5 boxes. Four boxes contain two magnets, the fifth contains one. On the way home, Anna's co-driver reads the instructions to her. They say: 'Each magnet absolutely needs to be stored separately, even just two magnets in the same box can trigger a horrible explosion.'
Anna exclaims: *Oh no, we have to turn around...*

b. In den Boxen sind jeweils zwei Magnete!
in the boxes are each two magnets
'There are two magnets in each of the boxes!'

(Haslinger et al. 2025: pg. 11)

In this paper, I argue that Mandarin *mei*, like *jeweils*, provides additional empirical evidence against the implicational universal that [+DIST] UQs must also be [+MAX]. Another morpheme, *dou*, which canonically licenses *mei*-phrases in subject positions, is the true source of maximality. The picture is further complicated by the fact that *dou* itself is also obligatorily distributive (as will be discussed in detail in Section 3). The resulting landscape of distributive items in Mandarin includes at least two distinct types, as listed in (8), reflecting intricate variation within a single language regarding whether non-maximal interpretations are permitted.

(8) **A typology of Mandarin distributive items**

a. *mei* ⇝ [+DIST], [-MAX]

b. *dou*, *mei...dou* ⇝ [+DIST], [+MAX]

I further argue that the empirical observations in Mandarin necessitate revisiting the conventional definition of predicate-level distributivity operators, as exemplified in (9). These definitions hard-wire maximality into the process of distributive predicate application, either to every atom of the plurality (Link 1991; Winter 2001) or to salient non-atomic entities, such as *covers* (Schwarzschild 1996).

(9) **Conventional DIST operator that forces maximality**
$[\![\text{DIST } P]\!] = \lambda X_e.\forall x[x \sqsubseteq_{\text{AT/COV}} X \rightarrow P(x)]$

The paper is structured as follows. As background, Section 2 introduces the puzzling licensing conditions of *mei*-phrases in subject positions and the role of *dou* in licensing *mei*. Section 3 presents data showing that although both *mei* and *dou* are obligatorily distributive, only *dou*, not *mei*, blocks non-maximality. Section 4 proposes a tentative analysis to disentangle maximality from the DIST operator: distributivity in a sentence with *mei* is contributed by a covert δ operator, which distributes the VP-property existentially over the elements of the plurality denoted by the *mei*-phrase. In contrast, *dou* is the overt realization of the canonical distributivity operator, as in (9), which enforces maximality. Section 5 discusses the implications of introducing a non-maximal distributivity operator, addresses several remaining issues, and concludes.

2. The puzzles of *mei* and *dou*

As discussed in Section 1, *mei* appears to impose both obligatory distributivity and maximality in sentences like (2), repeated below in (10).

(10) mei (yi) ge haizi chi le yi ge pingguo
MEI one CLF kid eat PRF one CLF apple
'Each kid ate one apple.'
✓ DISTRIBUTIVE, ✗ CUMULATIVE, ✗ COLLECTIVE, ✗ NON-MAXIMAL

However, sentences such as (10) constitute exceptional cases where *mei*-phrases can appear in subject positions, provided that a NumP like 'one CLF apple' is present in the VP (first observed by Huang 1996). Canonically, however, *mei*-subjects are licensed by another overt element, *dou*, within the clause, as exemplified in (11). [5]

(11) a. **Intransitive verb**
mei-(yi)-ge haizi *(**dou**) xiao le
MEI-one-CLF kid DOU smile PRF
'Every kid laughed.'

b. **Non-episodic context**
mei-(yi)-ge laoshi *(**dou**) keyi likai jiaoshi
MEI-one-CLF teacher DOU may leave classroom
'Every teacher may leave the classroom.'

c. **Transitive verb**
mei-(yi)-ge haizi *(**dou**) chi le pingguo
MEI-one-CLF kid DOU eat PRF apple
'Every kid ate an apple/apples.'

In a sentence containing *mei*-subjects, *dou* appears in a position following the *mei*-subject and preceding the verb and its aspect markers. All else being equal, the word order of a clause with *dou* can be schematized as follows in (12):

[5] I do not intend to make a strong claim that only *dou* can license the occurrence of *mei*. The so-called 'co-occurrence' requirement is far from an absolute constraint, given the existence of some, if not many, exceptions.

(12) [*mei*-subject – DOU – Verb].

This is the so-called "*mei-dou* co-occurrence" puzzle in Mandarin, which casts doubt on the UQ status of *mei*. Many accounts (e.g., Lin 1998) interpret this 'co-occurrence' pattern as evidence that *mei* lacks proper quantificational force and should not be analyzed as a *generalized quantifier*, like the English determiners *every* or *each*. Instead, universal elements such as *mei* are argued to denote "a function that takes a predicate and returns the maximal collection of individuals denoted by the predicate" (Lin 1998: 238), similar to the English definite article *the*. Distributive quantificational force is instead provided by *dou* or a covert DIST operator. This is by no means a novel idea; similar proposals have been made for English by Beghelli and Stowell (1997) and Szabolcsi (1997). [6]

Another line of proposals shares the general intuition that either *mei* or *dou* lacks inherent quantificational force, but they differ in technical implementation. These accounts treat *mei* as a true UQ, akin to *each*, while attributing *dou*'s semantic contribution to presupposition (e.g., Liu 2021). The main motivation for this analysis comes from the minimal pair in (13). At first glance, (13a) without *dou* and (13b) with *dou* appear to be semantically equivalent.

(13) a. mei-(yi)-ge keren chi-le yi-dao-cai
MEI-one-CLF guest eat-PRF one-CLF-dish
'Each guest ate one dish.'
b. mei-(yi)-ge keren dou chi-le yi-dao-cai
MEI-one-CLF guest DOU eat-PRF one-CLF-dish
'Each guest ate one dish.'

In the following section, I provide evidence that both camps fail to account for two crucial yet often overlooked empirical observations: (i) unlike *each*/*every*, exceptional *mei*-sentences without *dou* allow for non-maximal interpretations; and (ii) *dou* induces truth-conditional differences by enforcing both maximality and distributivity. I will focus on analyzing these two key data points in detail.

3. Reevaluation of *mei* and *dou*

3.1. *Dou*, not *mei*, blocks non-maximality

Recall our definition of maximality in Section 1: the use of a distributive universal like *each* requires that the property denoted by the VP hold of the maximal plurality contributed by the restrictor. The interpretation of *mei*-sentences without *dou*, as in (14), appears to confirm that *mei* enforces both distributivity and maximality.

(14) mei-(yi)-ge keren chi-le yi-dao-cai
MEI-one-CLF guest eat-PRF one-CLF-dish
'Each guest ate one dish.'
INTERPRETATION: *for each individual guest x, x ate one dish.*

If *mei* indeed behaves similarly to *each*, then there are two possible ways to approximate its semantics. It either has a meaning akin to a conventional DIST operator, such that sentence (14) has the LF in (15), or *mei* itself is not inherently quantificational. Instead, it functions as a 'sum' operator (Lin 1998), selecting the maximal plural individual within the domain denoted by its sister NumP, while a covert DIST operator supplies the quantificational force, as illustrated by

[6] In Beghelli and Stowell (1997)'s system, *every*-phrases introduce variables, just as indefinites do.

the LF in (16). [7]

(15) a. **LF with quantificational *mei*:**

- $\forall x[\#(x) = 1 \wedge *\mathsf{guest}(x) \rightarrow \mathsf{AteOneDish}(x)]$
  - $\lambda Q_{et}.\forall x[\#(x) = 1 \wedge *\mathsf{guest}(x) \rightarrow Q(x)]$
    - mei$_{et,<et,t>}$ $\lambda P_{et}.\lambda Q_{et}.\forall x[P(x) \rightarrow Q(x)]$
    - 1 clf guest$_{et}$ $\lambda x.\#(x) = 1 \wedge *\mathsf{guest}(x)$
  - VP$_{et}$ 'ate one dish' $\lambda x.\mathsf{AteOneDish}(x)$

b. $[\![mei_{\text{DIST}}]\!] = \lambda P_{et}.\lambda Q_{et}.\forall x[P(x) \rightarrow Q(x)]$

(16) a. **LF with non-quantificational *mei*:**

- $\forall x[x \sqsubseteq \bigoplus(\{x|\mathsf{guest}(x) \wedge \#(x) = 1\} \rightarrow \mathsf{AteOneDish}(x)]$
  - $\bigoplus(\{x| *\mathsf{guest}(x) \wedge \#(x) = 1\}$
    - mei$_{et,e}$ $\bigoplus$
    - 1 clf guest$_{et}$ $\lambda x.\#(x) = 1 \wedge *\mathsf{guest}(x)$
  - $\lambda X_e.\forall x[x \sqsubseteq X \rightarrow \mathsf{AteOneDish}(x)]$
    - DIST$_{et,<e,t>}$ $\lambda P_{et}.\lambda X_e.\forall x[x \sqsubseteq_{at/cov} X \rightarrow P(x)]$
    - VP$_{et}$ 'ate one dish' $\lambda x.\mathsf{AteOneDish}(x)$

b. $[\![mei_{sum}\ P]\!] = \bigoplus(\{x : P(x)\})$

The two analyses above differ in whether *mei* should be treated as quantificational. However, regardless of which version of the LF we adopt, it follows that universal quantification is hard-wired either into the semantics of mei_{dist} in (15b) or into the conventional covert DIST operator in (16a).

This prediction – that *mei* obligatorily imposes maximality – is challenged by cases where *mei* combines with a NumP where $|\text{NUM}| > 1$, as reported in Sun (2017). Consider the following sentence in (17):

(17) **Scenario:** For the Christmas dinner, there are four cooks, Anna, Bea, Carina and David.

a. mei liang ge chushi zuo-le yi dao cai
MEI two CLF cook make-PRF one CLF dish
'(Each one of the) Groups of two cooks made one dish.'
→ *In total, 2 dishes were made.*

b. mei liang ge chushi **dou** zuo-le yi dao cai
MEI two CLF cook **DOU** make-PRF one CLF dish
'Every conceivable pair of two cooks made one dish.'
→ *In total, 6 dishes were made.*

The *mei*-sentence in (17a), without *dou*, is true if and only if at least one of the following three conditions holds:

[7]In this work, I use the binary sum operator "+" and the generalized sum operator "$\bigoplus$", whose definitions are given in (i).

(i) a. **Binary sum operator "+"**
$x + y := \iota\Sigma[sum(\Sigma, x, y)]$

b. **Generalized sum operator** "$\bigoplus$"
Given any non-empty set X, $\bigoplus X := \iota\Sigma[sum(\Sigma, X)]$

(18) a. *a* and *b* as a group made one dish, *c* and *d* as a group made one dish;
b. *a* and *c* as a group made one dish, *b* and *d* as a group made one dish;
c. *a* and *d* as a group made one dish, *c* and *b* as a group made one dish;

When *dou* is present, (17b) is true if and only if all six possible pairs of cooks, namely, *ab*, *cd*, *ac*, *bd*, *ad*, and *cb*, each made one dish.

One way to understand the contrast between the interpretations of *mei* vs. *mei...dou* sentences is in terms of the *maximality/non-maximality contrast*. It appears that *mei* alone only ensures a weaker 'cover' reading, where some but not all pairs of two cooks formed a group and each group made one dish. The sentence is true as long as the pairs of two cooks who formed a group and made one dish constitute a *minimal cover* of the maximal plurality containing all the cooks in the context. The notion of minimal cover is formally defined in (19). A set of all possible minimal covers is provided in (20), with each cover corresponding to a distinct reading of the *mei*-sentence in (18).

(19) **Minimal Cover** : X minimally covers Y $\stackrel{\text{def}}{=}$
a. $X \subseteq Y$
b. $\bigoplus X = \bigoplus Y$
(The sum of the X's members is equal to the sum of Y's members.)
c. X does not contain the empty set $\varnothing$.
d. $\forall Z, Z' \in X \wedge Z \neq Z'$: $Z \cap Z' = \varnothing$
(X's blocks do not overlap.)

(20) An exhaustive list of possible *minimal covers* of $a+b+c+d$:
a. $\{a+b, c+d\}$
b. $\{a+c, b+d\}$
c. $\{a+d, c+b\}$

In contrast, *mei* combined with *dou* in (17b) ensures the truly maximal interpretation where every conceivable pair of cooks made one dish.

The observation above calls for a serious reconsideration of *mei*'s ability to block non-maximal interpretations. It appears that the presence of *dou*, *de facto*, ensures the maximal reading. In light of our initial definition of maximality, the weaker 'cover' reading can be understood as a form of non-maximality effect, formally defined in (21). Specifically, a minimal cover such as $\{\uparrow(a+b), \uparrow(c+d)\}$ cannot constitute the maximal element of the join semi-lattice defined by $(\{\uparrow X \mid *\mathsf{cook}(X) \wedge \#(X) = 2\}, \sqsubseteq)$. Here, I use the group formation operator "↑" (*à la* Landman 1989) to capture the interpretation of 'groups of two cooks'.

(21) **Non-maximality**
For any set P, x is not a maximal element of P iff $x \in P \wedge \exists y \in S[x \sqsubset y]$.

This implies that neither of the two analyses of *mei* introduced above can account for the weaker non-maximal reading. In a context with four cooks, assume that the sister NumP of *mei* denotes the set of pluralities of two cooks who formed a group, as in (22):

(22) $\{\uparrow X \mid *\mathsf{cook}(X) \wedge \#(X) = 2\}$
$= \{\uparrow(a+b), \uparrow(a+c), \uparrow(a+d), \uparrow(b+c), \uparrow(b+d), \uparrow(c+d), \uparrow(a+d)\}$

Under the mei_{sum} analysis, the non-maximal meaning cannot originate from the semantics of *mei*, as it selects the maximal element of the set denoted by the NumP '2 CLF cook', as shown in (23a). Likewise, the non-maximal meaning cannot stem from the DIST operator, which is inherently tied to universal quantification and thus blocks non-maximality.

(23) a. $[\![[mei_{sum}\ [2\ \text{CLF}\ cook]]]\!] = \bigoplus\{\uparrow X \mid *\mathsf{cook}(X) \wedge \#(X) = 2\}$
$= \bigoplus\{\uparrow(a+b), \uparrow(a+c), \uparrow(a+d), \uparrow(b+c), \uparrow(b+d), \uparrow(c+d), \uparrow(a+d)\}$

b. $[\![[mei_{sum}\ [2\ \text{CLF}\ cook]]\ [\text{DIST}\ [ate\ one\ apple]\ ]\ ]\!]$
$= 1$ *iff* $\forall x[x \sqsubseteq \bigoplus\{\uparrow X \mid *\mathsf{cook}(X) \wedge \#(X) = 2\} \rightarrow \mathsf{AteOneApple}(x)]$
This is the unattested maximal 'all conceivable pairs' reading.

Similarly, the '*mei* as a distributive quantifier' analysis also incorrectly predicts that *mei*-sentences without *dou* do not permit non-maximal readings. The reason is fairly straightforward at this point: the lexical entry in (24a) enforces the VP property to be distributed to every plurality of two cooks that formed a group.

(24) a. $[\![mei_{\text{DIST}}]\!] = \lambda P_{et}.\lambda Q_{et}.\forall x[P(x) \rightarrow Q(x)]$

b. $[\![[mei_{dist}\ [2\ \text{CLF}\ cook]]\ [ate\ one\ apple]\ ]\!]$
$= 1$ *iff* $\forall x[\#(x) = 2 \wedge *\mathsf{cook}(x) \wedge \mathsf{group}(x) \rightarrow \mathsf{AteOneApple}(x)]$
Again, the unattested maximal 'all conceivable pairs' reading.

The limitations of both accounts ultimately stem from the artificially imposed containment of [+MAX] within [+DIST]. This calls for a novel type of distributive operator – one that is obligatorily distributive yet permits non-maximality. However, before delving into the technical requirements for defining a [+DIST], [-MAX] UQ, we must first determine the status of *mei*: should it be treated as quantificational or not?

In the next subsection, I will argue that the presence of *dou*, at a minimum, signals the presence of a UQ that is both [+DIST] and [+MAX]. If *mei* corresponds to a [+DIST], [-MAX] UQ, then its co-occurrence with *dou* suggests that *mei* is unlikely to be quantificational.

3.2. Establishing *dou* as a [+MAX] distributivity marker

There are various morphological markers across languages that signal *distributive quantification*. Previous research has established generalizations on how to probe and verify the status of a potential distributive marker. These generalizations primarily concern the constraints a distributive marker imposes on the distributivity KEY and its interactions with collective and mixed predicates. I will briefly examine the following pieces of evidence to demonstrate that *dou* exhibits the characteristic properties of a distributivity marker.

Let us begin with the so-called *plurality requirement* (e.g., Roberts 1987; Link 1987;Champollion 2017), which states that the distributive KEY must contribute a plurality that can be divided into proper parts. This requirement is typical of distributivity markers, as distributive quantification inherently presupposes a domain with multiple entities over which distribution can apply. In a singleton domain, the distinction between distributive and non-distributive readings collapses, as there is nothing to distribute. Consider the English bi-nominal *each* as an example:

(25) The kids/*The kid each ate one dish.

Just like *each*, *dou* requires the subject to denote a plurality with proper parts, as illustrated in

(26).

(26) tamen/*ta/*an'na/*yi ge haizi dou ku-le
they/*she/*Anna/*one CLF kid DOU cry-PRF
'They/*she/*Anna/One kid each cried.'

Dou's status as a distributive marker can be further supported by its incompatibility with *numerous*-type predicates, which is argued to be strictly collective in the sense that they 'generally involve an emergent property of a group' and therefore resists distributivity (Kuhn 2020: pg. 227). [8]

(27) **tamen* dou renshuzhongduo
they DOU be.numerous
'*They are each numerous.'

As for *gather*-type predicates, *dou* patterns with English *all*. As shown in (28), *dou* is compatible with predicates like 'gather in the park', indicating that it allows for *sub-group distributivity* (Winter 2001; Champollion 2015; Kuhn 2020).

(28) *tamen* dou juji zai gongyuan li
they DOU gather at park in
'They all gathered at the park.'

Another common diagnostic involves the so-called 'mixed' predicates, which are ambiguous between distributive and non-distributive readings. The sentence in (29) is ambiguous between a distributive, a collective, and a cumulative reading:

(29) *tamen* zuo-le liang dao cai
they make-PRF two CLF dish
a. ✓ COLLECTIVE: They made two dishes together.
b. ✓ CUMULATIVE: They made two dishes in total.
c. ✓ DISTRIBUTIVE: They each made two dishes.

When *dou* is inserted, only the distributive reading remains available:

(30) *tamen* dou zuo-le liang dao cai
they DOU make-PRF two CLF dish
a. ✗ COLLECTIVE: They made two dished together.
b. ✗ CUMULATIVE: They made two dishes in total.
c. ✓ DISTRIBUTIVE: They each made two dishes.

To briefly summarize, the above diagnostics indicate that the presence of *dou* signals the presence of a DIST operator. Notably, this DIST operator must impose maximality, as suggested by the corresponding English translations of the *dou*-sentences above.

Let us first consider sentences without *dou*, such as the one in (31). In a non-maximal scenario like (31a), (31b) is judged true even when one child did not laugh.

(31) a. CONTEXT: John hired a professional costumed character for his son's birthday party. Most children laughed, except for his son Aaron, who usually never laughs.

[8] See similar ideas in Löbner (2000), Winter (2001) and Champollion 2015.

Someone wonders whether the costumed character is funny.
John replies: *Yes, she is very funny...*

b. *haizi-men* xiao-le
kid-PL laugh-PRF
'The kids laughed.'

When *dou* is inserted, as in (32), the non-maximal interpretation is blocked, meaning that *dou* does not allow for exceptions.

(32) *haizi-men* dou xiao-le
kid-PL DOU laugh-PRF
'Every kid laughed.' # in (31a)

If we are on the right track about treating *dou* as either contributing, or signaling the presence of a DIST operator which enforces both [+DIST] and [+MAX], *mei*, on the other hand, as contributing/signaling a [+DIST] but [-MAX] DIST operator, then what can the co-occurrence of *mei* and *dou* tell us? Recall that a *mei-dou* sentence like (33b) can only have a maximal 'all conceivable pairs' reading.

(33) a. **Scenario:** For the Christmas dinner, there are four cooks, Anna, Bea, Carina and David.

b. mei liang ge chushi **dou** zuo-le yi dao cai
MEI two CLF cook **DOU** make-PRF one CLF dish
'Every conceivable pair of two cooks made one dish.'

The above observations about *mei* and *dou* provide cross-linguistic support for the novel perspective proposed by Haslinger et al. (2025): whatever enforces maximality while permitting exceptions should not be hard-wired into the semantics of distributive universals such as Mandarin *mei* or German *jeweils*. Instead, [+MAX] and [+DIST] should be teased apart. This implies that the typology of distributive items must be expanded to include a new type whose semantics allow for non-maximality. How can this idea be implemented?

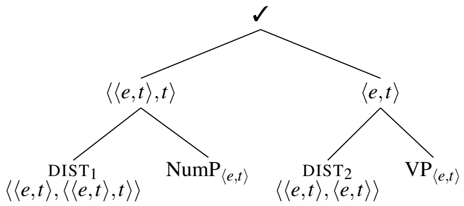
On top of the analysis of *dou* as quantificational, if we also assume that *mei*, too, is quantificational in the sense of contributing a [+DIST], [-MAX] UQ (henceforth written as "δ") we are immediately confronted with several challenges. First, the presence of two higher-order operators creates a compositional issue: standard wisdom on distributivity provides very little insight into maintaining compositionality when multiple DIST operators are present. Solutions to such type mismatch-related puzzles have been discussed in the literature, as recent work has argued that plural predicates can inherently encode existential quantificational force (e.g, Bar-Lev 2021; Križ and Spector 2021; Chatain 2022). [9]

[9] The idea that plural predicates have an underlying weaker meaning is supported by the interpretation of sentences like (i-a) under negation. Specifically, (i-a) only yields the reading that neither of the two girls laughed. Assuming that (i-a) has the LF in (i-b), where negation takes the positive sentence as its complement, one would expect the positive counterpart in (i-c) to convey the weaker meaning that either girl laughed in order to derive the 'neither' reading under negation. However, the attested interpretation of (i-c) is actually a stronger one, where both girls laughed. Due to space limitations, I refer interested readers to Bar-Lev (2018) and Chatain (2022) for further discussion on this phenomenon.

(i) a. It is not the case that the two girls laughed.
b. [NEG [*the two girls laughed*]]
c. The two girls laughed. $\rightsquigarrow$ 'Either girl laughed.' But: $\not\rightsquigarrow$ 'Both girls laughed.'

While various implementations exist, the specific choice is not pertinent to our purposes here. For simplicity, I will circumvent the compositional problem by assuming that D_e includes not only entities we would pre-theoretically classify as *individuals*, but also *sums* of individuals (Link 1983). By doing so, with some minor tweak of the semantic type of the higher DIST$_1$, two DIST operators can co-occur at the LF, as shown in (34).

(34) The co-occurrence of two DIST operators

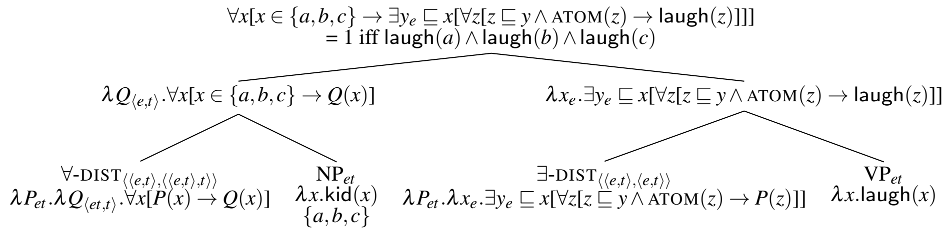


The above adjustment readily accounts for the ability of *every/each* to remove non-maximality in English, as shown in (35b). Assume that *every* introduces a ∀-DIST operator requiring the nuclear scope to hold of each member in its sister set. Since *every* selects only singular complements denoting sets of atomic individuals e.g. $\{a,b,c\}$, quantification ranges over a single atom at each evaluation point. Consequently, the universal-existential distinction collapses, rendering the existential import of the nuclear scope trivial.

(35) **Configuration 1**: [∀-DIST [∃-DIST VP]] ✓

a. Every kid laughed.

b.

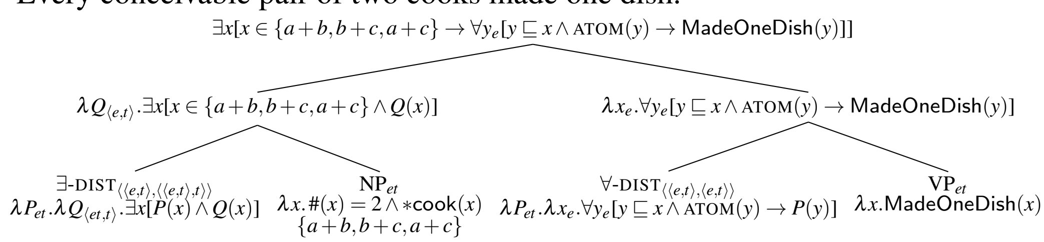


This analysis, however, faces challenge accounting for Mandarin *mei*-sentences as (a) *mei* does not remove non-maximality and (b) *mei* can also select semantically non-singular complement like [2 CLF *kid*]. If we simply assume that *mei* is translated to a ∃-DIST and *dou* as a ∀-DIST, the resulting LF gives us the meaning that there exists some pair of cooks and each of them made one dish, as shown in (36b). This is not what we want.

(36) **Configuration 2**: [∃-DIST [∀-DIST VP]] ✗

a. mei liang ge chushi **dou** zuo-le yi dao cai
MEI two CLF cook **DOU** make-PRF one CLF dish
'Every conceivable pair of two cooks made one dish.'

b.



The issue with analyses such as (36b) lies in the inadequate treatment of *mei*: the VP-level property should distribute over groups rather than atomic individuals. However, group denotations do not arise from NumPs alone, as evidenced by the interpretation of (37); instead, the group-meaning should be attributed to *mei*.

(37) liang ge chushi **dou** zuo-le yi dao cai
two CLF cook DOU make-PRF one CLF dish
'(The) Two cooks each made one dish.'

In the next section, I put forward a tentative analysis aimed at disentangling maximality from the semantics of *mei*. Specifically, I argue that distributivity in *mei*-sentences is not introduced by *mei* itself. Rather, *mei* serves a dual function: it signals the presence of a covert δ operator, which existentially distributes the VP-level property over the members of the plurality denoted by the *mei*-phrase; and it contributes a GROUP-forming operator, Δ.

4. A proposal: Existential distributivity

My proposal consists of the following components. First, I assume that *mei* must select a GROUP-denoting NP. And I treat *mei* as non-quantificational : it contributes a function Δ that constructs a set of groups from a given set via GENERATION and MEMBERSHIP, both defined in terms of the operators $\uparrow$ and $\downarrow$ (*à la* Landman 1989).

(16) a. ATOM = IND $\cup$ GROUP
b. For any singular predicate P, $*P(x)$ iff $\exists A \subseteq D_e.\ x = \bigoplus(A) \wedge \forall y[y \in A \rightarrow P(y)]$ (Link 1983)
c. $\uparrow$: *IND $\rightarrow$ ATOM such that
(i) $\forall a \in$ (*IND $-$ ATOM), $\uparrow(a) \in$ GROUP
(ii) $\forall b \in$ IND, $\uparrow(b) = b$
(iii) if $a \neq b$, then $\uparrow(a) \neq \uparrow(b)$
d. $\downarrow$: ATOM $\rightarrow$ *IND such that
(i) $\forall a \in$ *IND, $\downarrow(\uparrow(a)) = a$
(ii) $\forall b \in$ IND, $\downarrow(b) = b$

(17) **Generation**: A sum of groups $\mathbb{G}$ is generated from set A via $\uparrow$, written as $\mathbb{G}_{(A,\uparrow)}$ iff $\mathbb{G}_{(A,\uparrow)} = \bigoplus\{G \in D_e$: for some $X \in *A : G = \uparrow(X)\}$ (The sum of groups from sums of A-elements)

(38) **Group membership**: For any $a \in$ IND and any $G \in$ GROUP such that $G = \uparrow(b)$ and $b \in$ $*$IND, a is a member of G iff $a \sqsubseteq \downarrow(\uparrow(b))$.

(39) $[\![mei]\!] = [\![\Delta]\!] = \lambda P_{et}.\ \mathbb{G}_{(P,\uparrow)} = \bigoplus\{G \in D_e$: for some $X \in *P : G = \uparrow(X)\}$

Given the above semantics of *mei*, the denotation of [*mei* [two CLF cook]] is illustrated below in (40):

(40) $[\![$[mei] [two CLF cook] $]\!] = [\![\Delta$ [two CLF cook]$]\!] = \mathbb{G}_{(\{X|*\mathsf{cook}(X)\wedge\#(X)=2\},\uparrow)}$

In the previously mentioned 'Christmas dinner' context with four cooks, [*mei* [two CLF cook]] denotes the set of groups of two cooks, as shown in (41):

(41) $[\![$[mei] [two CLF cook] $]\!]$
$= \bigoplus\{\uparrow(a+b), \uparrow(a+c), \uparrow(a+d), \uparrow(b+c), \uparrow(b+d), \uparrow(c+d)\}$

The second component of my proposal concerns how to permit non-maximal interpretations of *mei*-sentences. Since *mei*-phrases denote a set of groups that include all conceivable pairs of two cooks, the responsibility for preserving non-maximality must be assigned to the predicate-level δ operator. In other words, I adopt the assumption that non-maximality arises from existential quantification over the set provided by the *mei*-phrase (see similar approaches, such as the $\exists$-pluralization operator in Bar-Lev 2021 and the covert DIST operator in Križ and Spector 2021).

To refer to the contextually determined set of groups that minimally cover the set of all cooks, I assume that the δ operator distributes the VP-property to a set of groups $\mathbb{G}'$ that is contextually ***permissible*** ($\simeq$) relative to the set $\mathbb{G}$ denoted by the *mei*-phrase, as defined in (42):

(42) **Contextual permissibility**
For any plurality of groups $\mathbb{G}', \mathbb{G}$ such that $\mathbb{G}', \mathbb{G} \in D_e$, $\mathbb{G}' \simeq \mathbb{G}$ in a context c iff the sum of groups members of all of the groups $G \in \mathbb{G}$ in c is equivalent to the sum of group members of all of the groups $G' \in \mathbb{G}'$.

According to the definition in (42), minimal covers such as $\bigoplus\{\uparrow(a+b), \uparrow(c+d)\}$ are contextually permissible relative to the set of groups denoted by [*mei* [two CLF cook]].

(43) $\bigoplus\{\uparrow(a+b), \uparrow(c+d)\}$
$\simeq \bigoplus\{\uparrow(a+b), \uparrow(a+c), \uparrow(a+d), \uparrow(b+c), \uparrow(b+d), \uparrow(c+d)\}$

With this formal tool of contextual permissibility in hand, I define the lexical entry of the non-maximal δ operator as in (44). Furthermore, I assume that the presence of *mei* signals the presence of the δ operator at LF. Applying $[\![\delta\ P]\!]$ to a plurality X yields the desired non-maximal interpretation: the VP-property holds for each atomic part of a contextually supplied plurality Z that is permissible relative to X.

(44) $[\![\delta]\!]^c = \lambda P_{et}.\lambda X_e.\exists Z[Z \simeq X \text{ in c } \wedge \forall y[y \sqsubseteq Z \wedge y \in \text{ATOM} \rightarrow P(y)]]$

A *mei*-sentence without *dou*, repeated below in (45), has the LF in (46a), which yields the truth conditions in (46b).

(45) mei liang ge chushi zuo-le yi dao cai
MEI two CLF cook make-PRF one CLF dish
'(Each one of the) Groups of two cooks made one dish.'
$\rightarrow$ *In total, 2 dishes were made.*

(46) a. LF of (45): [[mei 2 CLF cook] [δ [made one dish]]]
b. $[\![(46a)]\!]^c = 1$ iff $\forall y[y \sqsubseteq \bigoplus\{\uparrow(a+b), \uparrow(c+d)\} \wedge y \in \text{ATOM} \rightarrow \mathsf{MadeOneDish}(y)]$
$= 1$ iff $\mathsf{MadeOneDish}(\uparrow(a+b)) \wedge \mathsf{MadeOneDish}(\uparrow(c+d))$

In contrast to *mei*, which signals the presence of the silent δ operator, I propose that *dou* is the overt realization of a variant of the DIST operator that enforces maximality, with the lexical entry given in (47).

(47) $[\![dou]\!] = \lambda P_{et}.\lambda X_e.\forall y[y \sqsubseteq X \wedge y \in \text{ATOM} \rightarrow P(y)]$

Note that since our ontology now includes *groups* as atomic entities of type *e*, it naturally follows that *dou* can distribute not only down to atomic individuals but also to sub-group atoms. This explains *dou*'s compatibility with *gather*-type predicates, as discussed in Section 3.2.

Assuming that only one position at LF is reserved for the DIST operator, the overt presence of *dou* blocks the silent δ operator. This prevents a double-GQ problem that would otherwise lead to compositional difficulties. A *mei-dou* sentence, as in (48), has the LF in (49a), correctly predicting the attested truth conditions in (49b).

(48) mei liang ge chushi ***dou*** zuo-le yi dao cai
MEI two CLF cook **DOU** make-PRF one CLF dish
'Every conceivable pair of two cooks made one dish.'
$\rightarrow$ *In total, 6 dishes were made.*

(49) a. LF of (48): [[mei 2 CLF cook] [dou [made one dish]]]
b. $[\![(49a)]\!]^c = 1$ iff
$\forall y[y \sqsubseteq \bigoplus\{\uparrow(a+b), \uparrow(a+c), \uparrow(a+d), \uparrow(b+c), \uparrow(b+d), \uparrow(c+d)\}$
$\wedge\, y \in \text{ATOM} \rightarrow \mathsf{MadeOneDish}(y)]$
$= 1$ iff $\mathsf{MadeOneDish}(\uparrow(a+b)) \wedge \mathsf{MadeOneDish}(\uparrow(a+c)) \wedge \mathsf{MadeOneDish}(\uparrow(a+d)) \wedge \mathsf{MadeOneDish}(\uparrow(b+c)) \wedge \mathsf{MadeOneDish}(\uparrow(b+d)) \wedge \mathsf{MadeOneDish}(\uparrow(c+d))$

After addressing cases where *mei* combines with a NumP such that $|\text{NUM}| > 1$, let us return to the minimal pair in (50) involving [*mei* 1 CLF N]. Indeed, (50a) and (50b) appear to be truth-conditionally equivalent; both sentences, with and without *dou*, do not tolerate exceptions. In this case, the maximality/non-maximality contrast observed with *mei* vs. *mei...dou* is absent. Does this imply that our account of stripping away maximality from *mei* overgenerates? Perhaps *mei*'s ability to block or permit non-maximality is sensitive to more intricate semantic and syntactic environments?

(50) a. mei-(yi)-ge keren chi-le yi-dao-cai
MEI-one-CLF guest eat-PRF one-CLF-dish
b. mei-(yi)-ge keren dou chi-le yi-dao-cai
MEI-one-CLF guest DOU eat-PRF one-CLF-dish
Both (50a) and (50b) $\rightsquigarrow$ 'Each guest ate one dish.'

But I would like to emphasize that the current account correctly predicts the meaning equivalence between (50a) and (50b). When *mei* combines with a NumP where $|\text{NUM}| = 1$, our semantics of *mei* as a group-forming function Δ entails that the extension of the denotation of [*mei* [1 CLF guest]] is as shown in (51):

(51) In a context with 3 guests Anna, Bea and Carina:
$[\![\text{[mei] [1 CLF guest] }]\!] = [\![\Delta\text{ [1 CLF guest]}]\!] = \mathbb{G}_{(\{X|*\mathsf{guest}(X) \wedge \#(X)=1\},\uparrow)}$
$= \bigoplus\{\uparrow(a), \uparrow(b), \uparrow(c)\}$

According to our definition of contextual permissibility, the only permissible plurality from $\bigoplus\{\uparrow(a), \uparrow(b), \uparrow(c)\}$, regardless of context, is the plurality $\bigoplus\{\uparrow(a), \uparrow(b), \uparrow(c)\}$ itself. In this case, the distinction between the maximal and non-maximal readings collapses, rendering *dou*'s semantic contribution trivial. As a result, both LF structures in (52a) and (53a) yield a seemingly maximal interpretation. [10]

(52) a. LF with δ: [[mei 1 CLF cook] [δ [made one dish]]]

[10] As pointed out by Liu (2021), the contrast between this minimal pair lies in their ability to reflect different QUDs (*Questions Under Discussion*, in the sense of Roberts 2012). See further discussion in Liu (2021).

b. $[\![(52a)]\!]^c = 1$ iff $\forall y[y \sqsubseteq \bigoplus\{\uparrow(a), \uparrow(b), \uparrow(c)\} \wedge y \in \textsc{atom} \rightarrow \mathsf{MadeOneDish}(y)]$

(53) a. LF of *dou*: [[mei 2 CLF cook] [dou [made one dish]]]

b. $[\![(53a)]\!]^c = 1$ iff $\forall y[y \sqsubseteq \bigoplus\{\uparrow(a), \uparrow(b), \uparrow(c)\} \wedge y \in \textsc{atom} \rightarrow \mathsf{MadeOneDish}(y)]$

5. Conclusion and remaining issues

The presence or absence of *dou* poses a fundamental challenge for understanding the nature of universal quantificational (UQ) force in Mandarin. In this paper, I have highlighted key empirical observations that indicate *dou*, rather than *mei*, is responsible for expressing maximality. The existence of distributive quantifiers like *mei*, which are obligatorily distributive but do not impose maximality, provides further evidence that the alleged paradigmatic gap of [+DIST], [-MAX] is not attested. Natural languages possesses lexicalized distributive UQs, such as Mandarin *mei* and German *jeweils*, which allow for non-maximal interpretations. This strongly supports the need to disentangle [+DIST] and [+MAX] as independent features within the semantic feature geometry.

Through a detailed investigation of the three-way contrast and parallelisms among distributive expressions in Mandarin – including *mei*, *mei...dou*, and *dou* – I have proposed an analysis in which the non-maximal interpretation of distributivity serves as the unmarked "baseline." Under this account, maximality is not inherently encoded in *mei*; rather, it emerges through the overt presence of *dou*, which introduces a [+DIST], [+MAX] operator that strengthens the distributive reading.

This empirical pattern in Mandarin aligns with Haslinger (2024)'s broader typological generalization that imprecision-based meanings correlate with lower structural complexity across languages. The contrast between *mei* and *mei-dou* thus provides strong support for a *modular* view of quantificational force: different semantic properties involved in quantification are not bundled into a single lexical item, but are instead decomposed into distinct, independently manipulable components. These components can be compositionally assembled as overt morphological or structural augmentation is introduced. On this view, *dou* is not semantically vacuous nor merely pragmatic; rather, it serves as a licensor of a richer LF, overtly signaling the presence of additional semantic operator(s).

Despite the progress made in this study, several important questions remain for future investigation. First, the subject-object asymmetry in *mei*-sentences remains unresolved: why do *mei*-subjects canonically require the presence of *dou*, whereas *mei*-objects do not? Second, the licensing conditions for optional *dou* in subject *mei*-sentences are still not well understood. One potential avenue for addressing both issues is to posit that the interpretation of *mei* DPs is sensitive to their syntactic position. However, the precise mechanism by which syntactic position interacts with the availability or necessity of maximality remains an open question. Future research should aim to formalize this hypothesis, with the goal of providing a principled account of the *mei-dou* distributional asymmetries.

Last but not least, I want to address a thorny issue that arises with non-maximal *mei*. Ever since Milsark (1974), the (un)acceptability of quantifiers like *every* vs. *some* in existential sentences, as in (54), has received sustained attention. One influential line of research has proposed that the ungrammaticality of (54a) may result from triviality (e.g., Barwise and Cooper 1981;

Gajewski 2002, 2009; Chierchia 2006). As shown by the logical skeletons (LSs) below, (54a) is true regardless of the contextual properties, whereas (54b) can be false if there are no cats in my office.

(54) a. *There is every cat. $\Leftrightarrow$ $\forall x[x \in C \rightarrow x \in D_e] \Leftrightarrow_L \top$
b. There are some cats. $\Leftrightarrow$ $\exists x[x \in C \wedge x \in D_e]$

The above contrast is also observed with Mandarin *mei* and *yi-xie* ‘some’:

(55) a. *zhe li you mei (yi) zhi mao
here LOC exist MEI (one) CLF cat
‘*There is every cat.’
$\Leftrightarrow \exists x[x \sqsubseteq \bigoplus\{\uparrow(X) \mid *\mathsf{cat}(X) \wedge \#(X) = 1\} \wedge \textsc{atom}(x) \wedge x \in D_e]$
b. zhe li you yi-xie mao
here office LOC exist some cat
‘There are some cats.’ $\Leftrightarrow \exists x[*\mathsf{cat}(x) \wedge x \in D_e]$

According to the analysis of *mei* proposed in this work, both of the LSs in (55a) and (55b) should be existential, as shown above, and neither is expected to be L-analytical. Interestingly, as discussed at the end of Section 4, when *mei* combines with a NumP where $|\textsc{num}| = 1$, the set of contextually permissible pluralities reduces to a singleton, rendering the universal/existential distinction trivial. If so, then the LS of (55a) is indeed L-analytical, which accounts for the ungrammaticality of the sentence in (55a).

However, this assumption introduces complications. First, L-triviality should be derivable even when “bleaching” the non-logical material from lexical elements (Gajewski 2002). Thus, the difference between *mei*-phrases and other non-functional items should not affect whether triviality is deduced. In other words, if *mei* truly gives rise to non-maximality, both (55a) and (55b) should be predicted to be ungrammatical. Second, even if we step back and assume that the grammar is not entirely blind to non-logical terms–i.e., if the emergence of triviality is contingent on certain lexical material–then the grammar must be equipped to detect and operate over that material. In that case, we would expect the acceptability of *mei*-sentences where $|\textsc{num}| = 2$ to improve significantly, as the set of contextually permissible pluralities picked out by *mei* is no longer a singleton. But this is not observed in (56). Due to the limited scope of this paper, I leave further relevant discussions for future research.

(56) *zhe li you mei liang zhi mao
here LOC exist MEI two CLF cat
‘*There is every two cat.’ $\Leftrightarrow \exists x[x \in \{\uparrow(X) \mid *\mathsf{cat}(X) \wedge \#(X) = 1\} \wedge x \in D_e]$

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