

Remarks on the maximality approach to Mandarin *dou* and other related issues

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In this paper we comment on the maximality approach to Mandarin Chinese *dou* initiated by Giannakidou & Cheng (2006) and modified by Xiang (2008), showing that the approach fails (1) to explain several linguistic phenomena (e.g. the interaction between *na* ‘which’-phrases and *dou*, the distributive effect of *dou*, and the exclusiveness of *dou*), (2) makes incorrect predictions concerning the interpretations of *dou*-sentences, and (3) suffers from various theoretical problems (e.g. compositional difficulty). After refuting the maximality approach, the paper argues that treating *dou* as a device for encoding universal quantification gives the above issues a more cogent explanation, has a wider coverage of language data, and also avoids the theoretical problems with the maximality approach.

Keywords: universal quantification, maximality, *dou*, FCI, exclusiveness, distributivity

1. Introduction

Giannakidou & Cheng (2006), contrary to Lin (1998) and many others, divorces Mandarin *dou* from distributivity, treating it as a unary maximality operator which restricts the domain of Free Choice Items (henceforth FCIs), just like the definite article in Greek. According to Giannakidou & Cheng (2006), the subject *na* ‘which’+CL+N phrase in (1) is an intensional FCI which is licensed by the modal operator *keyi* ‘can’, and the function of *dou* in this sentence is to exert maximization on the intensional nominal domain provided by the *na*-phrase and renders the *na*-phrase definite.

- (1) *Na-ge-xuesheng dou keyi jin-lai.*

which-CL-student DOU can enter

‘Any student can enter.’

(Giannakidou & Cheng 2006)

We refer to the proposal by Giannakidou & Cheng (2006) as the maximality approach.¹ This approach is further extended by Xiang (2008) in the following two aspects. First, for the non-scalar use of *dou*, the maximization operation is argued to perform at the level of covers generated by the nominal domain rather than directly over individuals. Second, the scalar use of *dou* is explained as maximization over degrees and scalar alternatives.

Below we show that neither the original proposal by Giannakidou & Cheng nor the modified one by Xiang is built on solid empirical or theoretical grounds. On the contrary, we side with the universal quantificational approach (Lee 1986; Liu 1990; Jiang 1998; Lin 1998; Hole 2004; Pan 2006; Jiang & Pan 2013; Feng & Pan 2018) and further show that *dou* as a universal quantifier can account for the relevant data in a more cogent way. The detailed discussion is divided as follows. Section 2 discusses problems in Giannakidou & Cheng (2006) and sequel; §3 argues that Xiang (2008) and Giannakidou & Cheng (2006) are actually dealing with different maximality-related phenomena and further presents evidence against Xiang's modified maximality approach; §4 explicates how the universal quantificational approach solves the problems mentioned in the previous sections; and, finally, §5 concludes the paper.

2. Problems with the maximality approach in Giannakidou & Cheng (2006)

Giannakidou & Cheng (2006) investigates the interaction between Mandarin *na* 'which'+CL+N phrases and *dou* using the free choice theory of Giannakidou (2001). According to that theory, a *na*-phrase, when used non-interrogatively, denotes an intensional FCI, and the maximization of *dou* picks out the largest plurality in the intensional domain, endowing the *na*-phrase with definiteness (cf. (1)). Giannakidou & Cheng (2006: 176) defines *dou* as that in (2a). The semantic composition of *dou* with a *na*-phrase is illustrated in (2b) and (2c). Essentially, it works on the intensional definition contributed by the *na*-phrase *na-ge-ren* 'which person' and an implicit *wulun* 'no matter', as in (2b), and outputs the maximized plurality in the intensional domain, as in (2c).

- (2) a. $\text{DOU} = \lambda P_{\langle s, et \rangle} \iota (\lambda w \lambda x [P(x)(w)])^2$
 b. $\| \text{wulun} \| (\| \text{na-ge-ren} \|) = \lambda w \lambda y [\text{person}(y)(w)]$
 c. $\text{DOU}(\| \text{wulun na-ge-ren} \|) = \iota (\lambda w \lambda y [\text{person}(y)(w)])$

1. The maximality approach has gained much currency and is taken as a basic assumption in Zhang (2008), Huang & Jiang (2009), and Constant & Gu (2010), among others.

Giannakidou & Cheng's (2006) main focus is on the free choice theory and the cross-linguistic landscape of FCIs, and the major motivation of treating *dou* as a marker of definiteness is that they want to establish a parallel between Chinese *na* phrases with or without *dou* and Greek definite and indefinite FCIs which are realized in different syntactic forms.

Whether Chinese *na*-phrases are intensional FCIs is debatable (see Chen (2013) and Feng (2014)). In this paper, we focus on the side effect of Giannakidou & Cheng's analysis, that is, the treatment of *dou* as a maximizer, and point out that the maximality approach is not watertight and has undesirable consequences. Essentially, the problem with Giannakidou & Cheng's proposal is fourfold. First, it is unreasonable to ignore the distributive force of *dou* and encode it as a unary operator over the nominal domain; second, the interaction between Mandarin *na*-phrases and *dou* is drastically different from that of typical FCIs and markers of definiteness; third, maximization in the nominal domain cannot explain the suggestion of existence/givenness in certain *dou*-sentences; and fourth, the treatment of *dou* as a maximizer causes compositional difficulties.

Aside from the problems listed above, it is also worth noting that the maximality approach proposed by Giannakidou & Cheng is only based on a limited amount of data. *Dou* can also be used to express exclusiveness and scalarity, as illustrated in (3) and (4) respectively, and such uses cannot be explained with the notion of maximality, as the operational domain of *dou* is not provided by a nominal phrase, as in (3), and the domain is provided by the wrong noun phrase, as in (4). We shall discuss in detail the issues related to the exclusiveness and scalarity of *dou* in §4, showing that the universal quantificational approach to *dou* rather than the notion of maximality can give the more extensive range of data a cogent explanation.

- (3) *Ta dou xie-de [xiaoshuo]_F*.³
 he DOU write-DE novel
 'All he wrote are novels.'

2. Formula (2a) by Giannakidou & Cheng (2006) is a bit problematic. The iota operator should range over the individual variable *x*; however, in (2a), it does not bind any variable, and the individual variable *x* is bound by a lambda operator. In the following discussion, we use the corrected formula: $\text{DOU} = \lambda P \lambda w x [P(x)(w)]$.

3. The *shi...de* clefts in (i) and the pseudocleft in (ii) are also grammatical (see Hole (2011) for discussion of *shi...de* clefts). How the examples in (i) and (ii) are related to (3) is unclear. We leave this issue for further research.

- (i) a. *Ta shi dou xie-de [xiaoshuo]_F*.
 he COP DOU write-DE novel.
 'It is all novels that he wrote.'

- (4) *Lian* [*xiaoxuesheng*]_F *dou* *zhidao zhege*.
 LIAN elementary-school-student DOU know this
 ‘Even elementary school students know this.’

2.1 Against non-distributivity of *dou*

One essential problem of Giannakidou & Cheng’s proposal is: it cannot countenance the fact that many a time *dou* induces distributivity, as illustrated in (5) (cf. Lin (1996; 1998)).⁴

- (5) *Suoyou-de ren (dou) he-mai-le yi-ge-dangao*.
 all-DE-person DOU together-buy-ASP one-CL-cake
 Without *dou*: ‘All the people bought a cake together.’ (In total, they bought only one cake.)
 With *dou*: ‘All the people bought a cake together with others (separately).’
 (Every person participated in a separate cake-buying event, and in total they bought more than one cake with others.)

In (5), the subject noun phrase combines naturally with the collective predicate; thus, without *dou*, only the collective reading is accessible, which means all the people, as a group, bought one cake in total. With *dou*, however, collectivity is suppressed and the distributive reading becomes available and dominant. Interestingly, *he-mai yi-ge-dangao* ‘buy a cake as a group’ is essentially collective and does not support a distributive reading. With the presence of *dou*, the predicate has to be reanalyzed as ‘buy a cake together with others’ by incorporating an implicit argument; therefore, with *dou*, the sentence only has the reading where everyone bought a cake together with others (see also Feng & Pan (2017)). The maximality approach assumes a scopeless analysis of *dou*, treating it as a unary maximizer operating on the nominal domain to render the subject noun phrase referential; therefore, it remains unclear why the very occurrence of *dou* blocks

- b. *Ta dou shi xie-de [xiaoshuo]_F*
 he DOU COP write-DE novel
 ‘It is all novels that he wrote.’

- (ii) *Ta dou xie-de shi [xiaoshuo]_F*.
 he DOU write-DE COP novel
 ‘All that he wrote are novels.’

4. *Dou* does not necessarily distribute down to atomic entities. Lin (1998) analyzes it as a generalized distributive operator over covers (see Feng & Pan (2017) for a relevant yet different account).

the collective reading and changes the interpretation of the sentence in question (cf. Krifka (1992)). To keep the maximality approach intact, an implicit distributive operator has to be postulated to derive the distributive reading when *dou* is present; nevertheless, one still needs to explain why maximization specifically facilitates the application of such an operator and why such an operator is not available without *dou*. On the contrary, if *dou* is treated as a universal quantificational operator whose domain is restricted to a certain set of people denoted by *suoyou-de-ren* and whose scope ranges over the VP denotation, then *dou* can relate each member in the set of *suoyou-de-ren* with a separate cake-buying event with others, which gives us the distributive reading a reasonable explanation.⁵

Despite *dou*'s contribution of distributivity, as illustrated in (5), Giannakidou & Cheng (2006) and subsequently Cheng (2009) deny the quantificational nature of *dou*. In particular, Cheng (2009) includes (6a) and (7) as evidence for the non-distributive reading of *dou*-sentences:

- (6) a. *?Tamen dou yiqi lai.*
 they DOU together come
 ‘All of them came together.’
 b. *Tamen dou yiqi lai le.*
 they DOU together come ASP
 ‘All of them came together.’
- (7) *Zheng-zuo-qiao dou dao-xialai le.*
 whole-CL-bridge DOU fall-down ASP
 ‘The whole bridge collapsed.’

According to Cheng (2009), the adverbial *yiqi* ‘together’ in (6a) and the modifier *zheng* ‘whole’ in (7) block distributivity; thus *dou* in these sentences do not support a distributive reading. For us, (6a) is marginal as the sentence sounds incomplete. With the addition of the sentence-final *le* as in (6b), the sentence becomes better. However, we still do not consider (6b) and (7) solid evidence to falsify the distributive effect of *dou*.

Yiqi is not necessarily anti-distributive and can occur naturally with distributive predicates such as *bingxi* ‘hold breath’ and *guzhang* ‘clap hands/applaud’, as shown in (8) and (9).

- (8) *Shan, yun, niao dou yiqi bingxi.*
 mountain cloud bird DOU together hold-breath
 ‘The mountains, the clouds and the birds all held their breath together.’

5. Readers may refer to Krifka (1992) for more arguments concerning the differences between scopeless definite plurals and universal quantificational expressions.

- (9) *Xuduo-youke dou yiqi zhan-qilai guzhang.*
 many-traveler DOU together stand-up applaud
 'A large number of travelers all stood up and applauded together.'

The occurrences of *yiqi* in (8) and (9) express overlapping of events in the temporal or spatial dimension. In (8), *yiqi* indicates that the separate events of holding breath of the mountains, the clouds and the birds happen at the same time, and in (9), *yiqi* expresses that the events of the individual applauding happen at the same time and the same location. In both cases the events of holding breath and applauding are relativized to individuals. Similarly, in (6b), *yiqi* does not verify non-distributivity, either; rather, it only expresses that the individuals in question arrived at the same time, yet they came separately. (6b) can also mean that all the individuals came by the same bus and arrived at the same time; yet even under such a situation, the event of these people coming together can still be dissected into separate coming events of individual people, and *yiqi* indicates temporal and spatial overlapping of the separate coming events. Hence, it can be generalized from Examples (6), (8) and (9) that in any case, *yiqi* does not necessarily select the collective construal of the sentence in question, i.e. it does not necessarily block distributivity.

In (7), *zheng*, a nominal modifier, restricts the domain of quantification to the whole body of the bridge in question; yet, it does not necessarily force the bridge to collapse as one integral part. In (10), the adverbial *yi-kuai-yi-kuai* 'block by block' can occur with *zheng*, showing that the process of collapsing can be sectioned into multiple subparts. Furthermore, in (10) *dou* is compatible with *yi-kuai-yi-kuai*, indicating that it typically supports a distributive reading.

- (10) *Zheng-zuo-qiao yi-kuai-yi-kuai (dou) dao-xialai le.*
 whole-CL-bridge one-block-one-block DOU fall-down ASP
 'The whole bridge (totally) collapsed block by block.'

For (7), the modifier *zheng*⁶ emphasizes entirety and *zheng-zuo-qiao* picks out the whole body of a bridge salient in the context. *Dou* in (7) can still be treated as

6. Intuitively, *zheng* already imposes strict maximality on the domain, and it is questionable why *dou*, a supposed maximality operator, is still required. Sentence (i) does not tolerate the non-maximal interpretation of the noun phrase; while (ii) can mean 'some (but not every) part of the bridge collapsed' with proper contextual support.

- (i) *Zheng-zuo-qiao dao-xialai le.*
 whole-CL-bridge fall-down ASP
 'The whole bridge collapsed.'

distributive. It further coerces the noun phrase denotation into a semantic plurality which encompasses all the (conceptual) subparts of the bridge and distributes the collapsing property to each subpart. With the presence of *dou*, (7) means that every bit of the whole bridge collapsed without exception.

It should be noted that some may feel (7) does not necessarily have a distributive reading. We concur on that judgment; however, we do not think this can serve as evidence for the non-distributivity or maximality of *dou*. When the sentence is not construed as distributive, it has a scalar reading, emphasizing the unexpectedness of the whole bridge's collapsing. As shown in (11), when 'the whole bridge' is in focus, *dou* universally quantifies over the alternatives generated by the focused constituent, e.g. {the whole bridge, the cottage, the windmill}, rather than quantifying over the parts of the bridge; thus, naturally, in such contexts, (11) is interpreted non-distributively with respect to the bridge, though it is interpreted distributively over the alternatives to the bridge. In §4, we shall show in detail how the universal quantificational approach can explain both the *even*-like scalar reading of *dou* and the distributive use of *dou*.

- (11) [Zheng-zuo-qiao]_F *dou* *dao-xialai* le.
whole-CL-bridge DOU fall-down ASP
'Even the whole bridge collapsed.'

We have shown that the evidence for the non-distributivity of *dou* is rather precarious. The maximality approach assumes that *dou* only operates on the nominal domain, yet its distributive effect regulating both the nominal and the verbal domain cannot be effectively rejected, suggesting that the maximality approach is neither empirically nor theoretically well-grounded.

2.2 Against *dou* as a marker of definiteness

Giannakidou & Cheng (2006) and sequel claim that Mandarin *na*-phrases show anti-episodicity and quantificational variability. In this light, they treat Mandarin *na*-phrases as intensional FCIs and *dou* a marker of definiteness, trying to draw a parallel with typical FCIs in languages like Greek, as discussed in Giannakidou (2001); however, we present evidence showing that the distribution and licensing conditions of Mandarin *na*-phrases with or without *dou* deviate from the typical

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- (ii) *Na-zuo-qiao* *dao-xialai* le.
that-CL-bridge fall-down ASP
'That bridge collapsed.'

properties of FCIs, as observed in Giannakidou (2001), which further casts doubts on the maximality approach.

First, Mandarin *na*-phrases simply do not behave like FCIs, as they can appear in episodic contexts, as exemplified in sentences from (12) to (14).

- (12) *Xuexiao guiding zhiyou gaosan-de-xuesheng keyi jinru kaochang. Danshi, school rule only senior-DE-student can enter exam-venue but youyu guanli bu yange, jieguo na-ge-nianji-de xuesheng due-to management NEG strict consequence which-CL-grade-DE student dou jinlai le.*

DOU come-in ASP

'According to the school rules, only senior students can enter the exam venue, yet due to the loose management, students of any grade all came in.'

- (13) *Suiran ta xiang mai ji-ben-cankaoshu, dan youyu jiage tai although he want buy several-CL-reference-book but due-to price too gui, ta na-ben-shu dou meiyou mai.*

expensive he which-CL-book DOU NEG-have buy

'Although he wanted to buy several reference books, due to the expensive prices, he didn't buy any one of them.'

- (14) *Ni gangcai die zai di-shang le, you-mei-you jue de na-li tong?*

you just-now fall on ground-on ASP have-NEG-have feel which-place ache

'You just fell on the ground. Does it ache anywhere on your body?'

As to the contrast between Giannakidou & Cheng's (2006) claim and the data above, our explanation is: *Na*-phrases tend to be discourse-linked (Pesetsky 1987) or imply a set of familiar or salient entities in the speaker's epistemic states. The apparent marginality of Giannakidou & Cheng's examples in (15) is not due to the anti-episodic feature of *na*-phrases; rather, it is infelicity caused by the lack of contextual support.

- (15) a. **Na-ge-xuesheng dou jinlai le.*

which-CL-student DOU come-in ASP

Intended: 'Any student came in.'

(Giannakidou & Cheng 2006)

- b. **Ta na-ben-shu dou meiyou mai.*

he which-CL-book DOU NEG-have buy

Intended: 'He didn't buy any book.'

(Cheng 2009)

- c. **Tamen you-mei-you jieshao na-ge-chongbaizhe gei ni?*

they have-NEG-have introduce which-CL-admirer give you

Intended: 'Did they introduced any admirer to you?'

(Giannakidou & Cheng 2006)

On the contrary, in our examples like (12), *na*-phrases are linked to some familiar entities and can appear regardless of the episodicity of the sentences in question. If *na*-phrases do not have the crucial anti-episodic property to be diagnosed as intensional FCIs, then the analogy between *na*-phrases with or without *dou* and the definite or indefinite FCIs in other languages does not hold any more, which renders the treatment of *dou* as a definiteness marker rather dubious.⁷

Second, according to Giannakidou & Cheng's generalization, without *dou*, *na*-phrases can appear in the antecedents of conditionals or imperatives; while with *dou*, *na*-phrases may appear with modal verbs, verbs expressing epistemic attitudes, or in NP comparative constructions and sentences with a generic interpretation (Giannakidou & Cheng 2006: 172). From this perspective, the distribution of *na*-phrases and *dou* is problematic to be fit into the stock of definite and indefinite FCIs. Supposedly, FCIs, definite or indefinite, exhibit quantificational variability and can be licensed by various non-veridical contexts. As in the Greek Examples (16) and (17), indefinite FCIs instantiated as FCI nominals are directly bound by the epistemic modal or the quantificational adverbial.⁸

- (16) *Bori na anapse opjosdhipote to fos.*
 can.3SG SUBJ lit.3SG FCI-person the light
 'Anyone may have turned on the light.'
 (Greek, from Giannakidou & Cheng (2006))
- (17) *Stissigentrosis, i Ariadne sinithos milouse me opjosdhipote*
 at-the-meetings the Ariadne usually talked.imperf.3SG with FCI
fititi.
 student
 'At the meetings, Ariadne usually talked to any student.'
 (Greek, from Giannakidou & Cheng (2006))

However, *na*-phrases cannot be licensed by typical non-veridical contexts without *dou*. As exemplified in (18), the *na*-phrase in situ is ungrammatical even under the scope of non-veridical operators; instead, it needs to be moved to a pre-*dou* position. The presence/absence of *dou* determines the grammaticality of the sentences in question, not just contributing to the interpretational difference concerning definiteness. To maintain the maximality approach, one has to assume

7. We show in examples from (12) to (14) that *na*-phrases in Chinese are not licensed by intensional environments, as argued by Giannakidou & Cheng (2006). In §4.2, we further point out that what licenses the *na*-phrases in (12) to (14) is the downward-entailing environment.

8. In Greek, indefinite FCIs are instantiated as FCI nominals, and definite FCIs take the form of free choice free relatives.

that in multiple non-veridical contexts Mandarin FCIs have to be definite, which is counter-intuitive.

- (18) a. *Wo yiban/tongchang/yinggai na-zhong-shucai *(dou) chi.*
 I in-general/usually/should which-kind-vegetable DOU eat
 'I generally/usually/should eat any kind of vegetables.'
- b. **Wo yiban/tongchang/yinggai chi na-zhong-shucai.*
 I in-general/usually/should eat which-kind-vegetable
 Intended: 'I generally/usually/should eat any kind of vegetables.'

Cheng (2009) extends Giannakidou & Cheng's (2006) analysis to explain the interaction between quantificational noun phrases and *dou*. She points out that Mandarin strong noun phrases but not weak ones require the support of *dou* and that the maximization operation of *dou* restricts the quantificational domain of strong noun phrases, drawing a parallel between *dou* and definite articles in languages like Greek and Basque. Giannakidou & Cheng's analysis concerning FCIs is suspicious, as discussed above. Furthermore, the extension to strong noun phrases by Cheng is again not watertight on empirical grounds. There are plenty of examples where strong noun phrases⁹ stay *in situ* at the object position or appear at the subject position without *dou*, as exemplified in (19) (see also Pan (2005)).

- (19) a. *Xihuan mei-ge-xuesheng, jiu yao xian liaojie mei-ge-xuesheng.*
 like MEI-CL-student then need first know MEI-CL-student
 'To like every student, one needs to first know every student.'
- b. *Ba maojin na chulai shai yi-xia, keyi xiaomie dabufen-de-xijun.*
 BA towel take out bask one-CL can eradicate DABUFEN-DE-germ
 'Take the towels out and expose them to the sun for a while. This can kill most germs.'
- c. *Muqinjie-de-shishou, mei-ge-xiaohai wei-mama xie-le yi-feng-xin.*
 Mother's day-DE-time, MEI-CL-kid for-mum write-ASP one-CL-letter
 'On Mother's Day, every kid wrote a letter to their mum.'

9. Cheng (2009) and many other studies consider *mei*-CL-N phrases (a rough counterpart of *every*-phrases in English) and *dabufen-de*-N (a rough counterpart of *most*-phrases in English) as typical strong noun phrases. We follow their categorization in this work since these phrases are anomalous in existential sentences (cf. Milsark 1977). However, we do believe that *mei*-phrases and *dabufen-de*-phrases are semantically different from their apparent English counterparts. As for the semantics of *mei*, we refer the interested readers to Pan (2005). A reviewer suggests that the *dabufen*-phrase here is inherently definite. We agree with the reviewer and refer the interested readers to Chapter 7 of Feng (2018) for a detailed discussion of *dabufen*.

- d. *Dabufen-de-xuesheng xuan-le yuyanxue zuo zhuan*
 DABUFEN-DE-student choose-ASP linguistics as major
 ‘Most students chose linguistics as their major.’

To summarize, the interaction of *dou* with *na*-phrases and strong noun phrases does not support the analysis of *dou* as a maximizer on the nominal domain or a definiteness marker, and the analogy Giannakidou & Cheng (2006) and their subsequent works established between Mandarin and Greek is basically not correct. In §4, we shall show that, if *dou* is treated as a universal quantifier, its interaction with *na*-phrases can be given a more natural explanation.

2.3 Nominal maximizer ≠ suggestion of existence/givenness

In Giannakidou & Cheng (2006), the crucial evidence for the maximization of *dou* is the suggestion of existence/givenness of *dou*-sentences. Giannakidou & Cheng notes that Example (20) carries the expectation of existence of people calling in and can be used the moment when the telephone is ringing, and that Example (21) indicates the existence of a contextually determined set of places such that Zhangsan does not want to go to any of them. They attribute the suggestion of existence/givenness in such examples to the maximality of *dou*, which prompts the exclusion of the empty set.¹⁰ However, we argue that the link between maximality and the suggestion of existence/givenness is not discernible.

- (20) *Na-ge-ren da-dianhua lai, dou shuo wo bu zai.*
 which-CL-person telephone come DOU say I NEG at
 ‘Whichever person calls, say I’m not here.’
- (21) *Zhangsan nar dou bu xiang qu.*
 Zhangsan where DOU NEG want go
 ‘Zhangsan does not want to go to any (of the places).’

The formal treatment shown in (22) (repeated from (2)) cannot capture the expectation of existence in (20).

- (22) a. $\text{DOU} = \lambda P_{\langle s, \text{et} \rangle} \iota (\lambda w \lambda x [P(x)(w)])$
 b. $\| \text{wulun} \| (\| \text{na-ge-ren} \|) = \lambda w \lambda y [\text{person}(y)(w)]$
 c. $\text{DOU} (\| \text{wulun na-ge-ren} \|) = \iota (\lambda w \lambda y [\text{person}(y)(w)])$

First, it is unclear how maximization over the intensional domain can result in a weak commitment to existence in the evaluation world. Second, maximization

10. We take the expectation of existence or suggestion of existence in their work to refer to existence in the evaluation world.

prompts the exclusion of an empty set because it picks out the largest element in a domain, and logically it cannot be defined on an empty domain with no elements to be compared. Yet, (20) can also be used when there is actually no one calling in, which means, on one hand, *dou* excludes the empty set, and on the other hand, it has to be relaxed to be defined on an empty domain. Instead of being evidence strengthening the maximality approach, examples like (20) can also be deemed as cases which trivialize *dou*'s semantic contribution of maximality. Third, *dou* as a consequence cannot directly operate on the *na*-phrase in the antecedent of the conditional to exert its maximization force, as it is syntactically too far away from *dou*.

If the maximality approach is adopted, then for (21), *dou* operates on world-place pairs and outputs the maximal sum of places in each world. Even if such an operation could exclude the empty set, as proposed by Giannakidou & Cheng (2006), it remains unexplained why it can help relate to a contextually determined set. Contra Giannakidou & Cheng, we argue in §4.3 that the suggestion of existence/givenness is due to the universal force of *dou* and its interaction with other factors.

2.4 More compositional difficulty

In §2.3, we mention briefly the problem of compositionality to derive the interpretation of conditionals like (20). Below we show that the maximality approach is not syntactically well-grounded and can cause more compositional difficulty.

Normally, a definite determiner and the noun phrase with which it is associated should form a syntactic constituent so that the determiner can take the noun phrase as its argument. Giannakidou & Cheng's definition of *dou* (see (22a)) does require that it combine with the noun phrase syntactically. However, language facts show that *dou* forms a constituent with the VP rather than the preceding NP.

- (23) *Nūhai dou qu-le gongyuan.*
 girl DOU go-ASP park
 'The girls all went to the park.'

With respect to (23), one cannot answer the question of "who went to the park" with a fragment in the form of *nūhai dou*, intending to mean the maximal group of girls. This is simply impossible. However, one can respond to the question of "what did the girls do" by answering with *dou qu-le gongyuan*, meaning 'all went to the park'. *Dou* syntactically integrates with the VP first; yet, obviously, the definition in (22a) cannot combine with the VP to yield the correct interpretation of (23). First of all, the VP denotation is not intensional and cannot serve as the argument of *dou*. If we allow *dou* to take unintensional arguments, it will yield

a maximal plurality of entities that went to the park when operating on the VP denotation, as shown in (24). The output of *dou* is an entity of type $\langle e \rangle$ and cannot further integrate with the denotation of girls to yield the sentential interpretation of type $\langle t \rangle$. In this sense, the treatment of *dou* as a maximizer cannot derive the meaning of *dou*-sentences successfully.

- (24) $\|qu\ le\ gongyuan\| = \lambda x[\text{went to the park}(x)]$
 $DOU = \lambda P \iota x[P(x)]^{11}$
 $DOU(\|qu\ le\ gongyuan\|) = \iota x[\text{went to the park}(x)]$

3. Problems with the maximality approach in Xiang (2008)

After discussing the theoretical and empirical problems with the maximality approach initiated by Giannakidou & Cheng (2006), we now move to comment on the proposal of Xiang (2008). Xiang (2008) can be regarded as an extension of Giannakidou & Cheng's proposal, since her formal treatment of the non-scalar use of *dou* is the same as that in Giannakidou & Cheng (2006). However, Xiang is also aware of the distributive effect of *dou*; hence, to bridge distributivity with maximality, Xiang proposes that *dou*'s maximization operation is performed at the level of covers. Moreover, to account for the scalar use of *dou*, as in (25), Xiang further extends the idea of maximization to the ordered domain of degrees, integrating the insights of Portner (2002).

- (25) *Lian [shagua]_F dou zhidao zhege.*
 LIAN idiot DOU know this
 'Even idiots know this.' (Xiang 2008)

Below we argue that Xiang's modified maximality approach is still problematic. First, we would like to point out that evidence for *dou*'s maximality pertains to the maximizing effect, which is normally treated as the consequence of universal quantification. Furthermore, we shall show that Xiang's maximization over covers and degrees will make incorrect predictions concerning the interpretation of *dou*-sentences.

11. According to Giannakidou & Cheng's (2006) notational convention, the unintentional definition of *dou* would be $\lambda P \iota (\lambda x[P(x)])$. However, as mentioned in Footnote 2, the individual should be directly bound by the iota operator rather than under the scope of both the iota operator and the lambda operator. We use the corrected formula $\lambda P \iota x[P(x)]$ in our discussion.

3.1 Two different maximality-related phenomena

One essential issue we wish to address is that Xiang's evidence for *dou*'s "maximality" is very different from that of Giannakidou & Cheng's and that in the literature her evidence concerning the maximizing effect is normally explained with universal quantification.

Xiang (2008) follows Giannakidou & Cheng's formal treatment of *dou* and defines the morpheme as that in (26).

$$(26) \quad ||dou|| = \lambda P_t(\lambda x. P(x))^{12} \quad (\text{Xiang 2008})$$

Yet, the nature of her proposal varies greatly from the original thoughts in Giannakidou & Cheng (2006). Giannakidou & Cheng argue that *dou* contributes maximality/definiteness to FCIs, similar to the definite articles; while Xiang is concerned with the **maximizing effect**, or the cancelation of the non-maximal interpretation of definite noun phrases.

It is commonly assumed that a definite article can exert maximality over a structured domain (Rullmann 1995), which allows a definite phrase to pick out a unique referent. In certain contexts, the maximizing power can be weakened and a definite phrase is thus interpreted non-maximally with respect to the VP. The non-maximal interpretation arises when some but not necessarily all the members in a maximal plurality have the VP property in question. For instance, (27a) can be uttered when some but not all the windows from a salient set are related to the property of being open. This is because the maximal plurality picked out by the definite article *the* is weakened to a non-maximal interpretation when relating to the property of being open. In (27b), due to the presence of the universal *every*, however, each individual window is required to be related to the property denoted by the VP, which thus blocks the non-maximal construal of the windows.

- (27) a. The windows are open.
b. Every window is open.

Maximality encoded with definite/demonstrative determiners and the maximizing effect of overt operators (e.g. *all* and *every*) are two different matters. The former is always present and may be suppressed in certain contexts; while the latter operates on the already maximized output by a definite NP and blocks the possibility of non-maximal interpretation with respect to the VP denotation. Giannakidou & Cheng (2006) defines *dou* as a maximality operator of the former

12. Xiang's definition inherits the problem of Giannakidou & Cheng's proposal (see Footnote 2). The iota operator rather than the lambda operator should bind the individual variable. We use the corrected definition $\lambda P_t \iota x P(x)$ in the following discussion.

type. Although Xiang adopts their formal definition, her evidence concerns the latter type, as exemplified in (28).

- (28) a. *Haizi-men qu-le gongyuan.*
child-DET_{PL} go-ASP park
‘The children went to the park.’ (Xiang 2008)
- b. *Haizi-men dou qu-le gongyuan.*
child-DET_{PL} DOU go-ASP park
‘The children all went to the park.’ (Xiang 2008)

According to Xiang, in (28a), the interpretation of *haizi-men* ‘the children’ can be pragmatically weakened, that is, it is possible that only some children went to the park; while in (28b), no exception is allowed due to the maximization of *dou*. The formal definition in (26) treats *dou* as a determiner picking out a maximal referent and encoding uniqueness/definiteness. Supposedly, like *the* in English, the maximal referent can still be weakened in certain contexts to yield a non-maximal interpretation; however, with *dou*, such an interpretation is not allowed, which deviates from the behavior of typical maximizers on the nominal domain. Hence, there is inconsistency between Xiang’s formal treatment of *dou* and the evidence for the maximizing effect in her work. In contrast, if *dou* is treated as a universal quantifier like *every*, then incompatibility with non-maximality can be given a natural explanation, i.e. *dou* operates on each of the children in the domain and consistently relates them to the property of having gone to the park.

To summarize, maximization on the nominal domain can be weakened; while the maximizing effect ensures that the already maximized nominal interpretation is not weakened with respect to the VP and it is normally instantiated by universal operators (Landman 1989; Lasersohn 1995; Winter 2002). In Xiang (2008), there is a mismatch between the formal treatment and the data she presents: Her formal treatment of *dou* patterns with that of definite articles, i.e. maximization on the nominal domain, though her data suggest that *dou* has the maximizing effect, which is normally induced by universal quantification.

To treat *dou* as a maximizer on the nominal domain may also cause interpretive redundancy. Demonstratives, like definite articles, already convey maximality/uniqueness (Wolter 2006). If *dou* also exerts maximization over the nominal domain and picks out the maximal plurality, as formalized in (26), then *dou* and demonstratives tend to be of complementary distribution, since both perform the same function; however, as in (29), *dou* can safely co-occur with *zhexie* ‘these’ despite the fact that the domain of girls is already restricted to a maximal plurality by the demonstrative. In languages like Greek, demonstratives and definite articles co-occur obligatorily (Panagiotidis 2000), yet we do not think the co-occurrence of *zhexie* and *dou* is analogous to the data of Greek. In (29), without

dou, the plural demonstrative noun phrase *zhexie-nühai* ‘these girls’ simply cannot combine with the distributive predicate ‘wearing a dress.’ The main interpretive import of *dou* is not domain restriction or marking definiteness, as assumed in the maximality approach, and it is not semantically redundant, either. Instead, *dou* exerts its universal force to mediate the semantic clash between the plurality of girls and the individual property of wearing a dress, relating the property to each individual girl.

- (29) *Zhexie-nühai* *(*dou*) *chuan-zhe yi-tiao-qunzi*.
 these-girl DOU wear-ASP one-CL-skirt
 ‘These girls are each wearing a skirt.’

3.2 *Dou* ≠ maximization over covers

Section 3.1 shows that Xiang (2008) does not provide proper evidence for the maximality/definiteness of *dou*; rather, her examples deal with the maximizing effect, which is normally induced by overt universal quantifiers. This section comments on the modification of the maximality approach made by Xiang, i.e. treating *dou* as a maximality operator over covers.

Following Giannakidou & Cheng (2006), Xiang (2008) assumes that *dou* exerts maximization over the nominal domain (see the definition in (23)); however, she also proposes that maximization is at the level of covers generated by the noun phrase denotation with which *dou* is associated, aiming to bridge the maximality approach with distributivity. We show in the following discussion that the integration of covers with maximization is not so successful, as assumed by Xiang.

A cover *C* is a partition of a certain set *P* in the form of a set of sets, which allows overlapping (Schwarzschild 1996). By adjusting the make-up of a cover, we can derive different levels of distributivity, where collectivity is a special case of distribution over a cover with only one single cell. “Cover” is closely related to distributivity and Schwarzschild proposes that a distributive operator is always accompanied by a cover variable whose value assignment is regulated by context. Despite Xiang’s utilization of the notion of “cover”, her analysis is vague in the sense that she does not specify what exactly introduces the cover variable and does not mention the application of a distributive operator, either. Since *dou* is a one-place maximizer over covers generated by the nominal domain in Xiang (2008), it can be inferred that covers in her proposal are treated as an intrinsic part of noun phrase interpretation. In this respect, Xiang’s cover-based analysis diverges from Schwarzschild’s (1996) original proposal of a cover variable evoked by a distributive operator.

If we assume that Mandarin noun-phrases *per se* can make reference to covers and that somehow *dou* exerts maximization over the value assignment of covers, Xiang's proposal still cannot yield the correct results.

Xiang elaborates on her proposal as follows:

I propose that *dou* is simply a maximality operator. It operates on a set that has been partitioned by covers and picks out the maximal plural individual.

(Xiang 2008: 281)

Dou, as a maximality operator, operates at the level of a set of covers and outputs a maximal plural individual that consists of all the covers... (Xiang 2008: 286)

Maximization over covers in Xiang's proposal is subject to two different interpretations. First, literally speaking, "a maximal individual including all the covers" can be understood as: *Dou* operates at the level of covers and unifies all the covers to output a maximal individual. Following Schwarzschild's original proposal, Xiang assumes that covers are context-sensitive; hence, we assume that all the "covers" actually refer to all the contextually possible covers rather than all the logically possible covers generated by a given set.

Now let us see how this line of analysis may fail in certain examples (see also Krifka (1992)).

- (30) *Na-san-ge-nühai dou kan-le liang-bu-dianying.*
that-three-CL-girl DOU watch-ASP two-CL-movie
'Those three girls watched two movies.'

Suppose that the set of three girls in (30) is {a, b, c}, then all the contextually possible covers are listed below, as in (31), since movie-watching can be done individually, in twos, or in threes.

- (31) {{a},{b},{c}}
{{a,b},{b,c}}
{{a,c},{a,b}}
{{a,c},{b,c}}
{{a,b},{c}}
{{a,c},{b}}
{{a},{b,c}}
{{a,b,c}}

By unifying all the covers, the output is a set of sets as in (32):

- (32) {{a},{b},{c},{a,b},{a,c},{b,c},{a,b,c}}

If all the cover cells are related to the VP denotation via an implicit distributive operator, then (30) should be true in the situations, as represented in (33), where numbers correspond to different movies.

- (33) $\{a,b,c\} \rightarrow \{1,2\}$
 $\{a,b\} \rightarrow \{3,4\}$
 $\{a,c\} \rightarrow \{5,6\}$
 $\{b,c\} \rightarrow \{7,8\}$
 $\{a\} \rightarrow \{9,10\}$
 $\{b\} \rightarrow \{11,12\}$
 $\{c\} \rightarrow \{13,14\}$

In (33), all the cover cells in the maximal cover are related to the property of watching two movies and it is possible that the movies are all different, which adds up to a total of 14. However, intuitively, the maximal number of movies watched in (30) is 6, where each girl watched 2 different movies. In this sense, Xiang's (2008) proposal is too weak, as it allows unavailable readings.¹³

The other interpretation of Xiang's proposal is: *Dou* operates on a plural set and outputs a maximal plurality in the form of a context-sensitive cover.¹⁴ Hence, *dou*'s function is principally the adjustment of the value assignment of a cover to ensure that the cover properly includes every element of the plurality. In this sense, it seems that Mandarin *dou* can be analyzed on a par with the English *all*, as in Brisson (2003), both of which exert maximality by regulating the selection of a cover. It is true that both *all* and *dou* can cancel non-maximality of plurals, yet it should be noted that the two morphemes are by nature different in terms of distributivity. *All* tolerates both collective and distributive readings, while the occurrence of *dou* simply blocks a genuine collective reading, as compared in (34) and (35).

13. It should be noted that the reading where three girls watched 14 movies in total is the result of distribution over the maximized output of covers. It is not a general problem with cover-based distribution, as the definition of cover in Schwarzschild (1996) requires that any cover cell of a cover *C* of a set *P* does not cover the set *P* and thus will not allow a cover in the form of (32).

14. In Xiang (2008), the term "cover" is not used in the strict sense as that in Schwarzschild (1996), that is, it refers to both a cover in Schwarzschild's (1996) sense and a cover cell. A cover of the set $\{a, b, c\}$ with multiple parts as in (i) is called "a multiple-cover partition" with "three covers" in Xiang (2008: 258):

(i) $\{\{a,b\}, \{b,c\}, \{c,d\}\}$

- (34) The girls all built a raft.

OK: Distributive reading with respect to the maximal set of girls in the context.

OK: Collective reading (all the girls built one single raft together) with respect to the maximal set of girls in the context.

- (35) *Naxie-nühai dou zao-le yi-sou-huating.*

those-girl DOU build-ASP one-CL-raft

OK: 'Each of those girls built a raft.' (distributive reading)

NOT OK: 'All the girls built one single raft together.' (collective reading)

To account for the unavailability of a genuine collective reading in (35), Xiang (2008) separately postulates a plurality requirement over the composition of the maximal cover, that is, the context-sensitive cover should have more than one cell. However, logically speaking, a maximal cover with multiple cells still cannot induce distributivity or block genuine collectivity. To solve the problem, one has to assume that such a plural cover necessarily forces the application of an implicit distributive operator that relates each of the cells to the VP denotation. Yet, such a solution is both *ad hoc* and anti-intuitive. If noun phrases can generate covers, then *tamen* in (36) can naturally produce a plural cover to support distributivity. However, without *dou*, only the collective reading is available. Examples like (36) show that *dou* does not mark maximal covers with multiple cells which in turn evoke a distributive operator; rather, *dou*, *per se*, is the instantiation of the distributive force.

- (36) *Tamen mai-le yi-bu-chezi.*

they buy-ASP one-CL-car

'They bought a car (collectively).' (Lin 1998)

To close this section, we need to point out that Xiang's (2008) formal treatment of *dou* in (26), repeated below as (37), cannot derive the available readings of *dou*-sentences such as (35).

- (37) $||dou|| = \lambda P \iota x P(x)$

- (38) $||naxie-nühai dou|| = \iota x \text{ those girls}(x)^{15}$

$||zao-le yi-sou-huating|| = \lambda x \exists y [\text{raft}(y) \wedge \text{built}(x, y)]$

$||zao-le yi-sou-huating|| (||naxie-nühai dou||) = \exists y [\text{raft}(y) \wedge \text{built}(\iota x \text{ those girls}(x), y)]$

15. In §2.4 we show that *dou* forms a constituent with the VP rather than the subject noun phrase. Here we ignore the problem of compositionality and allow *dou* to combine with the NP first. A reviewer pointed out that (38) is problematic in that both the iota-operator and the demonstrative *those* perform similar functions on the nominal domain; hence, it is weird

The definition in (37) operates on a set predicate *P* and fails to flesh out the cover-based ideas Xiang (2008) proposes. If we assume that somehow the definition can output a maximized cover, it still cannot yield the correct result. As shown in (38), the VP denotation takes the maximized plurality as its argument, and the existential quantifier introduced by the indefinite object scopes over the maximal plurality of girls and yields only the collective reading where the girls built the same raft, which is counter-intuitive. Recall that Xiang (2008) introduces a separate plurality requirement to ensure distributivity; however, the extra requirement still cannot fix the formula in (38). The existential quantifier takes scope over the rest of the sentence; therefore, even though ‘*ix* those girls(*x*)’ is able to generate a maximal cover of multiple members, each of the members is still matched with the same raft. On the contrary, *dou*, as a universal quantifier, no longer outputs a referential nominal expression; rather, it can scope over the VP (and also the indefinite object), which gives a logical explanation to the inaccessibility of orthodox collectivity in (35).

3.3 Theoretical difficulty of maximization over degrees

The clear merit of the maximality approach in Xiang (2008) is its extension to the scalar use of *dou*, a typical example of which is *lian...dou* sentences, as exemplified in (39).

- (39) *Lian* [*shagua*]_F *dou* *zhidao zhege*.
 LIAN idiot DOU know this
 ‘Even idiots know this.’ (Xiang 2008)

According to Xiang, *lian* in (39) evokes a set of scalar alternatives generated by the focused constituent *shagua* ‘idiot’, and the alternative propositions are arranged according to a scale of unexpectedness,¹⁶ and the contribution of *dou* in (39) is not maximization at the level of covers but over the degrees of unexpectedness, as defined in (40).¹⁷

to retain those in the formal treatment. We agree with the reviewer’s opinion, and in (38), we retain the demonstrative determiner to show that Xiang’s treatment of *dou* may cause redundancy.

16. The evocation of ordered alternatives in the *lian...dou* construction is not a unique idea of Xiang (2008). For instance, the universal quantificational approach adopted by Jiang (1998) and Pan (2006) also makes use of ordered alternatives ranked by unlikelihood.

17. The definition of *dou* in (40) is reminiscent of Rullmann’s (1995) definition of a maximality operator *Max* over degrees, as in (i).

(i) $\text{Max}(D) = \lambda D \lambda d [d \in D \wedge \forall d' [d' \in D \rightarrow d' \leq d]]$ where *D* is a set of degrees.

(40) D is a set of ordered degrees, $\text{dou}(D) = d(d \in D \wedge \forall d' \in D(d \geq d'))$ (Xiang 2008)

Hence, for (39), *dou* operates on degrees of unexpectedness and picks out the maximal value d . Xiang (2008) argues that in this way a tighter connection between scalar and non-scalar contexts of *dou* is established.

Yet, the maximization over degrees is not without theoretical problems. Typically, the maximization operation over degrees is performed over a set of degree values, for instance, a standard maximization operation over degrees of heights outputs the greatest value of heights which is normally a numerical value. Maximization over degrees of heights cannot directly work on individuals that are already mapped to the values of heights.

In the scalar use of *dou*, a set of alternative propositions is mapped to a scale of degrees of unexpectedness, and then a maximization operation picks out the maximal value, as illustrated in Figure 1. Similarly, the maximization operation cannot have access to any alternative proposition since the ordered domain is not made up of propositions but rather degrees of unexpectedness.

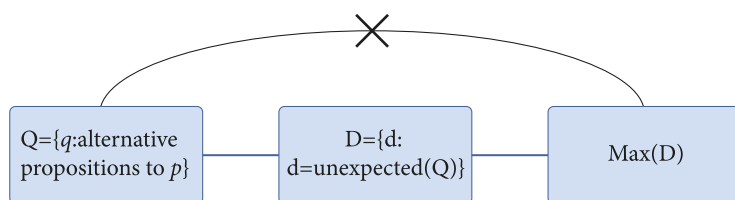


Figure 1. “Maximization” in the scalar use of *dou*

Consequently, the definition in (40) cannot facilitate a correct formal interpretation of scalar sentences, e.g. (39). The focus marker *lian* helps generate a set of alternative propositions ordered by a scale of unexpectedness as in (41) (see Pan (2006)), which cannot be further operated on by *dou* since it can only take a set of degrees as its argument.

(41) $||\text{lian shagua zhidao zhege}|| = \text{Alt}(|[_{\text{F}}\text{idiot}] \text{ knows this}|)$

Dou is not able to operate on the set of alternative propositions; similarly, it cannot exert its force on the set of alternative constituents, $\text{Alt}(|[_{\text{F}}\text{idiot}]|)$. To resolve the sortal mismatch, we have to assume an implicit operator *deg* which maps a set C of alternatives to their respective degrees of unexpectedness, as in (42). The derivation in (42) outputs a maximal degree of unexpectedness, whose truth or falsity is impossible to judge. Xiang (2008) points out that a *lian...dou* sentence normally conveys strong exhaustivity, for instance, (39) means that dumb people know this, which is most unexpected, and entails that all the other smarter ones

also know this, i.e. the lower alternatives propositions are all true. However, it is unclear how a maximal degree value can facilitate the inference of the truth of a set of alternative propositions.

- (42) $\text{deg} = \lambda C \lambda D [D : \{\text{unexpectedness}(p)\} \wedge p \in C]$
 $\text{deg}(\llbracket \text{lian shagua zhidao zhege} \rrbracket) = \lambda D [D : \{\text{unexpectedness}(p)\} \wedge p \in \text{Alt}(\llbracket [\text{Fidiot}] \text{ knows this} \rrbracket)]$
 $\text{dou}(D) = \text{id}(d \in D : \{\text{unexpectedness}(p)\} \wedge p \in \text{Alt}(\llbracket [\text{Fidiot}] \text{ knows this} \rrbracket) \wedge \forall d' \in D (d \geq d'))$

To close this section, let us note that Jiang (2009; 2011) also tackle the pragmatic reasoning of the *lian...dou* construction with the notion of scales (see also Pan (2006)). In the scalar model, a set of context propositions are ordered by entailment to facilitate the discourse participants' interpretation of the relevant sentences (Kay 1990). The unexpectedness of a *lian...dou* sentence lies in the fact that the new proposition introduced into the model by the sentence in question is more informative and entails the other contextual propositions. Though both Jiang (2009; 2011) and Xiang's (2008) proposals are related to the notion of scales, the scalar model adopted by Jiang can bypass the technical difficulties mentioned above. Xiang pins down the unexpectedness of the *lian...dou* construction as maximization induced by *dou*, while Jiang's proposal attributes unexpectedness to the pragmatic inference of the construction as a whole. In §4, we shall argue that *dou*, as a universal quantifier, can also help derive unexpectedness and the inference of strong exhaustivity of *lian...dou* constructions in a clearer way.

4. Explanatory power of *dou* as a universal quantifier

After the refutation of the maximality approach, we shall illustrate below how the universal quantificational approach can solve the problems mentioned in the previous sections and provide new data that manifest the explanatory power of treating *dou* as a universal quantifier. The discussion below does not aim to present a new theory of universal quantification; rather, it intends to offer a fair discussion of this more conventional approach, showing that universal quantification, compared with the notion of maximality, is a more effective tool to explain the diverse meanings of *dou*, i.e. distributivity, exhaustivity, scalarity, and to countenance the facts related to polarity item licensing.

4.1 Diverse quantificational mapping strategies of *dou*

Following Jiang (1998), Pan (2006), Jiang & Pan (2013), and Feng & Pan (2018), we argue that *dou* has a univocal meaning as a universal quantifier, and its various uses are derived by different quantificational mapping rules which lead to different compositions of its quantificational domain (see also Pan & Feng (2017)). As generalized in (43), *dou* can operate on an unordered domain or an ordered domain, and its quantificational structure is constrained by topic-comment mapping (rule P1) and/or background-focus mapping (rule P2).

- (43) P1: If the material to the left of *dou* can either serve as the quantificational domain or provide the quantificational domain through pragmatic inferences, it is mapped to the domain and the rest of the sentence, to the scope.
- P2: If the comment of the sentence contains a contrastive focus, the focused constituent is mapped to the scope, and the rest of the sentence, to the domain, which induces an exclusiveness interpretation on the focus.
- (Jiang & Pan 2013)

The distributive use of *dou* is constrained by rule P1.

- (44) *Zhexie-nühai *(dou) chuan-zhe yi-tiao-qunzi.*
these-girl DOU wear-ASP one-CL-skirt
‘All these girls are wearing a skirt.’

In (44) (repeated from (29)), the plurality to the left of *dou* can serve as its quantificational domain, and *dou*, as a universal quantifier, relates each individual girl in the plurality to the property of wearing a skirt, bringing forth the distributive effect. Universal quantification operates on every member in the domain; therefore, no exception is allowed with respect to the plurality, which thus explains the maximizing effect mentioned in Xiang (2008).¹⁸ *Dou*, as a universal quantifier, has

18. With respect to the quantificational domain, universal quantification has the maximizing effect, as truth-conditionally it requires that all members in the domain have certain properties. This is the reason why a number of studies argue that universal quantification can generate the maximizing effect (Landman 1989; Lasersohn 1995; Brisson 2003; Winter 2002). Also, Brasoveanu (2008) dissected universal quantification into two components, maximality and distributivity. In the meantime, some also point out that universal quantification tolerates exception and does not have the maximizing effect, giving examples like (i).

(i) *Haizi-men dou qu-le gongyuan, Doudou que zai-jia kan dianshi.*
child-PL DOU go-ASP park Doudou but at-home watch television
‘The children all went to the park, but Doudou is at home watching TV.’

its interpretive import of distributivity rather than definiteness; hence, naturally it is not in complementary distribution with other operators which contribute definiteness, e.g. *zhexie* ‘these’. Also, let us note that the universal quantificational approach will not generate the unavailable reading of (30) (repeated below as (45)), where the three girls watched 14 movies in total.

- (45) *Na-san-ge-nühai dou kan-le liang-bu-dianying.*
 that-three-CL-girl DOU watch-ASP two-CL-movie
 ‘Those three girls watched two movies.’

For (45), the universal *dou* quantifies over the set of the three girls and relates each of them to an event of watching two movies, i.e. girl *a* watched two movies in event e_1 , girl *b* watched two movies in e_2 , and girl *c* watched two movies in e_3 . If the value assignment of the themes of the three events happens to be the same, then the girls watched two movies in total. If the value assignment of the themes of the three events does not at all overlap with each other, then the girls watched altogether six different movies. No matter how the value assignments of the two movies change, the number of the movies watched cannot exceed 6.

The contribution of *dou* in *lian...dou* constructions is also constrained by rule P1, as discussed in Pan (2006).

- (46) *Lian [shagua]_F dou zhidao zhege.*
 LIAN idiot DOU know this
 ‘Even idiots know this.’

For (i), apparently Doudou is an exception to the children going to the park, which weakens the maximizing effect of *dou*. However, we think in (i), *dou*, interpreted as a universal quantifier, still exerts the maximizing effect on the set of children. The set of children certainly does not pertain to all children in the world, or in the context; rather it is a set which is restricted by contextual information and the speaker’s perception, for instance, *dou* may quantify over a set of children in the context that the speaker is familiar with, which excludes Doudou. Szabolcsi (2010) also raises a similar example. In the context specified in (ii), the speaker can truthfully utter a universally quantified sentence. In (ii), the domain *every* quantifies over is not the set of bottles in the context, but the set of oil bottles which the speaker is looking for. And maximality also pertains to the set of oil bottles.

- (ii) Context: The speaker is looking for oil and finds in the cupboard empty bottles of oil and full bottles of vinegar, and utters: “Every bottle is empty.”

Hence, we think the maximizing effect is the consequence of the truth-conditional requirement of universal quantification. And the apparent cases where universal quantification is non-maximal can be explained away if contextual restriction and the speaker’s perception are taken into consideration.

In (46) (repeated from (39)), the focused constituent marked by the operator *lian* generates a set of alternatives, $\text{Alt}(|_{\text{F}}\text{idiot}|)$,¹⁹ ordered by a scale of unlikelihood with respect to their command of knowledge. The ordered alternatives serve as the quantification domain and *dou* uniformly relates every alternative to the predicate denotation, as formalized in (47) (see also Jiang (1998); Hole (2004); and Pan (2006)).

$$(47) \quad \forall x[x \in \text{Alt}(|_{\text{F}}\text{idiot}|) \rightarrow \text{know this}(x)]$$

As a result, the sentence carries an exhaustive interpretation over all the ordered alternatives, meaning that dumb people as well as all the smarter people know this.²⁰ The ordered alternatives generated by the focus and the universal force of

19. Liu & Xu (1998) refer to the focused constituent marked by *lian* as the contrastive topic; while we take the focused constituent to be a contrastive focus contained in the topic.

20. Some may argue that the truth condition in (47) is too strong, since in some cases *lian...dou* constructions do not invite the inference that all alternatives are true, as illustrated in (i).

(i) *Lian* [Zhangsan]_F *dou kaoguo-le, zenme nimen mei guo?*

Even Zhangsan DOU pass-ASP why you NEG pass

'Even Zhangsan passed. How come you didn't pass?'

We do not take (i) to be a counter-example to the universal quantificational approach. Here in (i) the alternatives that *dou* quantifies over are contextually determined, for instance, it can be the class of students where Zhangsan is a member of. Zhangsan is the one who is least likely to pass, and since he passed, the sentence invites the universal inference that all other students also passed. And we argue that the people referred to by *nimen* 'you' do not belong to the set pertaining to the *lian...dou* sentence, for instance, it can be some students in another class who normally perform better than the students in Zhangsan's class. In this way, the people denoted by *nimen* are not included in the scale generated by Zhangsan. Therefore, logically, the second sentence in (i) (i.e. "How come you didn't pass?") does not directly contradict with the *lian...dou* sentence, and only convey the speaker's surprise towards the contrast. Also, it should be noted that even if *nimen* is in the same class with Zhangsan, (i) can still be interpreted with universal quantification if the speaker focuses only on the conceptual set denoted by *nimen* which excludes Zhangsan (cf. Footnote 18).

(ii), as compared with (i), is a bit infelicitous.

(ii) #*Lian* [Zhangsan]_F *dou kaoguo-le, zenme qita-ren dou mei guo?*

Even Zhangsan DOU pass-ASP why other-person DOU NEG pass

'Even Zhangsan passed the exam. How come the others all didn't?'

The first sentence of (ii) means that Zhangsan, the most unlikely one to pass in the context, passed the exam, and *dou* invites the inference that all the alternatives to 'Zhangsan passed the exam' also holds. The question following the *lian...dou* sentence encodes a piece of contradictory fact, i.e. all the people other than Zhangsan passed, which cancels the universal inference by force and causes the effect of unthinkability or inconceivability. *Zenme* 'how come' explicitly shows the speaker's surprise to the contradiction between the *lian...dou* sentence and the fact

dou concert to cause the connotation of unexpectedness, that is, all the alternative propositions and even the most unlikely one hold.

As shown in (47), the contrastive focus to the left of *dou*, i.e. contained in the topic, merely produces the domain of quantification. However, when the focus is located to the right of *dou* in the comment, it requires that the quantificational mapping of *dou* be determined by the background-focus partition, as stipulated in rule P2. Hence, in (48) (repeated from (3)), the focused constituent is mapped to the scope, and the rest of the sentence to the domain, as formalized in (49).

- (48) *Ta dou xie-de [xiaoshuo]_F.*
 he DOU write-DE novel
 'All he wrote are novels.'

- (49) $\forall x[\text{write}(\text{he}, x) \rightarrow \text{novel}(x)]$

Crucially, the background-focus mapping can produce exclusiveness, i.e. all the things 'he' wrote have the property of being novels rather than anything else. Comparatively, the maximality approach simply cannot explicate the exclusive interpretation of such sentences. For (48), *dou*, as a unary maximality operator, is not supposed to be focus-sensitive. And even if it can, maximization over the domain of novels can only yield the reading where he wrote all the possible nov-

that none of the other students passed. Without *zenme*, the example becomes even worse, as the two sentences express inconsistent meanings, as in:

- (iii) *#Lian [Zhangsan]_F dou kaoguo-le, qita-ren dou mei guo.*
 Even Zhangsan DOU pass-ASP other-person DOU NEG pass
 'Even Zhangsan passed the exam, and none of the others did.'

Due to the same reasons, (iv) is also infelicitous like (ii) and (iii).

- (iv) *#Ta lian yi-di-shui dou liu-gei-le haizi, zenme qita-dongxi dou mei liu-xialai?*
 she even one-drop-water DOU leave-give-ASP child why other-thing DOU NEG
 leave-down-come
 'She even left a drop of water to her child. How come she didn't leave the other things to the child?'

One essential problem with examples from (ii) to (iv) is that the sentences following the *lian...dou* sentences exclude all the other alternatives *dou* quantifies over and leave only one single alternative for *dou* to exert its universal force. However, *dou* requires a domain with a cardinality of more than one (Lee 1986; Lin 1996). The infelicity of these examples supports the universal approach and further shows that the semantics of *lian...dou* sentences is different from that of *even*. Also, the phenomena shown in examples from (i) to (iv) echo with the discussion in Footnote 18, i.e. the quantificational domain is restricted by contextual information and the speaker's perception.

els, as predicted by Giannakidou & Cheng's (2006) proposal, or the maximal cover of novels, as argued in Xiang (2008). However, the sentence does not express an exhaustive reading with respect to all the possible novels; rather it actually means all he wrote are novels, excluding the other alternatives from the set of things he wrote, which can only be accounted for by taking *dou* to be a universal quantifier whose quantificational structure is determined by the background-focus mapping.

To summarize, the core meaning of *dou* is universal quantification; however, due to its diverse mapping strategies, it can take on various effects including distributivity, exhaustivity, and exclusiveness. The maximizing effect on the nominal domain and the strong exhaustivity with respect to scalar alternatives can be given a natural explanation with the universal quantificational approach. Moreover, only the treatment of *dou* as a universal quantifier can explain the exclusive interpretation in examples like (48). To close this section, we show that the diverse mapping strategies are the veritable cause of ambiguity in sentences like (50).

(50) *Ta dou mai nizi-de-dayi.*

he DOU buy wool-DE-coat

Possible readings:

- a. '(In all the situations where he shops for coats), he buys woolen coats.'
- b. 'All he buys are woolen coats.'

For (50), the domain of *dou* can be provided by an implicit contextual topic, e.g. the set of situations where 'he' shops for coats, and the universal force further relates each of the situations with a situation wherein 'he' buys woolen coats (cf. Yuan (2005)). As formulated in (51a), the sentence stresses the uniformity among all the situations in which he shops, i.e. the buying of woolen coats; however, it does not exclude the possibility of his buying other types of coats, i.e. it could be the case that in some situation he bought a woolen coat and a cashmere coat. The sentence can also be interpreted with exclusiveness if the constituent *nizi-de-dayi* 'woolen coats' bears a stress and becomes the focus. The stressed constituent to the right of *dou* determines that its quantificational structure is constrained by background-focus. As formulated in (51b), the focused constituent is mapped to the scope, and the rest of the sentence, to the domain. As a result, all the possible value assignment of *x* that he buys has the property of being woolen coats rather than other things, which leads to the exclusiveness reading on woolen coats.

- (51) a. $\forall s[\text{he shops for coats in } s \rightarrow \text{he buys woolen coats in } s]$
- b. $\forall x[\text{he buys } x \rightarrow \text{woolen coat}(x)]$

4.2 Universal quantification and polarity item licensing

As pointed out earlier, Mandarin *na*-phrases do not exhibit anti-episodicity and cannot be directly licensed by various non-veridical operators. As in (52) (repeated from (18)), *dou* has to appear to render the sentence grammatical, despite the fact that the *na*-phrase is in the scope of the non-veridical operators.

- (52) *Wo yiban/tongchang/yinggai na-zhong-shucai *(dou) chi.*
 I in-general/usually/should which-kind-vegetable DOU eat
 ‘I generally/usually/should eat every kind of vegetables.’

Instead of treating *na*-phrases as atypical FCIs, we think that their polarity behavior is actually sensitive to negative contexts like negation, questions, antecedents of conditionals, and decreasing quantificational adverbs, as exemplified in (53)²¹ (see also Chen (2013)). In particular, it should be noted that these negative contexts need not be episodic to license *na*-phrases (see also Examples (12)–(14)).

- (53) a. *Meiyou na-ge-ren shi wanmei-de.*
 NEG-have which-CL-person be perfect-DE.
 ‘There does not exist anyone who is perfect.’
 b. *Ni die-dao le, you-mei-you na-li shoushang le?*
 you fall-down ASP have-NEG-have which-place hurt ASP
 ‘You fell down. Is there any part (of your body) that hurts?’
 c. *Ruguo na-ge-ren lai-le, jiu rang-ta deng-yixia.*
 if which-CL-person come-ASP JIU let-him wait-a-while
 ‘If anyone comes, ask him to wait for a while.’
 d. *Ta xihuan huwai-yundong, henshao qu na-ge-jianshenfang duanlian.*
 he like outdoor-sport rarely go which-CL-fitness-center work-out
 ‘He likes outdoor sports, and rarely works out in any fitness center.’

If *dou* is construed as a universal quantifier, then its decreasing domain is naturally grouped with the environments above as negative contexts. The domain of *dou* is decreasing in that the universal quantificational relation is still maintained if the domain is downsized (Ladusaw 1980).²² As illustrated in (54), if (54a) is true

21. We do not wish to claim that Mandarin *na*-phrases are standard NPIs, since aside from being interpreted as NPIs, non-interrogative *na*-phrases can also bring forth an ignorance effect under epistemic modality. The ignorance effect cannot be analyzed as a free choice phenomenon where every choice is possible; rather it is a weaker modal variation effect meaning that the speaker is not sure of the truth of any choice (cf. Alonso-Ovalle & Menéndez-Benito (2010)). Interested readers may refer to Feng (2014) for the relevant examples.

22. There are studies which treat *wh*-phrases as inherently quantificational (e.g. Huang (1982)). Under such frameworks, *wh*-phrases are interpreted as generalized quantifiers and *dou*

then (54b) is necessarily true with its domain narrowed down to a subset of girls. However, when the set of girls is enlarged to include boys as in (54c), the universal relation may not hold any more.

- (54) a. *Nūhai dou xihuan hua.*
 girl DOU like flower
 'Girls all like flowers.'
- b. *Piaoliang-nūhai dou xihuan hua.*
 pretty-girl DOU like flower
 'Pretty girls all like flowers.'
- c. *Nūhai-he-nanhai dou xihuan hua.*
 girl-and-boy DOU like flower
 'Girls and boys all like flowers.'

Hence, just like other negative contexts, the domain of *dou* is the true licenser of the *na*-phrase in (52) only if it is taken to be a universal quantifier. The domain rather than the scope of *dou* is a decreasing environment, which explains why the *na*-phrase has to move to a pre-*dou* position.²³ Semantically, the quantificational adverbials or the modal verb in (52) do not directly quantify over the kinds of vegetables, but rather over situations. The *na*-phrase contributes kinds of vegetables, which serves as the domain of *dou*, and under the scope of quantificational

is formalized as a universal quantifier, which may cause the problem of double quantification. The analysis of *wh*-phrases is beyond the focus of our work; however, we think double quantification can be tackled from a theory-internal perspective by treating *wh*-phrases as indefinite variables without inherent quantificational force following Cheng (1991) and Tsai (1999).

23. One of the reviewers raised Example (i) which seems to contradict our view that *na*-phrases are negative contexts.

- (i) #*Kan-guo-na-ben-shu-de-xuesheng dou kao-guo-le.*
 read-ASP-which-CL-book-DE-student DOU exam-pass-ASP
 'Every student who read any book passed the exam.'

The entailment pattern of *dou* is clear, as shown in (54). As to the apparent oddity of (i), we think it is caused by other semantic requirements of the *na*-phrase. *Na*-phrases can be licensed by a downward entailing environment. In the meantime, they need strong contextual support. Therefore, *na* 'which' in (i) tends to link the set of books to a familiar set. Without proper contextual support, the sentence is odd out of the blue, as compared in (i) and (ii).

- (ii) Context: The teacher recommended three books for the preparation of the exam. The speaker is not sure which books each of the students read, but he thinks the reference books are very useful, because:
Kan-guo-na-ben-shu-de-xuesheng dou kao-guo-le.
 read-ASP-which-CL-book-DE-student DOU exam-pass-ASP
 'Every student who read any book passed the exam.'

adverbials or modals, *dou* further requires that in such situations, for each x of the vegetable kinds, I eat x .

4.3 Universal quantification and the suggestion of existence/givenness

As to the weak suggestion of existence and the flavor of givenness in sentences with *na*-phrases and *dou*, we can offer an explanation using universal quantification, rather than treating the phenomena as a product of definiteness.

For *dou*-conditionals (exemplified in (20) and repeated below in (55)), we assume that the *na*-phrase contributes an individual variable, and that *dou*, as a universal quantifier, unselectively binds the individual variable introduced by the *na*-phrase and the situation variable evoked by the conditional structure.

- (55) *Na-ge-ren da-dianhua lai, dou shuo wo bu zai.*
 which-CL-person telephone come DOU say I NEG at
 ‘Whichever person calls, say I’m not here.’

There are two possible binding strategies in Mandarin, E-type pronoun binding and unselective binding (cf. Cheng & Huang 1996; Pan & Jiang 1997, 2015). In this paper, we adopt the unselective binding strategy for formalization; however, the E-type pronoun strategy should apply equally well. It should be noted that the choice of unselective binding in examples like (55) does not mean that *dou* invariably quantifies over situations. For instance, in (56), the situation variable is bound by the sentential adverbial *tongchang* ‘usually’; while *dou* only binds the individual variable. Hence, (56) is understood as: In most situations s , for every person x such that x makes calls in s , the speaker will not answer x ’s call.

- (56) *Tongchang na-ge-ren da-dianhua lai, wo dou bu jie.*
 usually which-CL-person telephone come I DOU NEG answer
 ‘Usually, I won’t answer the phone no matter which person calls.’

Supposedly, universal quantification over the individual variable should carry the existential import and have the non-empty domain effect, as first proposed in Strawson (1950). (See also Lee (1986) and Lin (1998) for the claim that *dou* requires that the cardinality of its domain be greater than 1). However, in (57), the universal quantifier also binds the situation variable; thus, the existential presupposition is evaluated in possible situations, which weakens the existential import to a mere expectation of existence (Geurts 2007). As formalized in (57), *dou* quantifies over possible situations where people call in and these situations are also

part of the speaker's belief relative to the actual circumstance, which brings forth the expectation of existence.²⁴

- (57) $\forall s', x[\text{person}(x, s') \wedge \text{call}(x, s') \rightarrow \exists s''[s' < s'' \wedge \text{say the speaker is not here}(\text{Hearer}, s'')]]$ where $s' \in f(s)(\text{Speaker})$ and $f(s)(\text{Speaker}) = \{s': \forall p[\text{believe}(p)(s)(\text{Speaker}) \rightarrow p(s')]\}$ for a situation of evaluation s ²⁵ and the speaker, $f(s)(\text{Speaker})$ is the set of situations where the speaker's beliefs about s holds

The givenness in (21), repeated below as (58), can also be accounted for by the existential import of universal quantifiers.

- (58) *Zhangsan nar dou bu xiang qu.*
 Zhangsan where DOU NEG want go
 'Zhangsan does not want to go to any (of the places).'

In (58), the *na*-phrase is explicitly moved to the pre-*dou* position, out-scoping the negation operator and the intensional operator. As formalized in (59), universal quantification over the individual variable contributed by the *na*-phrase carries the existential presupposition and exhibits the non-empty domain effect which thus signals the existence of a contextually-salient set.

- (59) $\forall x[\text{place}(x) \rightarrow \neg \text{want}(\wedge \text{go}(x)(\text{zhangsan}')(\text{zhangsan}'))]$

Another factor which helps explicate the effect of givenness in (58) pertains to *na*-phrases *per se*. *Na*-phrases, like English *which*-phrases, are discourse-linked to a set of already familiar entities (Pesetsky 1987); hence, it follows naturally that the use of *na*-phrases suggests some given entities in its denotation.

To recapitulate, the postulation of *dou* as an iota-operator which exerts maximality over the nominal domain cannot account for the suggestion of existence and the givenness of the relevant entities. In particular, the suggestion of existence is weaker than existential presupposition and the notion of maximization has to be relaxed to apply to an empty domain. Instead, we argue that these effects are due to several factors, including the existential import of universal *dou*, the domain selection of quantifiers and the discourse-linking property of *na*-phrases.

24. Also, the selection of the quantificational domain is contextually relativized; thus, *dou* does not quantify over all the possible situations, but rather the set of situations where the speaker's belief about people calling in holds. Following Dayal (1997), we capture the weak suggestion of existence through the domain selection of situations to be quantified over.

25. For (57), s is the evaluation situation.

4.4 Connection to Lin (1996; 1998) and Hole (2004)

We treat *dou* as a universal quantifier which can induce various effects including distributivity, scalarity, exhaustivity, and exclusiveness due to its various quantificational mapping strategies and different composition of the domain. As in Table 1 from Jiang & Pan (2013), *dou* can either operate on an ordered domain or an unordered domain. When *dou* operates on an ordered domain generated by a focused constituent (e.g. a contrastive focus marked by *lian*), the relevant sentence takes on the effect of unexpectedness. If the focused constituent is located in the topic, then the alternatives generated by the focus serve as the domain of quantification, and *dou* requires that all the alternatives satisfy the rest of the sentence, which brings forth strong exhaustivity of the alternatives. If the focused constituent is located in the comment, then it is mapped to the scope of *dou*, and the rest of the sentence to the domain of *dou*. Consequently, *dou* quantifies over all the possible value assignments of the focused constituent and maps them to the ordinary value of the focused constituent, which gives rise to exclusiveness. *Dou* can also operate on an unordered domain provided by a plurality to its left. In such cases, topic-comment mapping can yield distributivity. A focused constituent can also provide unordered alternatives, which serves as the domain of quantification. Again, if the focused constituent is in the comment, then background-focus mapping will be activated and cause an exclusive interpretation on the focused constituent (cf. Example (48)).

Table 1. Mapping strategies of *dou*

DOU: Universal quantifier	DOU ₁ : Quantifies over an ordered domain	DOU _{1a} : P1 mapping, [–exclusive]
		DOU _{1b} : P2 mapping, [+exclusive]
	DOU ₂ : Quantifies over an unordered domain	DOU _{2a} : P1 mapping, [–exclusive]
		DOU _{2b} : P2 mapping, [+exclusive]

Lin (1996; 1998) analyzes *dou* as a generalized distributive operator. We acknowledge the weighty contribution of *dou* to distributivity, and we also agree with Lin that the distributive property of *dou* may be “sloppy” in the sense that it does not necessarily operate at the level of atoms. Yet, it should be pointed out that the level of distribution does not change *dou*’s core nature of being a binary quantifier, as can be observed from Lin’s definition of *dou*:

- (60) $||\text{Dou}||: \lambda P \lambda X \forall y [y \subseteq X \wedge y \in ||\text{Cov}|| \rightarrow P(y)]$
 where $X \in D\langle e, t \rangle$ is a set with multiple elements, $P \in D\langle e, t \rangle$ and Cov is the value assignment of a cover of X anaphoric to the context (Lin 1998)

Lin's (1996; 1998) analysis covers a wide range of data and involves distribution over individuals, cover cells, and situations. In our framework, Lin's analysis corresponds to DOU_{2a} which operates on an unordered domain and whose quantificational structure is constrained by the topic-comment structure. Our proposal also takes into consideration *lian...dou* constructions and cases where *dou* is sensitive to a contrastive focus to its right; moreover, it is already shown that the universal force is the core of the various effects (including distributivity) *dou* induces. In this sense, our analysis extends the scope of Lin (1996; 1998) and ferrets out the meaning of *dou* more thoroughly.

The analysis of *dou* as a distributive operator is questioned by Zhang (1997) with examples like (61).

- (61) *Lian [tamen]_F dou mai-le na-ben-shu.*
 LIAN they DOU buy-ASP that-CL-book
 'Even they buy that book.'

For (61) to be true, it is possible that 'they' buy that book collectively instead of individually. An orthodox collective construal is at odds with a distributive analysis (see also Hole (2004)), since a distributive operation always maps the VP property to each member of a plurality, and is trivialized if the VP property is mapped to the plurality as a whole. In our framework, we take *dou* to be a universal quantifier in the broad sense and treat distributivity as one type of effects of the universal force. In (61), *dou* quantifiers over a plural domain of **alternatives** to *tamen* rather than the members in the set denoted by *tamen*, and naturally, it does not have to relate the VP property with every individual in the set of *tamen*, as it actually relates the VP property to each member in the set of alternatives to *tamen*; hence, (61) allows a collective construal of *tamen* with respect to the VP.

Hole (2004) tackles the focus-sensitive use of *dou* and defines *dou* in *lian...dou* constructions as a universal quantifier over alternatives. The focus-sensitive use of *dou* in Hole (2004) corresponds to DOU_{1a} in our framework; yet, Hole does not cover cases where a focus constituent is located to the right of *dou* and evoke an exclusive interpretation with respect to the focused constituent. Also, Hole does not pursue a unified meaning approach to *dou* and distinguish the focus-sensitive use and the distributive use of *dou* based on examples like (61). However, we have shown that in both uses the core meaning of *dou* is universal quantification and the different uses are the consequence of the different quantificational structures of *dou*.

The other issue with Hole's analysis is *dou*'s interaction with negative polarity items. According to Hole (2004), the *wh*-phrase *shei* 'who' in (62a) is interpreted as a negative polarity item which introduces the most general set of things and *dou* operates on the alternatives. Under the negative context marked by *mei*, the uni-

versal force of *dou* ensures that all the alternatives semantically stronger than (or more specific) things will yield an informationally weaker sentence. In this sense, we can infer from (62a) that ‘he’ did not buy anything even those minor things like a pair of socks. (62b) also receives a universal reading; however, Hole (2004) assumes that it lacks a downward-entailing context and cannot be analyzed in the same vein of negative polarity. Contra Hole, we argue that in both examples, the *wh*-phrase is moved to a pre-*dou* position to serve as the domain of quantification, and that the domain of a universal quantifier is itself a downward-entailing context. For (62b), *shenme* denotes the most general set of things and *dou* universally quantifiers over them. If we narrow down the set to a subset of things, i.e. entities with more specific properties than merely being things, the universal quantificational relation should still be maintained. Hence, it can be inferred from (62b) that he buys everything even those more specific things. In this way, (62a) and (62b) are indeed analyzed in the same vein. It is not the negative operator *mei* that licenses the *wh*-phrase; rather, it is the decreasing property of the domain of *dou* that licenses the *wh*-phrase in either case.²⁶

- (62) a. *Ta shenme dou mei mai.*
 he what DOU NEG buy
 ‘He did not buy anything at all.’
 b. *Ta shenme dou mai le.*
 he what DOU buy ASP
 ‘He bought everything.’

To summarize, our analysis bridges the former literature on the distributive use with the scalar use of *dou*, and also covers the exclusive use of *dou*. All these uses

26. According to Hole (2004), *wh*-words/indefinites can be ambiguous between an FCI and an NPI, which can be distinguished by adding *wulun* ‘no matter’.

(i) *Xiaowang wulun shenme dou bu chi.*
 Little-Wang no-matter what DOU NEG eat
 ‘No matter what, Little Wang doesn’t eat it.’

(ii) *Xiaowang shenme dou bu chi.*
 Little-Wang what DOU NEG eat
 ‘Little Wang doesn’t eat anything at all.’

(Hole 2004: 213)

In (i), *shenme* is interpreted as an FCI which is “open to denote any freely chosen single nominal value of the appropriate kind” (Hole 2004: 214). In (ii), *shenme* is interpreted as an NPI; thus, the sentence means that ‘if Little Wang has eaten anything, at least it is not anything with the property thing, and therefore, Little Wang has not eaten anything at all’. Since *wulun* can be dropped, (ii) can also have the free choice reading of (i). In the meantime, Hole also claims that the FCI use is only good in intensional constructions (see also Lin (1996)); hence, such ambiguity does not seem to be a problem for (62), which are extensional examples.

can be treated with the broad notion of universal quantification. Also, many phenomena, which seem puzzling in the maximality approach (including the interaction between *na*-phrases and *dou*, the maximizing effect of *dou*, the exclusive interpretation, etc.) can be given a clear and unified account.

5. Concluding remarks

In this paper, the maximality approach to *dou* is reviewed with care. It should be clear by now: (i) the distribution of *na* “which”+CL+N and *dou* does not resemble that of typical definite FCIs in Greek and the suggestion of existence of *dou*-sentences is not due to maximality; (ii) maximality over covers or degrees cannot derive the meaning of certain *dou*-sentences correctly; and (iii) Xiang’s (2008) evidence for *dou*’s maximality in non-scalar contexts is concerned with the maximizing effect, which is conventionally the consequence of universal quantification. By contrast, universal quantification can offer a more cogent explanation of *dou*’s contribution in various contexts.

To close our work, we would like to note that maximality and universal quantification are not at odds with each other. The latter actually entails the former. When the universal force is performed on a set and relates its members to something else, naturally maximization comes into play, since universal quantification requires that **all** the members of the set, without exception, be involved. This may be the ultimate reason why maximality and universal quantification get entangled so easily.

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Abbreviations

ASP	aspect	NEG	negation
CL	classifier	NP	Noun Phrase
COP	copular	NPI	Negative Polarity Item
DET	determiner	PL	plural
F	focus	SG	singular
FCI	Free Choice Item	SUBJ	subject
N	noun	VP	Verb Phrase

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