Mandarin Particle *dou*: A Pre-exhaustification Exhaustifier

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**Abstract** This paper provides a uniform semantics to capture various functions of Mandarin particle *dou*, including the quantifier-distributor use, the free choice item (FCI) licenser use, and the scalar marker use. I argue that *dou* is a special exhaustifier: it triggers an additive presupposition, operates on sub-alternatives, and has a pre-exhaustification effect.

**Keywords** Mandarin · *dou* · exhaustification · quantification · free choice · scalar · Alternative Semantics

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1 Introduction

The Mandarin particle *dou* has various uses. Descriptively speaking, it can be used as a universal quantifier-distributor, a free choice item (FCI) licenser, a scalar marker, and so on.

First, in a basic declarative sentence, the particle *dou*, similar to English *all*, is associated with a preceding nominal expression and universally quantifies and distributes over the subparts of the item denoted by this expression, as exemplified in (1). Here and throughout the paper, I use [·] to enclose the item associated with *dou*.

(1)  a. [Tamen] *dou* dao -le.
    they DOU arrive -ASP
    ‘They all arrived.’

    b. [Tamen] *dou* ba naxie wenti da dui -le.
    they DOU BA those question answer correct -ASP
    ‘They all correctly answered these questions.’

    they BA those question DOU answer correct -ASP
    ‘They correctly answered all of these questions.’
Moreover, under the quantifier-distributor use, *dou* brings up three more semantic consequences in addition to universal quantification, namely, a “maximality requirement,” a “distributivity requirement,” and a “plurality requirement.” The “maximality requirement” means that *dou* forces the predicate denoted by the remnant VP to apply to the maximal element in the extension of the associated item (Xiang 2008). For instance, imagine that a large group of children, with one or two exceptions, went to the park. Then (2) can be judged as true only when *dou* is absent.

(2)  [Haizimen] (#dou) qu-le gongyuan.
    children DOU go -PERF park
    ‘The children (#all) went to the park.’

The “distributivity requirement” means that if a sentence admits both collective and atomic/nonatomic distributive readings, applying *dou* to this sentence blocks the collective reading (Lin 1998). For instance, (3a) is infelicitous if John and Mary married each other, and (3b) is infelicitous if the considered individuals only participated in one house-buying event.

(3)  a.  [Yuehan he Mali] *dou* jiehun -le.
    John and Mary DOU get-married -ASP
    ‘John and Mary each got married.’

   b.  [Tamen] *dou* mai -le fangzi.
    they DOU buy -PERF house
    ‘They all bought houses.’ (#collective)

The “plurality requirement” says that the item associated with *dou* must take a non-atomic interpretation. If the prejacent sentence of *dou* has no overt non-atomic term, *dou* needs to be associated with a covert non-atomic item. For example, in (4), since the spelled-out part of prejacent sentence has no non-singular term, *dou* is associated with a covert term such as *zhe-ji-ci* ‘these times’.

(4)  Yuehan [(zhe-ji-ci)] *dou* qu de Beijing.
    John this-several-time DOU go DE Beijing
    ‘For all the times, the place that John went to was Beijing.’

Second, as a well-known fact, *dou* can license a preverbal *wh*-item as a
universal free choice item (FCI), as exemplified in (5). Moreover, I observe that *dou in company with a possibility modal can license the universal FCI use of a preverbal disjunction, as shown in (6a). In particular, if the possibility modal *keyi ‘can’ is dropped or replaced with a necessity modal *bixu ‘must’, the presence of *dou makes the sentence ungrammatical. For example, (6a) and (6c) are grammatical only in absence of *dou, admitting only disjunctive interpretations.

(5) a. [Shuí] *(dou) he -guo jiu. who DOU drink -EXP alcohol ‘Anyone/everyone has had alcohol.’
b. [Na-ge nanhai] *(dou) he -guo hejiu. which-CL boy DOU drink -EXP alcohol Any/Every boy has had alcohol.’

(6) a. [Yuehan huozhe Mali] *(dou) keyi jiao hanyu. John or Mary DOU can teach Chinese Without *dou: ‘Either John or Mary can teach Chinese.’ With *dou: ‘Both John and Mary can teach Chinese.’
b. [Yuehan huozhe Mali] *(dou) jiao hanyu. John or Mary DOU teach Chinese
c. [Yuehan huozhe Mali] *(dou) bixu jiao hanyu. John or Mary DOU must teach Chinese

Third, when associated with a scalar item, *dou implies that the pre-jacent sentence (namely, the sentence embedded under *dou) ranks relatively high in the considered scale. When *dou has this use, its associated item can stay insitu but must be focus-marked. For example, in (7a), *dou is associated with the numeral phrase *wu dian ‘five o’clock’, and the alternatives are ranked in chronological order.12

(7) a. Dou [WuF-dian] -le. DOU five-o’clock -ASP ‘It is five o’clock.’ ⇝ Being five o’clock is a bit late.

1Stressed items are capitalized, focused items are marked with a subscript ‘F’.
2‘⇝ p’ means that the Mandarin example implies p.
b. Ta **dou** lai -guo zher [LIANG₇-ci] -le.
   he **DOU** come -EXP here two-time -ASP.
   ‘He has been here twice.’ ➔ Being here twice is a lot.

The [lian Foc dou . . .] construction is a special case where **dou** functions as a scalar marker. A sentence taking a [lian Foc dou . . .] form has an even-like interpretation; it implicates that the prejacent proposition is less likely to be true than (most of) the contextually relevant alternatives.

(8) (Lian) [duizhang]₇ **dou** chi dao -le.
   LIAN team-leader **DOU** late arrive -ASP
   ‘Even [the team leader]₇ arrived late.’

In particular, ‘one-cl-NP’ can be licensed as a minimizer at the focus position of the [lian Foc dou NEG . . .] construction, as shown in (9a). Notice that the post-**dou** negation is not always needed, as seen in (9b).

(9) a. Yuehan (lian) [YI₇-ge ren] *(dou) *(mei) qing.
   John LIAN one-cl person **DOU** NEG invite
   ‘John didn’t invite even one person.’

b. Yuehan (lian) [YI₇-fen qian] *(dou) (mei) yao.
   John LIAN one-cent money **DOU** NEG request
   Without negation: ‘John doesn’t want any money.’
   With negation: ‘Even if it is just one cent, John wants it.’

   If a sentence has multiple items that are eligible to be associated with **dou**, the function of **dou** and the association relation can be disambiguated by stress. In (10a), where the prejacent of **dou** has no stressed item, **dou** functions as a quantifier and is associated with the preceding plural term *tamen* ‘they’, while in (10b) and (10c), **dou** functions as a scalar marker and is associated with the stressed item.

(10) a. [Tamen] **DOU/dou** lai -guo liang-ci -le.
   they **DOU/DOU** come -EXP two-time -ASP
   ‘They ALL have been here twice.’

   they **DOU** come -EXP two-time -ASP
   ‘They’ve been here twice.’ ➔ Being here twice is a lot.
The goal of this paper is to provide a uniform semantics of *dou* to account for its seemingly diverse functions. I propose that *dou* is a special exhaustifier that operates on sub-alternatives and has a pre-exhaustification effect. The basic idea can be roughly described as follows. Assume that a *dou*-sentence is of the form “*dou*(φ₀)” where φ₀ and a correspond to the prejacent sentence and the item contained within φ₀ that is associated with *dou*, respectively. The meaning of “*dou*(φ₀)” is roughly ‘φ₀ and not only φ₁’, where b’ can be a proper subpart of a’, a weaker scale-mate of a’, and so on. For example, “[A and B] *dou* came” means ‘A and B came, not only A came, and not only B came’; “it’s *dou* [five] o’clock” means ‘it’s 5 o’clock, not just 4, not just 3, …’.

The rest of this paper is organized as follows. Section 2 will review two representative theories of the semantics of *dou*, namely, the distributor approach (Lin 1998) and the maximality operator approach (Giannakidou & Cheng 2008, Xiang 2008). Section 3 will define *dou* as a special exhaustifier and compare it with the canonical exhaustifier *only*. Section 4 will discuss the universal quantifier use of *dou*. I will show that the so-called “distributivity requirement” and “plurality requirement” are both illusions, and that the facts usually thought to be related to these two requirements result from the additive presupposition of *dou*. Section 5 and 6 will be centered on the FCI-licenser use and the scalar marker use, respectively.

2 Previous Studies

There are numerous studies on the syntax and semantics of *dou*. Earlier approaches treat *dou* as an adverb with universal quantification power (Lee 1986, Cheng 1995, among others). Portner (2002) analyzes the scalar marker use of *dou* in a way similar to the inherent scalar semantics of the English focus sensitive particle *even*. Hole (2004) treats *dou* as a universal quantifier over the domain of alternatives. This section will review two more recent representative studies on the semantics of *dou*, one is the

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3For any syntactic expression a, a’ stands for the semantic value of a.
distributor approach by Lin (1996), and the other is the maximality operator approach along the lines of Giannakidou & Cheng (2006) and Xiang (2008).

### 2.1 The Distributor Approach

Lin (1996, 1998) provides the first extensive treatment of the semantics of *dou*. He proposes that *dou* is an overt counterpart of the generalized distributor $D$ in the sense of Schwarzschild (1996). Unlike the regular distributor *each* which distributes over an atomic domain, the generalized $D$-operator distributes over the cover of the nominal phrase associated with *dou*. A cover of an individual $x$ is a set of subparts of $x$, as defined in (11) and exemplified in (12). Its value is determined by both linguistic and non-linguistic factors.

(11) $\text{Cov}(\alpha, x)$ (read as “$\alpha$ is a cover of $x$”) iff
a. $\alpha$ is a set of subparts of $x$;
   b. every subpart of $x$ is a subpart of some member in $\alpha$.

(12) Possible covers of $a \oplus b \oplus c$ and corresponding readings:

\[
\{a, b, c\} \quad \text{(atomic distributive)} \\
\{a \oplus b, c\} \\
\{a \oplus b, b \oplus c\} \\
\{a \oplus b \oplus c\} \quad \text{(nonatomic distributive)} \\
\{a \oplus b \oplus c\} \quad \text{(collective)}
\]

The semantics of *dou* is thus schematized as follows:

(13) $\llbracket \text{dou} \rrbracket(P, x)$ is true iff

$D(\alpha)(P) = 1$, where $\text{Cov}(\alpha, x)$ iff $\forall y \in \alpha[P(y) = 1]$, where $\text{Cov}(\alpha, x)$

(Given some contextually determined variable $\alpha$ such that $\alpha$ is a cover of $x$, every member of $\alpha$ is $P$.)

The distributor approach only considers the quantifier use of *dou*. It is unclear how this approach can be extended to the other uses, such as the FCI-licenser use and the scalar marker use. Moreover, even for the quantifier use, this approach faces the following challenges.
First, *dou* evokes a distributivity requirement, but the generalized *D*-distributor does not. For instance, as seen in (3b) and repeated below, the presence of *dou* eliminates the collective reading of the prejacent sentence. As Xiang (2008) argues, if *dou* were a generalized distributor, it should be compatible with a single cover reading (viz., the collective reading): there can be a discourse under which the cover of *tamen* ‘they’ denotes a singleton set like \( \{a \oplus b \oplus c\} \); distributing over this singleton set yields a collective reading.

(14) [Tamen] *dou* mai -le  fangzi.
    they  *DOU* buy -PERF house
    ‘They *dou* bought houses.’ (#collective)

Second, unlike English distributors like *each* and *all*,¹⁴ *dou* can be associated with a distributive expression such as NP-*gezi* ‘NP each’.⁵

(15) a. They each (*each/*all) has some advantages.
    b. [Tamen gezi] *dou* you yixie youdian.
    They each *DOU* have some advantage
    ‘They each *dou* has some advantages.’

### 2.2 The Maximality Operator Analysis

Another popular approach, initiated by Giannakidou & Cheng (2006) and extended by Xiang (2008), is to treat *dou* as a presuppositional maximality operator. Briefly speaking, this approach proposes that *dou* operates on

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¹⁴Champollion (2015) argues that *all* is a distributor that distributes down to subgroups, while that *each* distributes all the way down to atoms.

⁵Similar arguments have been reached in previous studies (Cheng 2009, among others), but they are mostly based on the fact that *dou* can be associated with the distributive quantificational phrase *mei-CL-NP* ‘every NP’, as exemplified in (i). This fact, however, cannot knock down the distributor approach for the quantifier use of *dou*: observe in (i) that stress falls on the distributive phrase *mei-CL-NP*, not the particle *dou*; therefore, here *dou* functions as a scalar marker, not a quantifier.

(i) a. [MEI-ge ren]  *dou* you youdian.
    every-CL person *DOU* have advantage
    ‘Everyone *dou* has some advantages.’
    b. ??[MEI-ge ren]  *DOU* you youdian.
    every-CL person *DOU* have advantage
a non-singleton cover of the associated item, returns the maximal plural element in this cover, and presupposes the existence of this maximal plural element. I schematize this idea as follows:

\[(\lfloor \text{dou} \rfloor (x) = |\alpha| > 1 \land \exists y \in \alpha[\neg \text{Atom}(y) \land \forall z \in \alpha[z \leq y]]. \]

\[\text{Let } Cov(\alpha, x) = 1, \text{ then}\]

\[\lfloor \text{dou} \rfloor (x) = |\alpha| > 1 \land \exists y \in \alpha[\neg \text{Atom}(y) \land \forall z \in \alpha[z \leq y]]. \]

\[i. y \in \alpha[\neg \text{Atom}(y) \land \forall z \in \alpha[z \leq y]]. \]

\[\lfloor \text{dou} \rfloor (x) \text{ is defined iff the cover of } x \text{ is non-singleton and has a unique non-atomic maximal element; when defined, the reference of } \lfloor \text{dou} \rfloor (x) \text{ is this maximal element.} \]

This approach is close to the standard treatment of the definite determiner the (Sharvy 1980, Link 1983): the picks out the unique maximal element in the extension of its NP complement and presupposes the existence of this maximal element.

This approach is superior to the distributor approach in two respects: first, it captures the maximality requirement; and second, it can be extended to the scalar use of dou (see Xiang 2008). Nevertheless, this approach still faces several conceptual or empirical problems.

First, the plurality requirement comes as a stipulation on the presupposition of dou: dou presupposes that the selected maximal element is non-atomic. It is unclear why this is so, because the definite article the does not trigger such a plural presupposition. Moreover, as we will see in section 4.3, this plural presupposition is neither sufficient nor necessary in dealing with the relevant facts.

Second, this approach predicts no distributivity effect at all. Under this approach, “[X] dou did f” only asserts that ‘the maximal element in the cover of X did f’, not that ‘each element in the cover of X did f’. For instance in (14), if the cover of tamen ‘they’ is \(\{a \oplus b, a \oplus b \oplus c\}\), the predicted assertion is simply ‘\(a \oplus b \oplus c\) bought houses,’ which says nothing as to whether \(a \oplus b\) bought houses.

3 Defining dou as a Special Exhaustifier

This section will start with the semantics of the canonical exhaustifier only, and then define Mandarin particle dou as a special exhaustifier: dou is a pre-exhaustification exhaustifier that operates on sub-alternatives.
### 3.1 Canonical Exhaustifier *only*

The exclusive particle *only* is a canonical exhaustifier. Using Alternative Semantics for focus (Rooth 1985, 1992, 1996), we can summarize the standard treatment of the semantics of *only* in two parts. First, a focused element is associated with a set of focus alternatives. This alternative set grows point-wise (Hamblin 1973), as recursively defined in (17), adopted from Chierchia (2013:138).

\[
(17) \quad \text{a. Basic Clause: for any lexical entry } \alpha,\ Alt(\alpha) = \\
(i) \quad \{[\alpha]\} \text{ if } \alpha \text{ is lexical and does not belong to a scale; } \\
(ii) \quad \{[\alpha_1], \ldots, [\alpha_n]\} \\
\quad \text{ if } \alpha \text{ is lexical and part of a scale } \langle[\alpha_1], \ldots, [\alpha_n]\rangle.
\]

\[
\text{b. Recursive Clause:} \quad Alt(\beta(\alpha)) = \{b(a) : b \in Alt(\beta), a \in Alt(\alpha)\}
\]

Second, the exclusive particle *only* presupposes the truth of its prejacent proposition (Horn 1969) and asserts an exhaustivity condition. This condition says that all the excludable alternatives of the prejacent clause are false. For any proposition \(p\), an alternative of \(p\) is excludable as long as it is not entailed by \(p\).

\[
(18) \quad \text{a. } \quad \llbracket\text{only}\rrbracket(p) = \lambda w[q(w) = 1. \forall q \in Excl(p)[q(w) = 0]] \\
\quad \text{(To be revised in (20))}
\]

\[
\text{b. } \quad Excl(p) = \{q : q \in Alt(p) \land p \not\subseteq q\}
\]

In addition to the prejacent presupposition, I argue that *only* also triggers an additive presupposition, namely, that the prejacent has at least one excludable alternative. In (19), *only* has a restricted exhaustification domain, namely, \{I will invite John, I will invite Mary, I will invite John and Mary\}. Contrary to the case of (19a), (19b) is infelicitous because the prejacent I will invite both John and Mary is the strongest one among the alternatives and has no excludable alternative. As Martin Hackl (pers. comm.) points out, the additive presupposition of *only* can be reduced to a more general economy condition that an overt operator cannot be applied vacuously. For sake of comparison, observe that (19c) is felicitous, which is because covert exhaustification is free from the economy condition and so does not trigger an additive presupposition.
(19) Which of John and Mary will you invite?
   a. Only \( \text{JOHN}_F \), (not Mary / not both).
   b. #Only \( \text{BOTH}_F \).
   c. BOTH \( \text{F} \).

In sum, I schematize the semantics of \textit{only} as follows: it presupposes the truth of its prejacent and the existence of an excludable alternative; it negates each excludable alternative.

\[
\begin{align*}
\llbracket \text{only} \rrbracket(p) &= \lambda w. [p(w) = 1 \land \exists q \in \text{Excl}(p)]. \\
&\quad \lambda w. \forall q \in \text{Excl}(p)[q(w) = 0] \\
a. \text{Prejacent presupposition: } p \\
b. \text{Additive presupposition: } \exists q \in \text{Excl}(p) \\
c. \text{Assertion: } \lambda w. \forall q \in \text{Excl}(p)[q(w) = 0]
\end{align*}
\]

3.2 Special Exhaustifier \textit{dou}

I define \textit{dou} as a pre-exhaustification exhaustifier over sub-alternatives, as schematized in (21): it presupposes an additive inference; it affirms the prejacent and negates the exhaustification of each sub-alternative.

\[
\begin{align*}
\llbracket \text{dou} \rrbracket(p) &= \exists q \in \text{Sub}(p). \\
&\quad \lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)[O(q)(w) = 0]]
\end{align*}
\]

The additive presupposition is motivated by the economy condition, just as we saw with the canonical exhaustifier \textit{only}. The anti-exhaustification inference asserted by \textit{dou} differs from that asserted by \textit{only} in two respects. First, \textit{only} operates on excludable alternatives, but \textit{dou} operates on sub-alternatives. For now we can understand sub-alternatives as weaker alternatives, or equivalently, the alternatives that are not excludable (viz., not entailed by the prejacent) and are distinct from the prejacent, as schematized in (22). The sign ‘−’ stands for set subtraction. A revision will be made in section 5.

\[
\begin{align*}
\text{Sub}(p) &= \{q : q \in \text{Alt}(p) \land p \varsubsetneq q\} \\
&= (\text{Alt}(p) - \text{Excl}(p)) - \{p\} \\
\end{align*}
\]

Second, \textit{dou} has a pre-exhaustification effect: it negates the “exhaustification” of each sub-alternative. The pre-exhaustification effect is realized
by applying an $O$-operator to each sub-alternative.\footnote{In section 6, we will see other options to derive the pre-exhaustification effect. For instance, when $dou$ is used as a scalar marker, the pre-exhaustification effect is realized by applying a scalar exhaustifier ($\approx$ just) to the sub-alternatives.} The $O$-operator is a covert counterpart of the exclusive particle only, coined by the grammatical view of scalar implicatures (Fox 2007, Chierchia et al. 2012, Fox & Spector to appear, among others). This $O$-operator affirms the prejacent and negates all the excludable alternatives of the prejacent.

\begin{equation}
O(p) = \lambda w[p(w) = 1 \land \forall q \in Excl(p)[q(w) = 0]]
\end{equation}

(Chierchia et al. 2012)

Consider (24) for a simple illustration of the present definition. The prejacent proposition and its alternative set are (24a) and (24b), respectively. Only the two alternatives in (24c) are asymmetrically entailed by the prejacent, which are therefore the sub-alternatives. The use of $dou$ affirms the prejacent and negates the exhaustification of each sub-alternative, as in (24d), yielding the following inference: John and Mary arrived, not only John arrived, and not only Mary arrived. The anti-exhaustification inference given by the not only- clauses is entailed by the prejacent and adds nothing new to the truth conditions.\footnote{One might wonder why $dou$ is used even though it does not change the truth conditions. Such uses are observed cross-linguistically. For instance, in (i), the distributor both adds nothing to the truth conditions.}

(i) John and Mary both arrived.

One possibility, raised by the audience at LAGB 2015, is that $dou$ and both are used for the sake of contrasting with non-maximal operators like only part of or only one of. If this is the case, the question under discussion for (24) and (i) would be ‘is it the case that John and Mary both arrived or that only one of them arrived?’ This idea is supported by the oddness of using both/$dou$ in the following conversation:

(ii) Q: “Who arrived?”
A: “John and Mary #(both/dou) arrived.”

Using $dou$ makes the answer incongruent with the explicit question: if $dou$ is present, the answer has an alternative “only John or only Mary arrived,” which is not in the Hamblin set of the explicit question (viz., \{$x$ arrived: $x \in D_e$\}).

This idea also explains the maximality requirement of $dou$. Here let me just sketch out
(24) [John and Mary] **dou** arrived.

a. \( p = A(j \oplus m) \)
b. \( \text{Alt}(p) = \{A(x) : x \in D_e\} \)
c. \( \text{Sub}(p) = \{A(j), A(m)\} \)
d. \( \llbracket \text{dou} \rrbracket(p) = A(j \oplus m) \land \neg O[A(j)] \land \neg O[A(m)] \)

### 4 The Universal Quantifier Use

Recall that *dou* evokes three requirements when used as a universal quantifier: (i) the “maximality requirement,” namely, that *dou* forces maximality with respect to the domain denoted by the associated item; (ii) the “distributivity requirement,” namely, that the prejacent sentence cannot take a collective reading; (iii) the “plurality requirement,” namely, that the item associated with *dou* must take a non-atomic interpretation. This section will focus on the latter two requirements. (See footnote 7 for a rough idea on the maximality requirement.) I will argue that these two requirements are both illusions. Moreover, I will argue that all the facts that are thought to result from these two requirements actually result from the additive presupposition of *dou*.

#### 4.1 Explaining the “Distributivity Requirement”

To generate sub-alternatives and satisfy the additive presupposition of *dou*, the prejacent of *dou* needs to be monotonic with respect to the item associated with *dou*, which therefore gives rise to the “distributivity re-

this idea informally: the assertion of the *dou*-sentence (iii) is identical to that of (iiia), which is tolerant of non-maximality; but (iii) also implicates the anti-non-maximality inference (iiib), giving rise to a maximality requirement.

(iii) (Scenario: The children, with only one or two exceptions, went to the park.)


\[
\begin{align*}
\text{[Haizimen] (\#dou) qu-le gongyuan.} \\
\text{children DOU go -PERF park} \\
\text{‘The children (#all) went to the park.’}
\end{align*}
\]

a. The children went to the park.
b. Not [only part of the children went to the park.]

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8If \( \alpha \) is of type \( \delta \) and \( A \) is a constituent that contains \( \alpha \), then \( A \) is monotonic with respect to \( \alpha \) iff the function \( \lambda x.\llbracket A[\alpha/\nu] \rrbracket^{[\nu \rightarrow x]} \) is monotonic (adapted from Gajewski 2007). Here \( A[\alpha/\nu] \) stands for the result of replacing \( \alpha \) with \( \nu \) in \( A \).
requirement.” For instance, (25) rejects a collective reading because under this reading the prejacent proposition of *dou* is non-monotonic with respect to the subject position and hence has no sub-alternative, as shown in (25a). In contrast, when taking an atomic or a non-atomic distributive reading, the prejacent of *dou* is monotonic with respect to the subject position and does generate some sub-alternatives, as shown in (25b) and (25c).⁹

(25) 

\[ \text{[abc] dou bought houses.} \]

   a. *Collective #*

   (i) abc together bought houses. \\
       \( \not\Rightarrow \) ab together bought houses.

   (ii) \( \text{Sub(abc together bought houses)} = \emptyset \)

   b. *Atomic distributive \( \checkmark \)*

   (i) abc each bought houses. \( \Rightarrow \) ab each bought houses.

   (ii) \( \text{Sub(each(x)(BH))} = \{\text{each}(x)(BH): x \preceq \text{abc}\} \)

   c. *Nonatomic distributive \( \checkmark \)*

   (i) members of \( C_{abc} \) each bought houses. \\
       \( \Rightarrow \) members of \( X \) each bought houses (\( X \not\subset \text{abc} \))

   (ii) \( \text{Sub(D(C_{abc})(BH))} = \{D(X)(BH): X \not\subset \text{abc}\} \)

Hence, *dou* itself is not a distributor; but in certain cases, the additive presupposition of *dou* evokes the use of a distributor (a covert *each* or a covert generalized distributor). We can now easily explain why *dou* can be associated with a distributive expression NP-*gezi* ‘NP-each’: the presence of the distributor *gezi* ‘each’ is actually required for the sake of satisfying the additive presupposition of *dou*; if *gezi* is not overtly used, a covert distributor is still present in the logical form.

(26) 

\[ \text{[Tamen gezi] dou you yixie youdian.} \]

\[ \text{they each \textbf{dou} have some advantage} \]

\[ \text{‘They each \textbf{dou} has some advantages.'} \]

Moreover, *dou* can be applied to a collective statement as long as this statement satisfies the monotonicity requirement, namely, is monotonic

⁹\( C_{abc} \) in (25c) stands for a free variable that is a cover of abc.
with respect to the item associated with *dou*. For instance, *dou* is compatible with monotonic collective predicates (e.g., *shi pengyou* ‘be friends’, *jihe* ‘gather’, *jianmian* ‘meet’), as shown in (27). Consider, for instance, (27a). Let *tamen* ‘they’ denote three individuals *abc*. The set of sub-alternative sets is {*ab are friends, bc are friends, ac are friends*}; applying *dou* yields the following inference: *abc* are friends, not only *ab* are friends, not only *bc* are friends, and not only *ac* are friends.

(27)  
\[\begin{align*}
\text{a. [Tamen] (dou) shi pengyou.} \\
&\text{they dou be friends} \\
&\text{‘They are (all) friends.’}
\end{align*}\]

\[\begin{align*}
\text{b. [Tamen] (dou) zai dating jihe -le.} \\
&\text{they dou at hallway gather -ASP} \\
&\text{‘They (all) gathered in the hallway.’}
\end{align*}\]

\[\begin{align*}
\text{c. [Tamen] (dou) jian-guo-mian -le.} \\
&\text{They dou see-EXP-face -ASP} \\
&\text{‘They (all) have met.’}
\end{align*}\]

By comparison, *dou* cannot be applied to a collective statement that does not satisfy the monotonicity requirement, as shown in (28).

(28)  
\[\begin{align*}
\text{[Tamen] (*)dou zucheng -le lia er-ren-zu.} \\
&\text{they dou form -ASP two two-person-group} \\
&\text{‘They (*all) formed two pairs.’}
\end{align*}\]

We have to distinguish the case in (28) from the following ones, where the prejacent sentences actually admit non-collective (viz., non-atomic distributive) readings and thus satisfy the monotonicity requirement.

(29)  
\[\begin{align*}
\text{[Tamen] dou zucheng -le er-ren-zu.} \\
&\text{they dou form -ASP two two-person-group} \\
&\text{‘They all formed pairs.’}
\end{align*}\]

(30)  
\[\begin{align*}
\text{[Women he tamen] dou zucheng -le lia er-ren-zu.} \\
&\text{we and they dou form -ASP two two-person-group} \\
&\text{‘We formed two pairs, and they formed two pairs.’}
\end{align*}\]

In (29), the extension of the predicate *formed pairs* (FP) is closed under sum, just like any plural term: \(\text{FP}(a \oplus b) \land \text{FP}(c \oplus d) \Rightarrow \text{FP}(a \oplus b \oplus c \oplus d)\)
d) (see Kratzer 2008 for the question of pluralizing verbal predicates); hence the prejacent sentence admits a covered/cumulative reading. In (30), although the predicate formed two pairs (F2P) is non-monotonic, the subject we and they can be interpreted as a generalized conjunction, each conjunct of which yields a sub-alternative. A schematized derivation for the sub-alternatives in (30) is given in (31).

\[(31)\]
a. \[\llbracket \text{we and they} \rrbracket = \lambda P_{et} [P(\text{we}) \land P(\text{they})]\]
b. \[\llbracket \text{we and they } F2P \rrbracket = F2P(\text{we}) \land F2P(\text{they})\]
c. \[
\text{Sub}(\text{we and they } F2P) = \{F2P(\text{we}), F2P(\text{they})\}
\]

### 4.2 Explaining the “Plurality Requirement”

I argue that the “plurality requirement” of dou is illusive, and that the related facts all result from the additive presupposition of dou.

First, the plurality requirement is unnecessary: dou can be associated with an atomic item as long as the predicate denoted by the remnant VP is predicate.

\[(32)\]
\[
P \text{ is divisive iff } \forall x [P(x) = 1 \rightarrow \forall y \leq x [P(y) = 1]]
\]
(A predicate is divisive iff whenever it holds of something, it also holds of each of its subparts.)

For instance, in (33a), the associated item that apple takes only an atomic interpretation; with a divisive predicate \(\lambda x \cdot \text{John ate } x\), the prejacent sentence of dou has sub-alternatives, as schematized in (34a), which therefore supports the additive presupposition of dou. In contrast, in (33b), the predicate \(\lambda x \cdot \text{John ate half of } x\) is not divisive and hence is incompatible with the use of dou.

\[(33)\]
a. Yuehan ba [na-ge pingguo] (dou) chi -le.
John BA that-CL apple DOU eat -PERF
‘John ate that apple.’

John BA that-CL apple DOU eat -PERF one-half
Intended: ‘John ate half of that apple.’

\[(34)\]
a. ‘John ate that apple.’ \(\Rightarrow\) ‘John ate \(x\).’ (\(x \leq \) that apple)
\[
\text{Sub}(\text{John ate that apple}) = \{\text{John ate } x: x \leq \text{that apple}\}
\]
b. ‘John ate half of that apple.’
\[ \not \exists \text{‘John ate half of } x . \text{’ (} x \subseteq \text{that apple)} \]
\[ \text{Sub(John ate half of that apple)} = \emptyset \]

Second, the plurality requirement is insufficient. When followed by a monotonic collective predicate, *dou* requires its associated item to denote a group consisting of at least three members, as shown in (35).

(35) \[ [\text{Tamen -sa/*-lia}] \quad \textbf{dou} \text{ shi pengyou.} \]
\[ \text{they -three/-two } \textbf{dou} \text{ be friends} \]
\[ \text{‘They three/*two are all friends.’} \]

This fact is also predicted by the additive presupposition. As schematized in (36), the proper subparts of an dual-individual are atomic individuals, which, however, are undefined for the collective predicate ‘be friends’. Consequently, if the item associated with *dou* in (35) denotes only a dual-individual, the prejacent of *dou* has no sub-alternative, which therefore leaves the presupposition of *dou* unsatisfied.

(36) \[ [\text{ab}] (\star \textbf{dou}) \text{ are friends.} \]
\[ \text{a. } [\text{be friends}] = \lambda x [\neg \text{Atom}(x). \text{be-friends}(x)] \]
\[ \text{b. } \text{Sub(ab are friends)} = \emptyset \]

5 The Universal FCI-licenser Use

*Dou* can license the universal FCI use of polarity items, *wh*-items, and preverbal disjunctions. In this section, I argue that the asserted component of *dou* converts a disjunctive/existential statement into a conjunctive/universal statement, giving rise to a free choice (FC) inference. I will also explain why the licensing of universal FCIs requires the presence of *dou*, and why the licensing of a preverbal disjunction as a universal FCI exhibits the effect of modal obviation.

5.1 Licensing Conditions of Mandarin FCIs

In Mandarin, the licensing of a universal FCI requires the presence of *dou*. For instance, in (37), the bare *wh*-word *shei* ‘who’ is licensed as a universal FCI only when it precedes *dou*. 
(37) [Shei] *(dou) jiao -guo jichu hanyu.
    who  dou  teach -exp intro Chinese.
    ‘Everyone has taught Intro Chinese.’

To license the universal FCI use of a disjunction, dou must be present and followed by a possibility modal, as shown in (38) and (39).

(38) [Yuehan huozhe Mali] dou keyi/*bixu jiao jichu hanyu.
    John or Mary dou can/must teach intro Chinese
    ‘Both John and Mary can teach Intro Chinese.’

(39) [Yuehan huozhe Mali] (*dou) jiao -guo jichu hanyu.
    John or Mary dou teach -exp intro Chinese
    Intended: ‘Both Johan and Mary have taught Intro Chinese.’

This requirement is also observed with English emphatic item any: as shown in (40), any is licensed as a universal FCI when it precedes a possibility modal, but not licensed when it appears in an episodic statement or before a necessity modal.

(40) a. *Anyone came in.
    b. Anyone can/*must come in.

The licensing conditions of na-cl-NP ‘which-NP’ and renhe-NP ‘any-NP’ are less clear. Giannakidou & Cheng (2006) claim that the universal FCI uses of these items are only licensed in a pre-dou+◊ position; their judgements are illustrated in (41). Nevertheless, it is difficult to do justice to the data because judgements of (41) vary greatly among native speakers.

(41) a. [Na-ge/Renhe -ren] dou keyi/?bixu lai.
    which-cl/anywhat -person dou can/must come
    Intended: ‘Everyone can/must come.’

    b. *[Na-ge/Renhe -ren] dou lai -guo.
    which-cl/anywhat -person dou come -asp
    Intended: ‘Everyone has been here.’

Despite the variation in the judgments, the licensing conditions of universal FCIs in Mandarin can be summarized as follows. First, every universal FCI requires the presence of dou. Second, every universal FCI can
be licensed before *dou+◊*. Third, in absence of the possibility modal, ‘which’/‘any’-NP is less likely to be licensed than bare *wh*-words, but more likely to be licensed than disjunctions. For other recent studies, see Liao 2011, Cheng & Giannakidou 2013, and Chierchia & Liao 2015.

5.2 Predicting Universal FC Inferences

*Wh*-items are generally considered as existential indefinites; thus in (37), repeated in (42), the prejacent sentence of *dou* is a disjunction, and the sub-alternatives are the disjuncts. Applying *dou* affirms the prejacent and negates the exhaustification of each disjunct, yielding a universal FC inference. In a word, *dou* turns a disjunction into a conjunction.

(42) [Shei] *(dou)* has taught Intro Chinese.

\begin{align*}
\text{a. } p &= f(a) \lor f(b) \\
\text{b. } \text{Sub}(p) &= \{f(a), f(b)\} \\
\text{c. } \llbracket \text{dou} \rrbracket(p) &= [f(a) \lor f(b)] \land \neg O f(a) \land \neg O f(b) \\
&= [f(a) \lor f(b)] \land [f(a) \rightarrow f(b)] \land [f(b) \rightarrow f(a)] \\
&= [f(a) \lor f(b)] \land [f(a) \leftrightarrow f(b)] \\
&= f(a) \land f(b)
\end{align*}

What makes the use of *dou* mandatory in (37)? Following Liao (2011) and Chierchia & Liao (2015), I assume that the sub-alternatives associated with a Mandarin *wh*-word are obligatorily activated when this *wh*-word has a non-interrogative use, and that they must be used up via employing a c-commanding exhaustifier.\(^{10}\) If *dou* is absent, these sub-alternatives would be used by a basic exhaustifier (23), repeated in (43a), which has no pre-exhaustification effect. As schematized in (43b), a basic *O*-operator affirms the prejacent disjunction and negates both disjuncts, yielding a contradiction.\(^{11}\)

(43) \begin{align*}
\text{a. } O(p) &= \lambda w[p(w) \land \forall q \in \text{Excl}(p)[q(w) = 0]] \\
\text{b. } O(f(a) \lor f(b)) &= [f(a) \lor f(b)] \land \neg f(a) \land \neg f(b) = \bot
\end{align*}

\(^{10}\)In the case of disjunctions, subalternatives are simply what usually call “domain alternatives,” evoked by domain widening (Krifka 1995, Lahiri 1998, Chierchia 2006).

\(^{11}\)Disjunctions are free from this problem, because they do not mandatorily evoke sub-alternatives. See Chierchia 2006 for discussions on activations of alternatives.
Now, a problem arises as to the definition of sub-alternatives: in section 3, I defined sub-alternatives as weaker alternatives, namely, alternatives that are not excludable and distinct from the prejacent; but in (42) the disjuncts are semantically stronger than the disjunction.

This problem can be solved by a simple move from excludability to innocent excludability, a notion proposed by Fox (2007): an alternative is innocently excludable iff the inference of affirming the prejacent and negating this alternative is consistent with negating any excludable alternative. Thus, we can say that sub-alternatives are alternatives that are not innocently excludable and are distinct from the prejacent.

\[ ((\lambda w[p(w) = 1 \land q(w) = 0]) \subseteq q') \]

In (42), the disjuncts are not innocently excludable to the disjunction: as schematized below, affirming the disjunction and negating one of the disjuncts entail the other disjunct; in other words, affirming the disjunction and negating both disjuncts would yield a contradiction. Hence, the sub-alternatives of a disjunction are the disjuncts.

\[ [(f(a) \lor f(b)) \land \neg f(a)] \Rightarrow f(b) \]

Note that weaker alternatives are not innocently excludable: affirming a prejacent and negating a weaker alternative yield a contradiction, which entails any proposition. Hence, for cases where dou functions as a distributor, the new definition of sub-alternatives (44c) has the same consequence as the previous one in (22), which defines sub-alternatives as
weaker alternatives.

A full definition of *dou* is schematized as follows:

\[(dou)(p) = \exists q \in \text{Sub}(p).
\]

\[\lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)[O(q)(w) = 0]]\]

(i) Presupposition: *p* has some sub-alternatives.
(ii) Assertion: *p* is true, while the exhaustification of each sub-alternative of *p* is false.

b. \[\text{Sub}(p) = (\text{Alt}(p) - \text{IExcl}(p)) - \{p\}\]

(The set of alternatives excluding the innocently excludable alternatives and the prejacent)

Readers who are familiar with the grammatical view of exhaustifications might find that *dou* is similar to the operation of recursive exhaustifications (abbreviated as ‘*O*\(_R\)’) proposed by Fox (2007). This operation has two major characteristics: first, exhaustification negates only alternatives that are innocently excludable; second, exhaustification is applied recursively. Using the notations in (46), I schematize the semantics of *O*\(_R\) as follows:12

\[O_R(p) = \lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)[O(q)(w) = 0] \land \forall q' \in \text{IExcl}(p)[q'(w) = 0]]\]

Thus *dou* is weaker than *O*\(_R\): *dou* does not negate the innocently excludable alternatives; therefore, applying *dou* to a disjunction does not generate an exclusive inference. For instance, (38) does not imply the exclusive

---

12In particular cases, the definition of *O*\(_R\) in (47) yields inferences different from what Fox’s idea would expect: if the exhaustification of a sub-alternative is not innocently excludable, the exhaustification of this sub-alternative would not be negated by *O*\(_R\) under Fox’s original definition. See (i) for a concrete example.

(i) (Among Andy and Billy,) only Andy came or only Billy came.

a. Prejacent: \(O\phi_a \lor O\phi_b\); \(\text{Sub}(O\phi_a \lor O\phi_b) = \{O\phi_a, O\phi_b\}\)

b. By definition (47), applying *O*\(_R\) yields a contradiction:

\[
[O\phi_a \lor O\phi_b] \land \neg O\phi_a \land \neg O\phi_b = [O\phi_a \lor O\phi_b] \land \neg O\phi_a \land \neg O\phi_b = \perp
\]

c. By Fox’s original definition, *O*\(_R\) would be applied vacuously:

\[O_R[p\phi_a \lor p\phi_b] = p\phi_a \lor p\phi_b\]
inference that only John and Mary can teach Intro Chinese.

**5.3 Modal Obviation**

Recall the contrast between disjunctions and bare *wh*-words with respect to the licensing conditions of their FCI uses: *dou* alone is sufficient for licensing the universal FCI use of a bare *wh*-word, but not that of a disjunction; to license this use of a disjunction, *dou* must be followed by a possibility modal. To capture this contrast, I assume that disjunctions evoke scalar implicatures, while bare *wh*-words do not (cf. Liao 2011, Chierchia & Liao 2015). Compare the following two episodic sentences. *Dou* must be present in (48a) but must be absent in (48b).

\[
\begin{align*}
(48) & \quad \text{(a) } \text{[Shei] } \*\textbf{(dou) jiao }\text{-guo jichu hanyu.} \\
& \quad \text{who } \textbf{dou} \text{ teach }\text{-EXP intro Chinese} \\
& \quad \text{With } \textbf{dou}: \text{‘Everyone has taught Intro Chinese.’} \\
& \quad \text{(b) } \text{[Yuehan huozhe Mali] }\*\textbf{dou) jiao }\text{-guo jichu hanyu.} \\
& \quad \text{John } \text{or } \text{Mary } \textbf{dou} \text{ teach }\text{-EXP intro Chinese} \\
& \quad \text{Without } \textbf{dou}: \text{‘John or Mary has taught Intro Chinese.’}
\end{align*}
\]

In both sentences, the use of *dou* yields an FC inference that John and Mary/everyone have/has taught Intro Chinese. But in (48b), with a disjunction, the prejacent clause of *dou* also evokes the following scalar implicature, which contradicts to the FC inference: it is not the case that both John and Mary have taught Intro Chinese. Hence, *dou* cannot be used in (48b) because it yields a universal FC inference which contradicts the scalar implicature (à la Chierchia’s (2013) explanation of the licensing condition of the FCI *any*). By contrast, in absence of *dou*, the sub-alternatives of a disjunction are not activated, and then (48b) would take a simple disjunctive reading.

A preverbal disjunction is licensed as a universal FCI when it appears before *dou*+◊. This effect is called “modal obviation,” namely, that the presence of a possibility modal eliminates the ungrammaticality. This effect is also observed with English *any*, as seen in (49).

\[
\begin{align*}
(49) & \quad \text{(a) } \text{[Yuehan huozhe Mali] }\textbf{dou keyi jiao }\text{jichu hanyu.} \\
& \quad \text{John } \text{or } \text{Mary } \textbf{dou} \text{ can } \text{teach intro Chinese} \\
& \quad \text{‘Both John and Mary can teach Intro Chinese.’}
\end{align*}
\]
b. [Yuehan huozhe Mali] (*dou) bixu jiao jichu hanyu.
   ‘Both John and Mary must teach intro Chinese.
   ‘Both John and Mary must teach Intro Chinese.’

There have been plenty of discussions on the phenomenon of Modal Obviation involved in licensing universal FCIs. Representative works include Dayal 1998, 2013, Giannakidou 2001, Chierchia 2013, among others. This paper is not in a position to do full justice to these discussions, but just adds one more accessible story to the market.

I propose that the scalar implicature of a preverbal disjunction can be assessed within a circumstantial modal base: the modal base is restricted to the set of worlds where the scalar implicature is satisfied. For instance, (49) intuitively suggests that the speaker is only interested in cases where exactly one person teaches Intro Chinese. Assume that the property teach Intro Chinese denotes only three world-individual pairs, as in (50a). For instance, the pair \( \langle w1, \{j\} \rangle \) is read as ‘only John teaches Intro Chinese in \( w1 \)’. The scalar implicature of the preverbal disjunction restricts the modal base \( M \) to the set of worlds where not both John and Mary teach Intro Chinese, as in (50b). Exercising dou yields the universal FC inferences in (50c) and (50d). Crucially, only (50c) is true with respect to \( M \).

(50)  
a. \( f = \{\langle w1, \{j\} \rangle, \langle w2, \{m\} \rangle, \langle w3, \{j, m\} \rangle\} \)  
b. \( M = \{w1, w2\} \)  
c. \[ [dou] [\lozenge f(j) \lor \lozenge f(m)] = \lozenge f(j) \land \lozenge f(m) \] True w.r.t. \( M \)  
d. \[ [dou] [\square f(j) \lor \square f(m)] = \square f(j) \land \square f(m) \] False w.r.t. \( M \)

Broadly speaking, there is no modal base, except the empty one, with respect to which (50d) is true; therefore necessity modals cannot obviate the contradiction between the FC inference and the scalar implicature.

If I am on the right track, as for the licensing conditions for the universal FCI uses of na-ca-NP and renhe-NP, whether a speaker accepts (41) in absence of the possibility modal is determined by whether he interprets these items with scalar implicatures.

6 Scalar Marker

When dou is associated with a scalar item or occurs in the focus construction [lian Foc dou ...], it functions as a scalar marker. In such a case,
sub-alternatives are the alternatives ranking strictly lower than the prejacent with respect to a contextually relevant probability measure, and the pre-exhaustification effect is realized by the scalar exhaustifier just. In the following, I will firstly sketch out the semantics of the scalar dou, and then capture the even-like interpretation and the licensing conditions of minimizers in the [lian Foc/Min dou ...] construction.

6.1 Association with a Scalar Item
When dou is associated with a scalar item, the sub-alternatives are alternatives that rank lower than the prejacent proposition on the relevant scale, as schematized in (51), where \( q \preceq_\mu p \) says that \( q \) ranks strictly lower than \( p \) with respect to some contextually relevant probability measure \( \mu \). \( \text{Alt}_C(p) \) stands for the set of contextually relevant alternatives of \( p \). For instance, in (52), repeated from (7a), sub-alternatives are propositions that rank lower than the prejacent in chronological order.

(51) \[ \text{Sub}(p) = \{ q : q \in \text{Alt}_C(p) \land q \preceq_\mu p \} \]
(The set of contextually relevant alternatives of \( p \) that rank lower than \( p \) with respect to \( \mu \))

(52) \[ \textbf{Dou} \ [\text{WU}_F\text{-dian}] \ -\text{le.} \]
\textbf{dou} five-o’clock \ -\text{ASP}
‘It is dou FIVE_F o’clock.’

a. \[ \text{Sub(it’s 5 o’clock)} = \{ \text{it’s 4 o’clock, it’s 3 o’clock, \ldots} \} \]
b. \[ \textbf{[dou[it’s 5 o’clock]]} = \text{‘it’s 5, not just 4, not just 3, \ldots’} \]

To generate sub-alternatives and satisfy the additive presupposition of dou, the prejacent clause of dou needs to rank relatively high in the relevant scale. For instance, in (53), dou can be associated with many-NP but not with few-NP, because the prejacent of dou must be relatively strong among the quantificational statements.

(53) \[ \text{[Duo/*Shao -shu -ren] dou lai -\text{le.}} \]
\text{many/less -amount -person DOU come -ASP}
‘Most/*few people dou came.’

Since the alternatives of (52) are ordered based on their strength in the considered scale, the pre-exhaustification effect of dou is realized by the
scalar exhaustifier \textsc{just}. As schematized in (54), the semantics of \textsc{just} is analogous to that of the \textsc{o}-operator: \textsc{just} affirms the prejacent \( p \) and further states a scalar exhaustivity condition that there is no true alternative of \( p \) that ranks higher than \( p \) with respect to the contextually relevant measurement. Hence, when \textit{dou} functions as a scalar marker, its semantics would be adapted to (55).

\begin{align*}
\text{JUST}(p) &= \lambda w[p(w) = 1 \land \forall q \in \text{Alt}_c(p)[q(w) = 1 \rightarrow q \preceq_{\mu} p]] \\
&= (p \text{ is true; every contextually relevant true alternative of } p \text{ ranks not higher than } p \text{ with respect to } \mu.)
\end{align*}

\begin{align*}
\llbracket \textit{dou} \rrbracket(p) &= \exists q \in \text{Sub}(p).
\lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)\textsc{just}(q)(w) = 0]] \\
&= (p, \text{ and for any sub-alternative } q, \text{ not just } q; \text{ defined iff } p \text{ has a sub-alternative.})
\end{align*}

We can further simplify the assertion, because the anti-exhaustification condition provided by the \textit{not just}-clause is entailed by the remnant prejacent condition. [Proof: If \( q \) is an alternative of \( p \) that ranks lower than \( p \) with respect to \( \mu \), then \( p \) is an alternative of \( p \) that ranks higher than \( q \) with respect to \( \mu \). Hence, if \( p \) is true, there exists a true alternative of \( p \) that ranks higher than \( q \) with respect to \( \mu \), namely, \( p \). End of proof.]

\begin{align*}
\llbracket \textit{dou} \rrbracket(p):
\lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)\textsc{just}(p)(w) = 0]] \\
= \lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)\exists q' \in \text{Alt}_c(p)[q'(w) = 1 \land q \succeq_{\mu} q']]] \\
= \lambda w[p(w) = 1 \land \forall q \in \text{Alt}_c(p)[q \preceq_{\mu} p \rightarrow \exists q' \in \text{Alt}_c(p)[q'(w) = 1 \land q \succeq_{\mu} q']]]] \\
= p
\end{align*}

The semantics of the scalar marker \textit{dou} is finally defined as follows:

\begin{align*}
\llbracket \textit{dou} \rrbracket(p) &= \exists q \in \text{Alt}_c(p)[q \preceq_{\mu} p].p \\
&= (p; \text{ defined iff there is a contextually relevant alternative of } p \text{ that ranks lower than } p \text{ with respect to } \mu.)
\end{align*}
6.2 The [lian Foc dou . . . ] Construction

In the [lian Foc dou . . . ] construction, alternatives are ordered with respect to likelihood. Sub-alternatives are focus alternatives that are more likely to be true than the prejacent, as schematized in (58). This definition is a natural transition from informativity to likelihood: a proposition that is less informative (viz., weaker) is more likely to be true.\(^\text{13}\)

\[(58) \quad \text{Sub}(p) = \{q : q \in \text{Alt}_C(p) \land q \preceq_{\text{likely}} p\} \]
(The set of contextually relevant alternatives of \(p\) that are more likely to be true than \(p\))

For instance, in (59), alternatives are propositions of the form “\(x\) was late” where \(x\) is a relevant individual. In a context that a team leader is less likely to be late than a team member, sub-alternatives are the team member \(A\) was late, the team member \(B\) was late, etc. Thus (59) means ‘the team leader was late, not just that a team member was late.’

\[(59) \quad \text{Lian [duizhang]}_F \text{ dou} \text{ chidao -le.} \]
\(\text{LIAN team-leader DOU late -ASP} \)
‘Even the team leader was late.’

Extending the definition of \(dou\) to the [lian Foc dou . . . ] construction, I schematize the meaning of \(dou\) in (60). Just like what we saw in (56), the anti-exhaustification condition is asymmetrically entailed by prejacent condition and hence is neglected in the end.

\[(60) \quad \llbracket \text{dou} \rrbracket(p) \]
\(= \exists q \in \text{Sub}(p). \lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)[\text{just}(p)(w) = 0]] \)
\(= \exists q \in \text{Sub}(p). \lambda w[p(w) = 1 \land \forall q \in \text{Sub}(p)\exists q' \in \text{Alt}_C(p)[q'(w) = 1 \land q \preceq_{\text{likely}} q']] \)
\(= \exists q \in \text{Alt}_C(p)[q \preceq_{\text{likely}} p]. \lambda w[p(w) = 1 \land \forall q \in \text{Alt}_C(p)[q \preceq_{\text{likely}} p \rightarrow \exists q' \in \text{Alt}_C(p)[q'(w) = 1 \land q \preceq_{\text{likely}} q']] \]
\(= \exists q \in \text{Alt}_C(p)[q \preceq_{\text{likely}} p]. p \)

\(\text{13}\)To be consistent with the general definition in (51), we can use “unlikelihood” as the probability measurement and define sub-alternatives as the ones that are less unlikely to be true than the prejacent.
(\(p\) is true; defined only if \(p\) has a contextually relevant alternative that is more likely to be true than \(p\).)

Notice that the presupposition of the scalar marker \(dou\) is identical to the scalar presupposition of the additive scalar focus-sensitive operator \(even\), according to the tradition initiated by Bennett (1982) and Kay (1990): the prejacent proposition is less likely to be true than at least one contextually relevant alternative.\(^{14}\) Thus, it is plausible to say that the \(even\)-like interpretation of the \([lian \ Foc \ dou \ \ldots]\) construction comes from the additive presupposition of \(dou\) (Portner 2002, Shyu 2004, Paris 1998, Liu to appear), while the particle \(lian\) is semantically vacuous and is present only for syntactic purposes.

### 6.3 Association with a Minimizer

Observe that, in licensing a minimizer, the post-\(dou\) negation is mandatory in (61a) but optional in (61b).

\begin{align*}
(61) & \quad \text{a. Yuehan (lian) [YI-ge ren]}_F \ (dou) \ (bu) \ renshi. \\
 & \quad \text{John LIAN one-cl person DOU NEG know} \\
 & \quad \text{‘John doesn’t know anyone.’}
\end{align*}

\begin{align*}
 & \quad \text{b. Yuehan (lian) [YI-fen qian]}_F \ (dou) \ (bu) \ yao. \\
 & \quad \text{John LIAN one-cent money DOU NEG request} \\
 & \quad \text{Without negation: ‘John even doesn’t want one cent.’} \\
 & \quad \text{With negation: ‘John wants it even if it is just one cent.’}
\end{align*}

I argue that the distributional pattern of the post-\(dou\) negation in a \([lian \ MIN \ dou \ (NEG) \ \ldots]\) construction is also constrained by the additive presupposition of \(dou\).

The additive presupposition of \(dou\) requires the prejacent not to be weakest proposition among the alternatives. In (61a), this requirement forces the minimizer \textit{one person} to take reconstruction and gets inter-

\footnote{Note that this additive presupposition says nothing about the truth value of any sub-alternative, as shown in (i).}

\begin{align*}
\text{(i) \quad Lian [Yuehan]}_F \ \text{dou jige -le, qita-ren \ zenme mei -you?} \\
 & \quad \text{LIAN John DOU pass -ASP, other-person how NEG -ASP.} \\
 & \quad \text{‘Even [John]$_F$ passed the exam, why is that the others didn’t?’}
\end{align*}
interpreted below negation, as in (62b): without reconstruction, the prejacent would be *There is at least one person whom John didn’t invite*, which is weaker than any alternatives of the form *There are at least n people whom John didn’t invite* (*n* > 1); in contrast, under the LF in (62b) which involves reconstruction of *one person*, the prejacent *¬*[John invited at least one person] is stronger than alternatives of the form *¬*[John invited at least *n* people] (*n* > 1).

(62) a. *Dou [one person ] \* [John knows \[]]
   
b. Dou [NEG [John knows one person]]

This reconstruction-based analysis is supported by the contrast in (63): when the minimizer *one person* serves as a subject, its surface position and reconstructed position are both higher than negation; therefore, the ungrammaticality in (63a) cannot be salvaged by reconstruction.

   
oone-CL person dou NEG know John.
   
   Intended ‘no one knows John.’
   
   
   John one-CL person dou NEG know
   
   ‘John doesn’t know anyone.’

In (61b), however, under the assumption that John shouldn’t want the money if the amount of money is too little, we expect that *John wants one cent* is more unlikely to be true than *John wants two cents*; therefore, the additive presupposition of *dou* can be satisfied even in absence of the post-*dou* negation.

7 Conclusions

In this paper, I offered a uniform semantics to capture the seemingly diverse functions of the Mandarin particle *dou*, including the quantifier use, the FCI-licenser use, and the scalar use. I proposed that *dou* is a special exhaustifier that operates on sub-alternatives and has a pre-exhaustification effect: *dou* presupposes the existence of at least one sub-alternative, asserts the truth of the prejacent and the negation of each pre-exhaustified sub-alternative.
Basically, sub-alternatives are alternatives that are not innocently excludable and are distinct from the prejacent. The pre-exhaustification effect is realized by a basic exhaustifier (viz., the $O$-operator). Depending on the meaning of its associated item, $dou$ functions either as a universal quantifier/distributor or as a universal FCI-licenser.

When $dou$ is associated with a scalar item, sub-alternatives are the ones that rank lower than the prejacent sentence with respect to the contextually relevant measurement, and the pre-exhaustification effect is realized by the scalar exhaustifier $j.ust$. In particular, in a $[\text{lian Foc } dou \ldots]$ sentence, sub-alternatives are the alternatives that are more likely (viz., less unlikely) to be true than the prejacent.

The additive presupposition of $dou$ explains the distributional pattern of $dou$ and many of its semantic consequences, such as the requirements regarding to distributivity, plurality, and monotonicity, the even-like interpretation of the $[\text{lian Foc/Min } dou \ldots]$ construction, the distributional pattern of the post-$dou$ negation in licensing minimizers, and so on.

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**References**


