Chapter 2

Mention-some questions

2.1. Introduction

This chapter is centered on the interpretations of wh-questions like (100), which contains an existential priority modal. I call wh-questions of this form “◊-questions.”

(100) Who can chair the committee?

What makes ◊-questions special and puzzling is that they admit mention-some answers (Groenendijk & Stokhof 1984). For example, the ◊-question (100) can be properly answered by naming one of the qualified chair candidates. Therefore, we say that (100) can take a mention-some reading and call it a “mention-some question.” Moreover, (100) admits also mention-all answers, meaning it can be answered by specifying all the qualified chair candidates, and hence we say that its interpretation involves a mention-some/mention-all ambiguity.

In most earlier works, mention-some readings were treated pragmatically and were not distinguished from partial readings, such as the one in (101).

(101) Who came, for example?

Nevertheless, I show that mention-some readings behave differently from other non-exhaustive readings (such as partial readings and choice readings) in many respects. For instance, unlike a partial answer, a mention-some answer takes a particular form of non-exhaustivity: it specifies exactly one of the possible choices. To this extend, mention-some readings are exclusive to ◊-questions. Hence, we must pursue a structural approach to predict the limited distribution of mention-some readings and explain the mention-some/mention-all ambiguity.

The proposed analysis of mention-some and conjunctive mention-all readings succeeds and refines the proposal by Fox (2013). Moreover, I present a simple way to derive disjunctive mention-all readings, based by observations with the Mandarin particle dou. dou behaves as an exhaustivity-marker in ◊-questions and triggers universal free choice inferences in disjunctive declaratives.

25Priority modals include bouletic, deontic, and teleological modals (Portner 2009).
At the end of this chapter, I compare my $O_{\text{dou}}$-operator, namely, the covert counterpart of 
*dou*, with other two exhaustifiers that have been employed in deriving free choice inferences, 
including Fox’s (2007) recursive exhaustifier, and Chierchia’s (2006, 2013) pre-exhaustification 
operator for domain alternatives.

### 2.2. What is a mention-some reading?

Most *wh*-questions admit only exhaustive answers. For example, to properly answer (102), the 
addressee needs to specify all the actual attendants to the party, as in (102a). If the addressee 
does not have enough knowledge about this question and can only provide a non-exhaustive 
answer, he would have to flag the incompleteness of his answer in some way. For instance, he 
can mark his answer with a prosodic rise-fall-rise (RFR) contour, as in (102b). This RFR contour 
involves a rising accent on *John*, followed by a fall, and then a final rise at the end of the utterance 
(in the following indicated by ‘/’). Given this difference, we call (102a) a “complete answer” 
while (102b) a “partial answer.” If a partial answer is not properly marked, as in (102c) which 
takes a falling tone (in the following indicated by ‘\’), it gives rise to an undesired exhaustive 
inference.

(102) Who went to the party?  
(\textit{w: only John and Mary went to the party.})  
\begin{enumerate}  
\item a. John and Mary.  
\item b. \hspace{1em} John did 
\hspace{1em} I don’t know who else did.  
\hspace{1em} \ \text{L.H* L-H%}  
\item c. \hspace{1em} # John did.  
\hspace{1em} Only John did.  
\hspace{1em} \ \text{H* L-L%}  
\end{enumerate}

In contrast, $\diamond$-questions admit not only exhaustive answers but also non-exhaustive answers 
(Groenendijk & Stokhof 1984). For instance, (103) can be naturally answered by specifying one 
of the chair candidates, as in (103a). Crucially, while being non-exhaustive, the answer (103a) 
does not need to carry an ignorance mark: it does not yield an exhaustivity inference even if 
taking a falling tone. Moreover, an exhaustive answer of (103) can take either a conjunctive form 
as in (103b), or a disjunctive form as in (103c).\cite{footnote:26}

(103) Who can chair the committee?  
(\textit{w: only John and Mary can chair; single-chair only.})  
\begin{enumerate}  
\item a. John can. 
\item \hspace{1em} Only John can chair.  
\end{enumerate}

\footnote{Notice that in (103) only an elided disjunctive answer can take an exhaustive reading. For example, the following full disjunctive answer takes only a partial reading.  
(1) Q: “Who can chair the committee?”  
A: “John or Mary can chair the committee.” $\Rightarrow$ Either John or Mary can chair, but I don’t know which.}\footnote{In contrast, (103c) is an argument of the topical property of the given question, and its scope is determined by the topical property (see section 2.6.3).}
Since it remains controversial whether (103c) is complete or partial, we tag the answers in (103a-c) with respect to a different dimension. (103a) is a mention-some answer, since it specifies only some chair candidate; while (103b-c) are mention-all answers, since they specify all of the chair candidates. Questions admitting and rejecting mention-some answers are called mention-some questions and mention-all questions, respectively. The readings under which a question admits mention-some answers are called mention-some readings.

In addition to matrix questions, indirect questions and other wh-constructions (e.g., free relatives, antecedents of wh-conditionals in Mandarin) exhibit the same distributional pattern of mention-some: mention-some/existential reading is available if and only if the form of the wh-construction resembles a ◊-question.

(104) Indirect questions
   \(\leadsto\) For every individual \(x\), if \(x\) arrived, Jack knows that \(x\) arrived.

b. Jack knows who can chair the committee.
   \(\leadsto\) For some individual \(x\) such that \(x\) can chair the committee, Jack knows that \(x\) can chair the committee.

(105) Free relatives
a. John ate what Mary cooked for him.
   \(\leadsto\) John ate everything that Mary cooked for him.

b. John went to where he could get help.
   \(\leadsto\) John went to some place where he could get help.

(106) Mandarin wh-conditionals
a. Ni qu-guo nar, wo jiu qu nar.
   you go-exp where, I jiu go where
   ‘Where you have been to, I will go where.’
   Intended: ‘I will go to every place where you have been to.’

b. Nar neng mai-dao jiu, wo jiu qu nar.
   where can buy-reach liquor, I jiu go where
   ‘Where I can buy liquor, I will go where.’
   Intended: ‘I will go to some place where I can buy liquor.’

Moreover, this distributional pattern of mention-some is also observed with question-answer clauses (QACs) in American Sign Language (ASL) (Davidson et al. 2008, Caponigro & Davidson 2011). A QAC is uttered by a single signer. It consists of two parts, namely, a question constituent which looks like an interrogative clause conveying a question, and an answer constituent which resembles a propositional answer or a short answer to that question. As shown below, just like their corresponding discourse-level question-answer pairs in (a), the answer constituent of each QAC in (b) resembles a mention-some answer if and only if the question constituent resembles a ◊-question.
CHAPTER 2. MENTION-SOME QUESTIONS

(107)  (w: John bought a book, a CD, and a DVD.)
   a. Signer A: JOHN BUY WHAT?
      ‘John bought what?’
   Signer B: #BOOK.
      ‘Book.’
   b. JOHN BUY WHAT,  # BOOK.
      ‘What John bought is a book.’

(108)  (w: There are two coffee places nearby, Starbucks and Peet’s.)
   a. Signer A: CAN FIND COFFEE WHERE?
      ‘Where can you find coffee?’
   Signer B: STARBUCKS.
      ‘Starbucks.’
   b. CAN FIND COFFEE WHERE,  STARBUCKS.
      ‘You can find coffee at Starbucks.’

It is important to notice that the form of non-exhaustivity in mention-some readings of ♦-questions is quite unique: a mention-some answer specifies exactly one of the possible options. Hence, it is more precise to call mention-some “mention-one.” In replying to a ♦-question, if an answer provides multiple choices and is not ignorance-marked, it will be interpreted exhaustively, as shown in (109b). Moreover, the embedded ♦-question in (110) admits a “mention-one” reading (110b) but not a “mention-three” reading (110c). This characteristic challenges the pragmatic analysis of mention-some. I will return to this point in section 2.4.1.

(109)  Who can chair the committee?
   a. Andy.\,  \implies Only John can chair.
   b. Andy and Billy.\,  \sqsimp Only John and Billy can chair.

(110)  John knows who can chair the committee.
   a. For some individual x such that x can chair, John knows that x can chair.  \(\text{(ok)}\)
   b. For every individual x, if x can chair, John knows that x can chair.  \(\text{(ok)}\)
   c. For some three individuals xyz such that xyz each can chair, John knows that xyz each can chair.  \(\text{(#)}\)

The mention-some reading of a ♦-question can be blocked under three conditions. First, it is blocked if the conversational goal explicitly or implicitly requests an exhaustive answer. For instance, in (111), the chair of the job search committee expected the assistant to list all the candidates who can teach Experimental Semantics; hence an answer without an ignorance mark would be understood exhaustively.

(111)  (Context: In making the final decision of a job search, the committee decided to consider only candidates who can teach Experimental Semantics or Field Methods.)
   Chair: “Who can teach Experimental Semantics?”
   Assistant: “John can.”
   \(\sqsimp Among the candidates, only John can teach Experimental Semantics.\)
Second, mention-some is blocked when an exhaustivity marker appears above the existential modal. Exhaustivity markers are found cross-linguistically, such as English all in a variety of dialects, German particle alles (and variants like überall), and Mandarin particle dou. For instance, the following (a) questions each demands an exhaustive list of individuals who can teach Introduction to Linguistics, and the following (b) questions each requests an exhaustive list of coffee places in the surroundings.

(112)  
(a) Who all can teach Introduction to Linguistics?  
(b) Where all can we get coffee around here?

(113)  
(a) Wer kann alles Einführung in die Sprachwissenschaft unterrichten?  
Who all can teach Introduction to Linguistics?  
(b) Wo kann ich hier überall Kaffee bekommen?  
Where all can we get coffee around here?

(114)  
(a) Dou shui keyi jiao yuyanxue jichu?  
Who can teach linguistics introduction  
‘Who all can teach Introduction to Linguistics?’  
(b) Zai fujin women dou keyi zai nali mai dao kafei?  
Where all can we get coffee around here?’

Third, mention-some readings are blocked if the wh-item takes a singular or numeral-modified wh-complement. For instance, the questions in (115) each can have only one true answer, and therefore there is no room for mention-some. I will discuss these uniqueness effects and their interactions with mention-some in Chapter 3.

(115)  
(a) Which candidate can teach Morphology?  

\[\leadsto\text{Only one of the candidates can teach Morphology.}\]

(b) Which two candidates can teach Morphology?  

\[\leadsto\text{Only two of the candidates can teach Morphology.}\]

To sum up, mention-some readings of questions have three characteristics. First, they are systematically available not only in matrix questions but also in other embedded wh-constructions such as indirect questions, free relatives, Mandarin wh-conditional, and QACs in ASL. Second, they express a particular form of non-exhaustivity: a mention-some answer specifies exactly one of the possible choices. Third, they can be blocked by exhaustive conversational goals and

\[27\]I thank Christopher Davis and Robert Henderson for data in Texan English, and Manuel Križ for data in German.
grammatical factors, such as the presence of exhaustivity-markers and uniqueness effects of singular or numeral-modified wh-items.

2.3. What is not a mention-some reading?

In addition to ◊-questions, questions with a partiality-marker (e.g., for example, for instance) (called “ex-questions” henceforth) and questions with an existentially quantificational expression (called “∃-questions” henceforth) also admit non-exhaustive readings. For instance, the ex-question (116) only requests to name some of the party attendants; the ∃-question (117) demands just a list of individuals that were voted for by some particular professor.

(116) Who came to the party, for example?
(117) Who did one of the professors vote for?

Nevertheless, the non-exhaustive readings of ex-questions and ∃-questions differ from mention-some readings of ◊-questions in many respects. Hence, I do not consider them as mention-some readings, but instead “partial readings” and “choice readings,” respectively.

2.3.1. ex-questions with partial readings

Unlike ◊-questions, ex-questions can rarely occur in embeddings. In (118), presence of the partiality-marker for example makes these sentences ungrammatical.28

(118) a. John knows who (*for example) came to the party.
   b. John ate what (*for example) Mary bought.

Therefore, it is more appropriate to treat for example as a discourse expression outside the root denotation: it signals that the questioner is tolerant of partial answers (or more precisely, a true proposition in the Hamlin set that is asymmetrically entailed by a max-informative true answer). See also (72) in section 1.5.2.

Moreover, the partial reading of an ex-question and the mention-some reading of a ◊-question involve different forms of non-exhaustivity. As discussed in section 2.2, mention-some readings rule in only non-exhaustive answers that specify exactly one of the available choices, which we call “mention-one answers.” In contrast, partial readings admit any non-exhaustive answer.

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28 Beck & Rullmann (1996) find out that some partiality-markers, such as Dutch zoal and German so, are acceptable in embeddings, as exemplified below.

(1) Jan wil weten wie er zoal (niet) op het feest waren.
   Jan wants know who there zoal (not) at the party were
   ‘John wants to know who for example were (not) at the party’

(2) Hans wil wissen, wer so (?nicht) auf dem Fest war.
   Hans wants know who so (not) at the party was
   ‘John wants to know who for example were (not) at the party’

Nevertheless, embedded questions with zoal or so are acceptable only in rogative environments.
CHAPTER 2. MENTION-SOME QUESTIONS

For example, in replying to the \textit{ex}-question (119), the addressee is free to name any number of attendants: (119a) names one attendant while (119b) names two. Moreover, in replying to (119), regardless of how many attendants an answer specifies, this answer does not give rise to an exclusive inference.

(119) Who went to the party, for example?
\begin{itemize}
  \item a. John. \textit{⇒} Only John did.
  \item b. John and Mary. \textit{⇒} Only John and Mary did.
\end{itemize}

2.3.2. \(\exists\)-questions with choice readings

There are, quite generally, two paths to the non-exhaustive readings of \(\exists\)-questions. One path is to treat them as \textit{mention-some readings}, derived in the same way as the mention-some readings of \(\diamond\)-questions (George 2011, Fox 2013). This path is motivated by the fact that \(\diamond\)-questions and \(\exists\)-questions both contain expressions of existential quantification force, namely, existential modals and existential generalized quantifiers, respectively. The other path, which I will pursue in Chapter 6, is to treat them as \textit{choice readings} (Groenendijk & Stokhof 1984), on a par with the pair-list readings of questions with universal quantifiers (abbreviated as “\(\forall\)-questions” henceforth). The following discusses two empirical facts in favor of the choice reading analysis.

On the one hand, unlike mention-some readings of \(\diamond\)-questions, choice readings of \(\exists\)-questions are not blocked by the presence of an exhaustivity-marker or the uniqueness effect of a singular \textit{wh}-phrase, as shown in (120a-b). In (120a), the presence of all marks local exhaustivity, which demands the addressee to provide an exhaustive list of candidates that one particular student voted for. Likewise, in (120b), the uniqueness inference triggered by the singular \textit{wh}-phrase is assessed beneath the existential quantifier (Fox 2013); it does not imply that only one of the candidates got votes from the students, but instead that one of the students voted for only one of the candidates. In contrast, in the \(\diamond\)-question (121), exhaustivity and uniqueness take effects above the existential modal and therefore block mention-some.

\begin{itemize}
  \item (120) \(\exists\)-questions
    \begin{itemize}
      \item a. Who all did one of the students vote for? \( (\exists > \text{all}) \)
      \hspace{1cm} \textit{⇒} As for one of the students, who are all the individuals that he voted for?
      \item b. Which candidate did one of the students vote for? \( (\exists > \imath) \)
      \hspace{1cm} \textit{⇒} As for one of students, who is the unique person that he voted for?
    \end{itemize}
  \item (121) \(\diamond\)-questions
    \begin{itemize}
      \item a. Who all can teach Introductory Chinese? \( (\text{all} > \diamond) \)
      \hspace{1cm} \textit{⇒} Who are all the individuals that can teach Introductory Chinese?
      \item b. Which person can teach Introductory Chinese? \( (\imath > \diamond) \)
      \hspace{1cm} \textit{⇒} Who is the unique person that can teach Introductory Chinese?
    \end{itemize}
\end{itemize}

On the other hand, choice readings of \(\exists\)-questions and pair-list readings of \(\forall\)-questions have similar distributions. Both readings exhibit a subject-object/adjunct asymmetry (Chierchia 1991,
1993): they are more likely to be available when the quantifier serves as the subject and c-commands the \(wh\)-trace at the object or an adjunct position. For instance, the examples in (122a) illustrate the subject-object asymmetry in choice readings: (122a-i) accepts a choice reading, and here the existential quantifier one of the students serves as the subject, c-commanding the object \(wh\)-trace; while (122a-ii) can hardly get choice readings, and here the \(wh\)-phrase is moved from the subject position. The subject-adjunct asymmetry is analogous, as shown in (122b) and (123b).

(122) **Choice readings of \(\exists\)-questions**
   a. Subject-Object
      i. Which candidate did [one of the students] vote for? \(\checkmark\) choice
      ii. Which person voted for [one of the students]? \(?\) choice
   b. Subject-Adjunct
      i. At which station did [one of the guests] get gas? \(\checkmark\) choice
      ii. Which guest got gas at [one of the nearby stations]? \(?\) choice

(123) **Pair-list readings of \(\forall\)-questions**
   a. Subject-Object
      i. Which candidate did everyone vote for? \(\checkmark\) pair-list
      ii. Which voter voted for every candidate? \(\times\) pair-list
   b. Subject-Adjunct
      i. At which station did every guest get gas? \(\checkmark\) pair-list
      ii. Which guest got gas from every gas station? \(\times\) pair-list

2.4. **Earlier approaches of mention-some**

The availability of mention-some in \(\diamond\)-questions challenges the traditional view that questions admit only exhaustive answers. Before getting into the details, we need to first figure out two basic issues, namely, whether mention-some is semantically licensed, and whether the distribution of mention-some is grammatically constrained. I classify the previous approaches into the following three lines, based on views and predictions they make on these two issues:

**The pragmatic line**: Complete answers must be exhaustive. Mention-some answers are partial answers that are sufficient for the conversational goal behind the question. (Groenendijk & Stokhof 1984, van Rooij 2004, among others)

**The post-structural line**: Mention-some reading is semantically licensed. The distribution of mention-some is mainly restricted by pragmatic factors. Mention-some and mention-all are two independent readings derived via different operations outside the question nucleus. (Beck & Rullmann 1999, George 2011: ch. 2)

**The structural line**: The mention-some/mention-all ambiguity is a result of a structural variation within the question nucleus. (George 2011: ch. 6, Fox 2013)
Mention-some is semantically licensed
Mention-some is grammatically restricted

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<th>Pragmatic</th>
<th>Post-structural</th>
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Table 2.1: Summary of current lines of approaches on mention-some

This section reviews the pragmatic line and the post-structural line. Both lines face the problem that they can only restrict the distribution of mention-some by pragmatic factors, which are not restrictive enough.

2.4.1. The pragmatic line

Most works on questions consider only exhaustive answers as complete answers. Since mention-some answers are non-exhaustive, works holding this view attribute the acceptability of mention-some to pragmatic factors, such as the conversational goal of the question. Consider (124) for instance. If the goal is just to get some gas, the addressee only needs to name one accessible gas station; if the goal is to investigate the local gas market, the addressee needs to list all the local gas stations.

(124) Where can I get gas?

This pragmatic treatment of mention-some was initiated by Groenendijk & Stokhof (1984) and remained popular under various frameworks of questions. van Rooij (2004) develops a theory of utility which gives a formal characterization for the circumstances where mention-some is accepted and preferred.

A commonly seen criticism to the pragmatic view, pointed out by Groenendijk & Stokhof (1984) themselves and reiterated by George (2011), is that pragmatics cannot predict the availability of mention-some in embeddings. As seen in section 2.2, mention-some is available not only in root questions, but also in indirect questions, free relatives, and QACs. In responding to this concern, Ginzburg (1995), Lahiri (2002), and van Rooij & Schulz (2004) build contextual parameters into question denotations and encode sensitivity to the question goals. For instance, Lahiri (2002) proposes that interpreting an indirect question involves picking a sub-question, and that the size of the selected sub-question, compared with the size of the full question, needs to be large enough for the speaker’s purpose.

I do not object to the existence of contextual parameters in question interpretations. I also agree that pragmatics plays a role in distributing mention-some in several respects; for instance, if a question is semantically ambiguous between mention-some and mention-all, a conversational goal that calls for an exhaustive answer can block mention-some. Nevertheless, I doubt that pragmatics is restrictive enough to predict the very limited and systematic distribution of mention-some: mention-some is only available in $\Diamond$-questions.

Below, I provide two additional empirical arguments against the pragmatic treatment of mention-some. Both arguments are related to what I call *mention-intermediate answers*. These answers are, as the name implies, non-exhaustive answers that are stronger than mention-some
answers. I show that the pragmatic view cannot capture the differences between mention-some and mention-intermediate: contrary to the case of mention-some, mention-intermediate is unacceptable in root questions and embedded questions.

First, in answering a mention-some question, mention-intermediate answers, while being informative enough for the question goal, must be ignorance-marked. For instance, assume that the goal of asking (125) is to find a qualified person to chair the committee. Under a discourse where three individuals are qualified, a mention-some answer names one of the candidates, as in (125a), while a mention-intermediate answer names two of the candidates, as in (125b-c). Crucially, while both mention-some and mention-intermediate answers are sufficient for the question goal, the mention-intermediate answers must to be ignorance-marked; otherwise they yield an undesired exhaustivity inference, as seen in (125b’) and (125c’).

(125) Who can chair the committee?

(w: only John, Mary, and Sue can chair; single-chair only.)

a. John.\[\leftrightarrow Only John can chair.

b. John and Mary.../

b’ # John and Mary.\[\leftrightarrow Only John and Mary can chair.

c. John or Mary.../

c’ # John or Mary.\[\leftrightarrow Only John and Mary can chair.

The obligatory ignorance-marks on mention-intermediate answers suggest the following: in responding to a ⊠-question, whether an answer can be interpreted inclusively is primarily determined by the grammatical structure of this answer, rather than the question goal. When taking a falling tone, simple individual answers like (125a) can be interpreted inclusively, while answers taking a conjunctive form or a disjunctive form like (125b-c) admit only exhaustive readings.

Second, interpretations of indirect questions show that good answers are always “mention one (group)” or “mention all (groups),” as exemplified in (126a)/(127a) and (126b)/(127b), respectively. The conversational goal of a question, however, can be any “mention N (groups)” where N is a number in the available range. For instance, assume that the dean wants to meet with three chair candidates so as to make plans for the committee, then the goal of the embedded question in (126) would be “mention three.” A pragmatic account predicts (126) to take the mention-three reading (126c), which however is infeasible. A semantic account does not have this prediction: complete answers derived from the possible logical forms of a mention-some question are either mention-one or mention-all, not mention-intermediate.

(126) John knows who can chair the committee.

a. For some individual x such that x can chair, John knows that x can chair. (ok)

b. For every individual x, if x can chair, John knows that x can chair. (ok)

c. For some three individuals xyz such that xyz each can chair, John knows that xyz each can chair. (#)

(127) John knows who can form the committee.
a. For some group of individuals $X$ s.t. $X$ together can form the committee, John knows that $X$ together can form the committee. \[(\text{ok})\]

b. For every group of individuals $X$, if $X$ together can form the committee, John knows that $X$ together can form the committee. \[(\text{ok})\]

c. For three groups of individuals $XYZ$ s.t. each group among $XYZ$ can form the committee, John knows that each group among $XYZ$ can form the committee. \[(\#)\]

2.4.2. The post-structural line

Another commonly seen line of approaches, which I call “the post-structural line,” treats mention-some as an independent reading on a par with mention-all. Approaches following this line are sometimes referred to as “semantic approaches,” to the extend that they acknowledge the existence of mention-some in semantics. But I call them “post-structural approaches” so as to distinguish them from the structural approaches. Structural approaches attribute the mention-some/mention-all ambiguity to the structural ambiguity within the question nucleus, which is structurally contained within the root denotation; while post-structural approaches attribute this ambiguity to an operation outside the nucleus or even outside the root denotation.

The rest of this section briefly reviews two representative post-structural approaches, including Beck & Rullmann (1999) and George (2011: ch. 2). Beck & Rullmann attribute the mention-some/mention-all ambiguity of $wh$-questions to answerhood-operators with different quantificational force. While George’s system has only one existential answerhood-operator, and it attributes the ambiguity to the optional presence of a strengthening operator within the root denotation.

Beck & Rullmann (1999) assume that the root denotation of a question is the Hamblin-Karttunen intension (of type $\langle s, stt \rangle$), namely, a function that maps a world to the Karttunen set in this world (viz., the set of propositional answers that are true in this world). The root denotation $Q$ can be operated by different answerhood-operators, yielding different readings. Employing $\text{Ans}_{BR_1}$ returns the conjunction of all the true propositional answers, yielding a mention-all answer. While employing the higher-order $\text{Ans}_{BR_3}$-operator shifts the root denotation into an existential generalized quantifier over a family of sub-question intentions.

\[
\begin{align*}
\text{(128)} & \quad \text{a. } \text{Ans}_{BR_1}(Q)(w) = \bigcap \{ p : Q(w)(p) \land p(w) \} & \text{(for mention-all)} \\
& \quad \text{b. } \text{Ans}_{BR_3}(Q)(w) = \lambda P_{(s, stt)}. \exists p \{ P(w)(p) \land Q(w)(p) \land p(w) \} & \text{(for mention-some)}
\end{align*}
\]

As exemplified in (129), interpreting an embedded mention-some question involves raising the entire type-shifted question. The existential quantification force within $\text{Ans}_{BR_3}$ introduces mention-some.

\[
\text{(129)} \quad \text{John knows } Q_{MS}.
\]
The account proposed by George (2011: ch. 2) involves two stages in the question formation, including an abstract formation which denotes the intension of a lambda abstract Abs, and a question formation which produces a set of possible answers via a question-formation operator Q. The mention-some/mention-all ambiguity comes from the absence/presence of a strengthening operator X between Abs and Q, as illustrated in (130).

(130) Who came?
   a. \[\text{Abs} = \lambda x [\text{people} @ (x) \land \text{came}_w (x)]\]
   b. \[Q = \lambda x, \gamma [\lambda p. \lambda y. \exists \beta (p = \lambda w. \alpha (w) (\beta))]\]
   c. \[X = \lambda y, \gamma, \lambda \delta (\delta = \gamma)\]

When the X-operator is absent, question formation delivers the Hamblin set, as schematized in (131a). When the X-operator is present between Abs and Q, question formation delivers a partition, or equivalently, a set of exhaustified propositions of the form that “only the individuals in \(\beta\) came,” as schematized in (131b). Finally, answerhood operation unambiguously applies existential quantification over the output Hamblin set or partition, yielding mention-some and strongly exhaustive, respectively.

(131)
   a. Without X: mention-some
      \[\llbracket Q(\text{Abs}) \rrbracket = \lambda p(x) \exists \beta \exists \gamma (p = \lambda w. [\text{people} @ (x) \land \text{came}_w (\beta)])\]
      \[= \{ \lambda w. [\text{people} @ (x) \land \text{came}_w (\beta) : \beta \in D_c]\}
      \[= \{ \text{came} (\beta) : \beta \in \text{people} @ \}\]
   b. With X: strongly exhaustive
      \[\llbracket Q(X(\text{Abs})) \rrbracket = \lambda p(x) \exists \beta (\text{Abs}) (p = \lambda w. \lambda x [\text{people} @ (x) \land \text{came}_w (x) = \beta])\]
      \[= \{ \lambda w. \lambda x [\text{people} @ (x) \land \text{came}_w (x) = \beta) : \beta \in D(\text{Abs})\}\]

Regardless of the technical details, post-structural approaches all face the problem that they do not restrict the availability of mention-some grammatically. For instance, no grammatical

\[29\] A non-trivial assumption that George (2011: ch. 2) makes is that mention-some and weakly exhaustive are the same reading, derived when the X-operator is absent.
factor blocks the use of Beck & Rullmann’s $\text{ANS}_{BR3}$-operator or forces the presence of George’s $X$-operator. Hence, post-structural approaches predict that mention-some is always semantically licensed, and that its limited distribution come from pragmatic restrictions. These predictions, however, lead to the very same problems that we just saw with the pragmatic line.

2.5. A structural approach: Fox (2013)

The structural line attributes the interpretation ambiguity of a question to a structural variation within the question nucleus. George (2011: ch. 6) proposes the first structural treatment of mention-some/mention-all ambiguity. But his treatment only applies to $\exists$-questions, which are not considered to be mention-some questions in this dissertation (section 2.3.2). As far as I know, only Fox (2013) has made a structural treatment for the mention-some/mention-all ambiguity in $\diamond$-questions. This treatment has two major assumptions. First, any max-informative true answer counts as a complete true answer. Second, the mention-some/mention-all ambiguity comes from the scope ambiguity of distributivity with the question nucleus.

2.5.1. Completeness and answerhood

Earlier works assume that complete answers are always exhaustive. As one of the most popular views, Dayal (1996) assumes that a complete true answer is the strongest true answer, namely, the unique true answer that entails all the true answers. This view of completeness leaves no space for mention-some, as we saw in section 2.4.1. To rule in mention-some answers as complete answers, Fox (2013) weakens the definition of completeness and proposes that any maximally (max)-informative true answer counts as a complete true answer. A true answer is max-informative as long as it is not asymmetrically entailed by any of the true answers.

\begin{align*}
(132) \text{ Given a set of propositions } \alpha, \\
\quad & \text{a. the strongest member of } \alpha: \\
\quad & \quad \top[p \in \alpha \land \forall q[q \in \alpha \rightarrow p \subseteq q]] \\
\quad & \quad \text{(The unique member that entails all the members of } \alpha) \\
\quad & \text{b. the set of max-informative members of } \alpha: \\
\quad & \quad \{p : p \in \alpha \land \forall q[q \in \alpha \rightarrow q \not\subseteq p] \} \\
\quad & \quad \text{(The members of } \alpha \text{ that are not asymmetrically entailed by any members of } \alpha) \\
\end{align*}

For a simple illustration of the two notions in (132a-b), compare the two proposition sets in (133). Set $\alpha$ is closed under conjunction; it has only one max-informative member, which is also the strongest member, while set $\beta$ has no strongest member but instead two max-informative members.

\begin{align*}
(133) \text{ Assume that } p \text{ and } q \text{ are semantically independent and non-contradictory,} \\
\end{align*}

\footnote{Since Danny Fox had not written out his analysis into a paper by the time when this dissertation was written, the work ‘Fox 2013’ refers to the handouts of a series of lectures on mention-some that he gave since 2013 at MIT and other occasions. Please look out for any further updates.}
a. \( \alpha = \{ p, q, p \land q \} \)
   i. The strongest member of \( \alpha \): \( p \land q \)
   ii. The max-informative member(s) of \( \alpha \): \( p \land q \)

b. \( \beta = \{ p, q \} \)
   i. The strongest member of \( \beta \): Non-existent
   ii. The max-informative member(s) of \( \beta \): \( p, q \)

The two views of completeness by Dayal and Fox make no difference in cases where the answer space is closed under conjunction, as in (133a). But, defining completeness as max-informativity leaves space for mention-some: it allows non-exhaustive answers to be complete, so that a question to have multiple complete true answers. Under Fox’s view, a mention-some answer is a max-informative true answer that is non-exhaustive, a question is interpreted as mention-some if it can have multiple max-informative true answers, and a question does not take mention-some if its answer space is closed under conjunction.

Using the weaker definition of completeness, Fox defines the answerhood-operator as in (134): the root denotation of a question is a Hamblin set; \( \text{Ans}_{\text{Fox}} \) applies to the Hamblin set \( Q \) and the evaluation world \( w \), returning the set of max-informative true answers of \( Q \) in \( w \). Accordingly, a question takes a mention-some reading if and only if the output set of employing \( \text{Ans}_{\text{Fox}} \) can be non-singleton.

(134) **Fox’s (2013) answerhood-operator**
\[
\text{Ans}_{\text{Fox}}(Q)(w) = \{ p : w \in Q \land \forall q \{ w \in q \rightarrow q \notin p \} \}
\]
\[
(\{ p : p \text{ is true answer of } Q \text{ in } w; \text{ and } p \text{ is not asymmetrically entailed by any of the true answers of } Q \text{ in } w. \})
\]

### 2.5.2. Deriving the ambiguity

Fox (2013) attributes the mention-some/mention-all ambiguity to the scopal ambiguity of distributivity. The core idea is as follows: mention-some reading is available only if the answer space is not closed under conjunction; in a \( \Diamond \)-question, the answer space is not closed under conjunction only if distributivity takes scope below the existential modal.

To realize this idea, Fox firstly inserts a covert distributor \( \text{EACH} \) to the LF as a phrase-mate of the \( wh \)-trace \( X \). \( \text{EACH} \) distributes over the atomic subparts of \( X \):

(135) \[
\llbracket X \text{ EACH} \rrbracket = \lambda f_{(i,j)}. \forall x [x \in \text{At}(X) \rightarrow f(x)]
\]

In a \( \Diamond \)-question, the distributive phrase \( [X \text{ EACH}] \) flexibly takes scope above or below the existential modal. For a simple illustration, observe that the two LFs in (136) for the question nucleus differ only with respect to the scope of \( [X \text{ EACH}] \) relative to the modal \( \text{can} \).

(136) **Who can chair the committee?**

a. Global distributivity
   b. Local distributivity
CHAPTER 2. MENTION-SOME QUESTIONS

52

The two LFs yield the Hamblin sets in (137a) and (137b), respectively. For a more intuitive comparison, see the two pictures in (138). Each square stands for an answer space (viz., a Hamblin set); shading marks the true answers; underlining marks the max-informative true answers; arrows indicate entailments.

(137)  

a. \{\text{\textasciitilde\textasciitilde}EACH}(X)(\lambda x.\text{chair}(x)) : X \in \text{people} \} \quad \text{Global distributivity}

b. \{\text{\textasciitilde\textasciitilde}EACH}(X)(\lambda x.\text{chair}(x)) : X \in \text{people} \} \quad \text{Local distributivity}

(138)  

(w: only Andy and Billy can chair the committee; single-chair only.)

a. Global distributivity

b. Local distributivity

The answer space in (138a) is closed under conjunction; therefore, it has and can have only one max-informative true answer, yielding a mention-all reading. In contrast, the answer space (138b) is not closed under conjunction due to the entailment asymmetry in \textasciitilde\textasciitilde-environments (e.g., \textasciitilde\textasciitilde[f(a) \land f(b)] \subset [\textasciitilde\textasciitilde f(a) \land \textasciitilde\textasciitilde f(b)]); it has two max-informative true answers in the given discourse, yielding a mention-some reading.

This approach is supported by observations with the particle \textit{alles} in Austrian German: as exemplified in (139), the presence of \textit{alles} above the existential modal blocks mention-some (Martin Hackl and Manuel Križ pers. comm. to Fox 2015). This contrast is also observed with the distributor \textit{all} in several English dialects.

(139)  

a. (\textit{alles} \textit{\textasciitilde} \textit{\textasciitilde} \textit{\textasciitilde} \textit{\textasciitilde} \textit{\textasciitilde}\textit{\textasciitilde} with \textit{\textasciitilde} 3)

Was \textit{alles} kann ich mit 3 Euro kaufen?
What \textit{alles} can I with 3 Euro buy

‘What are all the things that I can buy for €3.’

b. (\textit{\textasciitilde} \textit{\textasciitilde}\textit{\textasciitilde} \textit{\textasciitilde} \textit{\textasciitilde}\textit{\textasciitilde} with €3 \textit{alles})

Was kann ich \textit{alles} mit 3 Euro kaufen?
What can I all with 3 Euro buy

‘What is a set of items s.t. with €3 I can buy them all?’

Fox considers only questions with atomic distributive predicates. In questions like (140a), distributivity distributes down to subgroups instead of atoms. For such cases, a natural move
would be to replace each with the generalized distributor \( \text{Part} \) (Schwarzschild 1996: ch. 5).

(140) Who can lift the piano?
   
   \[
   \text{a. } \{ (\text{Part}_C(X)(\lambda x. \mathbf{1}_c.t.p.(x)) : X \in \text{people}_@ \} \quad \text{Global distributivity}
   
   \text{b. } \{ (\mathbf{1}_c.\text{Part}_C(X)(\lambda x. \mathbf{1}_c.t.p.(x)) : X \in \text{people}_@ \} \quad \text{Local distributivity}
   \]

This Part-operator distributes over subparts of \( X \) that are members of the free cover variable \( C \). The value of \( C \) is determined by both linguistic and non-linguistic factors.\(^{31}\)

(141) \( [X \text{ Part}_C] = \lambda f.e.t.p. \forall x [x \in C \land x \leq X \rightarrow f(x)] \) where \( C \) is a cover of \( X \).

(142) \( C \) is a cover of \( X \) if and only if
   
   \[
   \text{a. } C \text{ is a set of subparts of } X; \\
   \text{b. } \text{every subpart of } X \text{ belongs to some member in } C.
   \]

2.5.3. Advantages and remaining issues

Fox’s (2013) treatment of mention-some makes two major breakthroughs. First, mention-some answers and mention-all answers are uniformly treated as complete answers. Compared with the pragmatic approaches, this treatment captures the systematic availability of mention-some in root and embedding environments. Second, mention-some and mention-all are derived via employing the very same \( \text{Ans} \)-operator; the mention-some/ mention-all ambiguity comes from a structural variation within the question nucleus. Compared with the post-structural approaches, this treatment provides a grammatical constraint as to the distribution of mention-some: mention-some is possible only if the answer space is not closed under conjunction.

\(^{31}\)How to define and use covers is tricky. To predict the mention-all reading of (1), we need to ensure both entailments in (1a-b); otherwise, all the true answers of (1) would be predicted to be max-informative.

(1) Who lifted the piano? \((f = \lambda x. \mathbf{1}_c.t.p.(x))\)

(\(w: \text{the piano was lifted twice, once by } ab, \text{once by } cd\))
   
   \[
   \text{a. } \text{Part}_C(a@b)(f) \land \text{Part}_C(c@d)(f) \Rightarrow \text{Part}_C(a@b@c@d)(f) \\
   \text{b. } \text{Part}_C(a@b)(f) \land \text{Part}_C(c@d)(f) \Leftrightarrow \text{Part}_C(a@b@c@d)(f)
   \]

If the cover variable \( C \) is existentially bound, as in (2), the entailment in (1b) wouldn’t hold. For example, in case that \( abc \) together lifted the piano and \( ad \) together lifted the piano, definition (2) predicts \( \text{Part}_C(a@b@c@d)(f) \) to be true, while \( \text{Part}_C(a@b)(f) \) and \( \text{Part}_C(c@d)(f) \) to be false.

(2) \( [X \text{ Part}_C] = \lambda f.A.C \forall x [x \in C \land x \leq X \rightarrow f(x)] \)

Hence, following Schwarzschild (1996: ch. 5), we’d better treat \( C \) as a free variable and assign it the same value across the possible answers. In the given scenario, with only four individuals \( abcd \), it is the most convenient to assume \( C = [a@b,c@d] \). For comparison, if \( C = [a@b] \), then \( \text{Part}_C(c@d)(f) \) would be vacuously true, because \( C \) does not contain any subparts of \( c@d \); if \( C = [a@b,c@d,a@d] \), then \( \text{Part}_C(a@b@c@d)(f) \) would be false, because it would also entail the false inference that \( ad \) together lifted the piano. In conclusion, to rule in all the true answers in \( w \), \( C \) should be the set consisting of exactly all the groups who lifted the piano in \( w \).

Nevertheless, this method is still problematic. It requires the value of \( C \) to be pre-determined by the true answers; in other words, this method predicts that whoever asks a question already knows the true answers of this question. This prediction is clearly implausible.
This analysis still has some remaining issues. First of all, as pointed out by Fox himself, allowing a question to have multiple max-informative true answers makes it difficult to predict the uniqueness effects of singular and numeral-modified wh-phrases. As we saw briefly in section 2.2, questions with a singular or numeral-modified wh-phrase can have only one true answer. For instance, (143a) is incoherent because the singular question evokes a uniqueness inference that 'only one of the boys came to the party', which contradicts the second clause; in contrast, this incoherency disappears if the singular wh-phrase which boy is replaced with the plural one which boys or the bare wh-word who.

(143)  
   a. “Which boy came to the party? # I heard that many boys did.”
   b. “Which boys came to the party? I heard that many boys did.”
   c. “Who (among the boys) came to the party? I heard that many boys did.”

Dayal (1996) captures this uniqueness effect using a presuppositional Ans_{Dayal}-operator: Ans_{Dayal}(Q)(w) presupposes the existence of the strongest true answer of Q in w. In a singular question, this presupposition is not satisfied if the question has multiple true answers, which therefore gives rise to a uniqueness effect. Clearly, the presupposition of Ans_{Dayal} cannot be directly incorporated into Fox’s analysis of mention-some: for Dayal, to avoid a presupposition failure, a question must have a unique strongest true answer; while for Fox, to get a mention-some reading, a question needs the possibility of having multiple max-informative true answers instead of a unique strongest true answer. To solve this dilemma, Fox (2013) proposes a weaker presupposition using innocently exclusive exhaustifications. But this solution still faces some problems. I will discuss this dilemma in more detail and offer a solution in Chapter 3.

Second, in certain cases, good mention-some answers are predicted to be partial answers. For example, consider the ◇-question (144). Intuitively, both (144b-c) are good mention-some answers; but (144b) is asymmetrically entailed by (144c) and hence would be predicted to be a partial answer under Fox’s analysis. In section 2.6.1, I refine Fox’s analysis of mention-some and solve this problem by inserting a local exhaustifier below the existential modal.

(144)  Who can serve on the committee? 
   (w: the committee can be made up of Andy and Billy; it also can be made of Andy, Billy, and Cindy.)
   a. # Andy. ◇[serve(a)]
   b. \sqrt{Andy and Billy.} ◇[serve(a) ∧ serve(b)]
   c. \sqrt{Andy, Billy, and Cindy.} ◇[serve(a) ∧ serve(b) ∧ serve(c)]

Third, Fox makes use of the scope ambiguity of a distributor within the question nucleus, which however, cannot extend to questions with predicates admitting only collective readings. As shown by the minimal pair in (145), repeated from (85) in section 1.6.3, the predicate formed a team supports only a collective reading. Likewise, the corresponding ◇-declarative of (145a) also admits only a collective reading, as seen in (146a).

(145)  (w: The kids ABCD formed two teams in total: AB formed one; CD formed one.)
a. # The kids formed a team. (collective)
b. √ The kids formed teams. (covered)

(146) (w: The kids ABCD can form two teams in total: AB can form one; CD can form one.)
a. # The kids can form a team. (collective)
b. √ The kids can form teams. (covered)

Nevertheless, the ◊-question (147) does exhibit a mention-some/mention-all ambiguity. Since the predicate can form a team cannot license covered or distributive readings, there cannot be any distributor present in the question nucleus. Hence, we need an analysis of the mention-some/mention-all ambiguity that is independent from whether a distributor is present.

(147) Who can form a team?
a. A and B. \( \downarrow \) (mention-some)
b. AB can form one, and CD can form one. \( \downarrow \) (mention-all)

Last, Fox has not discussed the derivation of mention-all answers taking disjunctive forms, which however are more commonly used than the conjunctive ones. In section 2.6.3, I will offer an analysis of disjunctive mention-all based on empirical observations with the Mandarin particle dou.

(148) Who can chair the committee?
a. John and Mary. (conjunctive mention-all)
b. John or Mary. (disjunctive mention-all)

2.6. Proposal

In this section, I firstly refine Fox’s (2013) treatment of mention-some and then argue for two structural methods to derive mention-all readings. In particular, conjunctive mention-all is derived by interpreting the higher-order wh-trace above the existential modal, and disjunctive mention-all is derived by employing a covert \( O_{dou} \)-operator above the existential modal.

2.6.1. Deriving mention-some

I adopt Fox’s (2013) view that a max-informative true answer counts as a complete true answer. Adapting the definition of \( ANS_{Fox} \) in (134) to the proposed hybrid categorial approach, I define the \( \text{Ans} \)-operator as in (149): \( \text{Ans} \) applies to the topical property \( P \) and the evaluation world, returning the set of max-informative true propositions in the range of \( P \).

(149) \( \text{Ans}(P)(w) = \{ P(\alpha) : \alpha \in \text{Dom}(P) \land w \in P(\alpha) \land \forall \beta \in \text{Dom}(P)[w \in P(\beta) \rightarrow P(\beta) \not\in P(\alpha)] \} \)
My treatment of mention-some is close to Fox’s (2013) treatment in the sense that it also relies on the narrow scope interpretation of the wh-item; but my treatment has two different assumptions related to the structure of the question nucleus, as illustrated in (150).

(150) Who can chair the committee?

First, the wh-phrase (in company with the BeDom-operator) takes a mandatory local QR (from \(x\) to \(\pi\)) before it moves to the spec of the interrogative CP. These movements create two wh-traces, namely, an individual trace \(x\) and a higher-order trace \(\pi\). Second, the existential modal embeds an exhaustivity O-operator associated with the individual wh-trace \(x\).

The local QR of the wh-phrase rules in generalized conjunctions and disjunctions as possible answers. As we have seen in (97), the semantic type of a topical property is determined by the semantic type of the highest wh-trace: if the wh-item directly moves from the base position to spec of the interrogative CP, the topical property is a property of individuals and hence only individuals of type \(e\) can be possible short answers; in contrast, if the wh-item firstly takes a local QR, the domain of the topical property ranges over generalized conjunctions and disjunctions of type \(\langle et, t\rangle\). The motivation for ruling in higher-order answers will be explained in Chapter 3: briefly, if a question does not have a strongest true answer, then it would be undefined unless the domain of its topical property includes generalized conjunctions.

The insertion of a local O-operator is motivated by cases like (144), repeated below. The contrast between (151a) and (151b-c) suggests that mention-some answers involve local exhaustivity: in (151), a good mention-some answer needs to specify the all the members of a possible committee. Intuitively, (151b) means ‘it is possible to have only Andy and Billy serve on the committee.’

(151) Who can serve on the committee?

\(w:\ the\ committee\ can\ be\ made\ up\ of\ Andy\ and\ Billy;\ it\ also\ can\ be\ made\ of\ Andy,\ Billy,\ and\ Cindy.\)  

\(\begin{align*}
  a. \ & \#\ Andy.\ & \Diamond O[\text{serve}(a)] \\
  b. \ & \checkmark\ Andy\ and\ Billy.\ & \Diamond O[\text{serve}(a \oplus b)] \\
  c. \ & \checkmark\ Andy,\ Billy\ and\ Cindy.\ & \Diamond O[\text{serve}(a \oplus b \oplus c)]
\end{align*}\)
Following the grammatical view of exhaustifications (Chierchia 2006, 2013; Fox 2007; Chierchia et al. 2013; Fox & Spector to appear; among others), I capture the local exhaustivity by inserting a covert $O$-operator below the existential modal and associating it with the individual $wh$-trace. This $O$-operator has a meaning close to the exclusive focus particle *only*; it affirms the prejacent and negates the alternatives that are not entailed by the prejacent.

$$O(p) = \lambda w [p(w) = 1 \land \forall q \in Alt(p) [q \not\subseteq q(w) \rightarrow q(w) = 0]]$$

(The prejacent $p$ is true, and any alternative of $p$ that is not entailed by $p$ is false.)

The alternatives associated with the individual $wh$-trace $t_{wh}$ are items of the same semantic type as $t_{wh}$. The alternative set is composed point-wise, analogous to the focus value of a focus-containing expression (Rooth 1992).

<table>
<thead>
<tr>
<th>(153)</th>
<th>a. Terminal Node</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt($t_{wh}$) = {a : \text{type}(a) = \text{type}(t_{wh})}</td>
</tr>
<tr>
<td>b.</td>
<td>Point-wise Functional Application</td>
</tr>
<tr>
<td></td>
<td>Alt($f(t_{wh})$) = {f(a) : a \in Alt(t_{wh})}</td>
</tr>
</tbody>
</table>

Inserting an $O$-operator rules out the infelicitous answer (151a): under the common knowledge that a committee consists of multiple members, it is impossible to have only Andy serve on the committee. Moreover, as a non-monotonic operator, this $O$-operator creates a non-monotonic environment with respect to the individual $wh$-trace, which therefore makes (151b) semantically independent from (151c) and preserves (151b) as a max-informative true answer.

More generally speaking, the insertion of an $O$-operator ensures that all the individual answers are semantically independent, and the presence of an existential modal ensures that these answers are NOT mutually exclusive. Hence, mention-some is available in $\diamond$-questions. In comparison, as shown in the following, if the existential modal is dropped or replaced with a universal modal, these locally exhaustified answers become mutually exclusive:

$$\begin{align*}
(154) & \quad \diamond O[serve(a \oplus b \oplus c)] \land \diamond O[serve(a \oplus b)] \neq \bot \\
& \quad O[serve(a \oplus b \oplus c)] \land O[serve(a \oplus b)] = \bot \\
& \quad \Box O[serve(a \oplus b \oplus c)] \land \Box O[serve(a \oplus b)] = \bot
\end{align*}$$

See (155) for a concrete example of deriving the topical property of a mention-some reading.

<table>
<thead>
<tr>
<th>(155)</th>
<th>Who can chair the committee?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(w: Only Andy and Billy can chair the committee; single-chair only.)</td>
</tr>
</tbody>
</table>
The meaning of (155) proceeds as follows:

(i) At Node 1, abstracting over the question nucleus generates a chairing-property defined for any generalized quantifier, as in (155a-b).

(ii) Who is an existential quantifier living on the set \( \mathcal{P} \), as in (155c). This set consists of not only atomic and sum individuals in \( \mathcal{P} \) but also conjunctions and disjunctions over \( \mathcal{P} \). At Node 2, BeDom shifts who into a domain restrictor, as in (155d-e).

(iii) Composing Nodes 1-2 by Functional Application derives the topical property \( P \), as in (155f). It is a partial chairing-property defined for generalized quantifiers of type \( \langle et, st \rangle \) that are conjunctions and disjunctions over human individuals. The answer space yielded by \( P \) is illustrated in Figure 2.1. Here and throughout the thesis, in illustrations of answer spaces, arrows indicate entailments, shading marks the true answers, and underlining marks the max-informative true answers.
This answer space involves three types of answers, namely, conjunctive answers (row 1-2), individual answers (row 3), and disjunctive answers (row 4-5). The conjunctive answers are all contradictory, due to the presence of the local \( O \)-operator. The individual answers are all semantically independent, and hence each true individual answer counts as a max-informative true answer. Disjunctive answers are asymmetrically entailed by some individual answers. Moreover, as illustrated in Figure 2.2, a disjunctive answer is semantically equivalent to the disjunction of the corresponding individual answers; hence, disjunctive answers are always partial: whenever a disjunctive is true, there must be a true individual answer that asymmetrically entails this disjunctive answer.

The overall shape of the answer space is independent from whether the predicate chair the committee takes a distributive or collective reading; due to the non-monotonicity of the \( O \)-operator, \( \Diamond Of(a) \land Of(b) \land Of(a \oplus b) \) is semantically independent from \( \Diamond Of(a) \) and \( \Diamond Of(b) \).

In sum, among the three types of answers, only individual answers can be max-informative. This prediction captures the characteristics of the types of non-exhaustivity in mention-some, which cannot explained in a pragmatic approach (section 2.4.1): (i) in discourse, without carrying an ignorance-mark, only individual answers can be mention-some answers, while conjunctive and disjunctive answers tend to get an exhaustive reading; and (ii) in indirect questions, mention-some readings are always “mention-one”.

(iv) Applying the \( A \)-operator to the topical property \( P \) and the evaluation world \( w \) returns the set of max-informative true answers in \( w \), as in (155g). Each of these max-informative true answers counts as a complete true answer. Applying \( f_{\text{ch}} \) picks out one of the max-informative true answers. Note that \( A \) and \( f_{\text{ch}} \) are semantically active but not syntactically present.
2.6.2. Conjunctive mention-all

Conjunctive mention-all answers are derived by moving the higher-order \(wh\)-trace \(\pi\) above the existential modal. Since the value of \(\pi\) can be a generalized conjunction, this approach is essentially the same as Fox’s (2013) idea of global distributivity, but it has the advantage of being applicable to questions with collective predicates.

As a simple illustration, the two LFs in (156) for the question nucleus differ only with respect to the scope of the higher-order \(wh\)-trace \(\pi\) relative to the modal \(can\).

(156) Who can chair the committee?

<table>
<thead>
<tr>
<th>a. (\diamond &gt; \pi)</th>
<th>b. (\pi &gt; \diamond)</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>IP</td>
<td>IP</td>
</tr>
<tr>
<td>can</td>
<td>can</td>
</tr>
<tr>
<td>(\pi_{(et,t)})(\lambda x)(O)(chair(x))</td>
<td>(\pi_{(et,t)})(\lambda x)(can)(O)(chair(x))</td>
</tr>
</tbody>
</table>

The two LFs yield the topical properties in (157a) and (157b), respectively. The answer space yielded by these two topical properties are illustrated in (158a) and (158b), respectively. For simplicity, I ignore the answers that involve the plural individual \(a \oplus b\).

(157) a. \(\lambda\pi_{(et,t)}[\uparrow^{people}(\pi) = 1.\diamond\pi (\lambda x. O[chair(x)])]\) \(\diamond > \pi\)
b. \(\lambda\pi_{(et,t)}[\uparrow^{people}(\pi) = 1.\pi (\lambda x. O[chair(x)])]\) \(\pi > \diamond\)

(158) (w: only Andy and Billy can chair the committee; single-chair only.)

<table>
<thead>
<tr>
<th>a. (\diamond &gt; \pi): mention-some</th>
<th>b. (\pi &gt; \diamond): conjunctive mention-all</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\diamond[Of(a) \land Of(b)])</td>
<td>(\diamond[Of(a) \land Of(b)])</td>
</tr>
<tr>
<td>(\diamond Of(a))</td>
<td>(\diamond Of(b))</td>
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<tr>
<td>(\lor)</td>
<td>(\lor)</td>
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<tr>
<td>(\diamond[Of(a) \lor Of(b)])</td>
<td>(\diamond[Of(a) \lor Of(b)])</td>
</tr>
<tr>
<td>(\diamond Of(a))</td>
<td>(\diamond Of(b))</td>
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<tr>
<td>(\lor)</td>
<td>(\lor)</td>
</tr>
<tr>
<td>(\diamond[Of(a) \lor Of(b)])</td>
<td>(\diamond[Of(a) \lor Of(b)])</td>
</tr>
</tbody>
</table>

The answer space in (158a) can have multiple max-informative true answers and hence yields a mention-some reading; moreover, the conjunctive answer is contradictory. In contrast, the answer space in (158b) is closed under conjunction and hence yields a mention-all reading; moreover, the conjunctive answer is the unique max-informative true answer and hence serves as a conjunctive mention-all answer.

2.6.3. Disjunctive mention-all

Recall that mention-all answers of a \(\diamond\)-question can take a disjunctive form. Moreover, as shown in (159), an elided disjunction can take an existential reading or a free choice reading, used as a
partial answer and a mention-all answer, respectively.

(159) Who can chair the committee?
   a. John or Mary../ I don’t know which. (partial: existential)
      \(\leadsto\) ‘Either John or Mary can chair the committee, but I don’t know which.’
   b. John or Mary.\ (mention-all: free choice)
      \(\leadsto\) ‘Both John and Mary can chair the committee. No one else can.’

I argue that the mention-some/mention-all ambiguity of a \(\Diamond\)-question correlates the existential/free-choice ambiguity of the corresponding disjunctive answers: a \(\Diamond\)-question takes a mention-all reading if its disjunctive answers take free choice readings.

2.6.3.1. Evidence from Mandarin particle \textit{dou}

The functions of the Mandarin particle \textit{dou} suggest a parallel between the mention-all readings of \(\Diamond\)-questions and the free choice interpretations of disjunctions. In a \(\Diamond\)-question, similar to the cases of German \textit{alles} and English \textit{all}, presence of \textit{dou} above the existential modal blocks mention-some, as shown in (160). Square brackets ‘[●]’ encloses the items associated with \textit{dou}. Following Beck & Rullmann (1999), I descriptively call this use an “exhaustivity-marker.”

\begin{align*}
\text{(160) a.} & \quad (\text{Dou}) [\text{shui}] \text{keyi jiao jichu hanyu?} \\
& \text{dou} \quad \text{who can teach Intro Chinese} \\
& \text{Without dou: ‘Who can teach Intro Chinese?’} \\
& \text{With dou: ‘Who all can teach Intro Chinese?’} \\
\text{b.} & \quad \text{Women (dou) keyi zai [nali] mai dao kafei?} \\
& \text{we dou can at where buy get coffee} \\
& \text{Without dou: ‘where can we get coffee?’} \\
& \text{With dou: ‘where all can we get coffee?’}
\end{align*}

Under the exhaustivity-marker use, \textit{dou} ought to appear on the right side of the subject if the subject is not a \textit{wh}-item, as seen in (160b). This fact suggests that \textit{dou} is posited within IP. Moreover, \textit{dou} must c-command the \textit{wh}-item at the surface structure, as exemplified in (161): \textit{dou} functions as an exhaustivity-marker when appearing above \textit{shenme} ‘what’, and as a distributor when appearing below \textit{shenme} ‘what’.

\begin{align*}
\text{(161) (w: John can give all the apples to Mary; he can also give some of the cookies to Mary.)} \\
\text{a.} & \quad \text{Yuehan dou keyi ba [shenme] gei Mali?} \\
& \text{John dou can ba what give Mary} \\
& \text{‘What all is John allowed to give to Mary?’} \\
& \text{(exhaustivity-marker)} \\
& \text{Proper reply: ‘The apples or some of the cookies.’} \\
\text{b.} & \quad \text{Yuehan keyi ba [shenme] dou gei Mali?} \\
& \text{John can ba what dou give Mary} \\
& \text{‘What } x \text{ is such that John can give all of } x \text{ to Mary?’} \\
& \text{(distributor)} \\
& \text{Proper reply: ‘The apples.’}
\end{align*}
Given that Mandarin is a *wh*-in-situ language and that *wh*-items take covert movement at LF (Huang 1982), I conjecture that at LF *dou* is interpreted somewhere within the question nucleus (i.e., inside IP) that c-commands the *wh*-trace. Hence, the surface structures and logical forms of (160a-b) are as follows.

(162) Surface structure
   a. \[ CP [IP *dou* [ who can teach Intro Chinese ]]]
   b. \[ CP [IP we \_j *dou* [t\_j can get coffee at where ]]]

(163) Logical Form
   a. \[ CP who\_i C^0 [IP *dou* [ t\_i can teach Intro Chinese ]]]
   b. \[ CP where\_i C^0 [IP *dou* [we can get coffee at t\_i ]]]

Despite the similarity between *dou* and *allesall* in questions, *dou* should not be analyzed simply as a distributor or a quantifier (Compare Lin 1996, Jie Li 1995, Xiaoguang Li 199732 ). In declaratives, *dou* has more functions than *allesall*: in a general way of classification, *dou* can be used as a distributor, a universal free choice item (*V*-FCI)-licenser, and a scalar marker. For the issues that are concerned with in this section, let us focus on its *V*-FCI-licenser use: in a \(\Diamond\)-declarative, associating *dou* with a pre-verbal disjunction evokes a universal free choice inference, as exemplified in (164).

(164) a. [Yuehan huo\_ze Mali] (*dou*) keyi jiao hanyu.  
   John or Mary *dou* can teach Chinese  
   Without *dou*: ‘Either John or Mary can teach Chinese.’ (existential)  
   With *dou*: ‘Both John and Mary can teach Chinese.’ (free choice)  

b. Women zai [Xingbake huo\_ze Maidanglao] (*dou*) keyi mai dao kafei.  
   we at Starbucks or McDonalds *dou* can buy get coffee  
   Without *dou*: ‘From either S or M, we can get coffee.’ (existential)  
   With *dou*: ‘From both S and M, we can get coffee.’ (free choice)

Chapter 7 motivates and presents a uniform semantics of *dou* to capture its various uses. I define *dou* as a pre-exhaustification exhaustifier that operates on *sub-alternatives*.

---

32 Xiaoguang Li (1997) assumes that, under the exhaustivity-marker use, *dou* is associated with a covert adverbial denoting multiple events and quantifies over events. This analysis cannot predict the unavailability of mention-some in \(\Diamond\)-questions like (1a). If here *dou* were associated with a covert quantificational adverbial over events, then (1a) should admit pair-list mention-some or individual mention-some readings, as observed in (1b). For example, if Starbucks is always accessible to John while J.P. Licks is sometimes accessible to John, “Starbucks” is a proper answer to (1b) but not to (1a).

(1) a. Yuehan *dou* keyi qu [nali] mai kafei?  
   John *dou* can go where buy coffee?  
   ‘Where all can John buy coffee?’ (mention-all)

b. Yuehan [mei-ci] *dou* keyi qu nali mai kafei?  
   John each-time *dou* can go where buy coffee?  
   ‘Each time, where can John can buy coffee?’ (pair-list mention-some)  
   ‘John always can buy coffee from where?’ (individual mention-some)
\[(\text{dou}(p)) = \lambda w[\exists q \in \text{SUB}(p).p(w) = 1 \land \forall q \in \text{SUB}(p)\{O(q)(w) = 0\}]\]

a. Presupposition: \(p\) has a sub-alternative.
b. Assertion: \(p\) is true; for each sub-alternative of \(p\), its exhaustification is false.

Sub-alternatives are simply the complements of Fox’s (2007) innocently (I)-excludable alternatives; in other words, sub-alternatives are the ones that are not I-excludable and distinct from the prejacent. For the purpose of this section, it is enough to know that the sub-alternatives of a conjunction/disjunction are its conjuncts/disjuncts. See Chapter 7 for more details.

\[(\text{dou}(p)) = w[\exists q \in \text{SUB}(p).p(w) = 1 \land \forall q \in \text{SUB}(p)\{O(q)(w) = 0\}]\]

\[(\text{dou}(p)) = \left\{ \begin{array}{l}
\begin{array}{l}
\text{Presupposition: } p \text{ has a sub-alternative.}
\end{array} \\
\begin{array}{l}
\text{Assertion: } p \text{ is true; for each sub-alternative of } p, \text{ its exhaustification is false.}
\end{array}
\end{array} \right.\]

33 Notice that the disjunction takes scope above the existential modal. We are, unfortunately, unable to check the semantic consequences of associating \(\text{dou}\) with a disjunction across an existential modal, because \(\text{dou}\) has to be associated with an preceding item when it functions as an FCI-licenser in declaratives.

(1) a. * Ni \(\text{dou}\) keyi mai [pingguo huozhe binggan].
    You \(\text{dou}\) can buy apples or cookie
    Intended: ‘You can buy apples or cookies.’

b. Ni [pingguo huozhe binggan] \(\text{dou}\) keyi mai.
    You apples or cookie \(\text{dou}\) can buy
    Intended: ‘You can buy apples and you can buy cookies.’

Given that universal FC and existential FC inferences are semantically equivalent in \(\Diamond\)-declaratives, as exemplified in (2), one might wonder why we cannot interpret the disjunction in (167) below the existential modal.

(2) a. Anyone can be invited (by you).
    universal FC

b. You can invite anyone.
    existential FC

This interpretation is not possible because associating \(\text{dou}\) with a pre-verbal disjunction exhibits a modal obviation which is only observed in the case of universal FCI-licensing. Compare the following English and Mandarin examples: (see section 7.6.3 for an explanation of this modal obviation effect.)

(3) Anyone *(can)/*must be invited.

(4) a. * Ni [pingguo huozhe binggan] \(\text{dou}\) mai -le.
    You apples or cookie \(\text{dou}\) can buy

b. * Ni [pingguo huozhe binggan] \(\text{dou}\) must mai.
    You apples or cookie \(\text{dou}\) must buy

34 Readers who are familiar with the grammatical view of exhaustifications might find the proposed definition
(167) [John or Mary] **dou** can teach Intro Chinese.
   a. Prejacent: $\Diamond f(j) \lor \Diamond f(m)$  
      $(f = [\text{teach Intro Chinese}])$
   b. $\text{SUB}(\Diamond f(j) \lor \Diamond f(m)) = \{\Diamond f(j), \Diamond f(m)\}$
   c. $\text{SUB}([\Diamond f(j) \lor \Diamond f(m)])$
      
      $= [\Diamond f(j) \lor \Diamond f(m)] \land \neg O \Diamond f(j) \land \neg O \Diamond f(m)$
      $= [\Diamond f(j) \lor \Diamond f(m)] \land [\Diamond f(j) \rightarrow \Diamond f(m)] \land [\Diamond f(m) \rightarrow \Diamond f(j)]$
      $= [\Diamond f(j) \lor \Diamond f(m)] \land [\Diamond f(j) \leftrightarrow \Diamond f(m)]$
      $= \Diamond f(j) \land \Diamond f(m)$

2.6.3.2. Deriving disjunctive mention-all

Based on the observations with the Mandarin particle **dou**, I propose that disjunctive mention-all answers are derived by employing a covert $O_{\text{dou}}$-operator above the existential modal. This $O_{\text{dou}}$-operator is a non-presuppositional counterpart of the Mandarin particle **dou**.  

(168) $O_{\text{dou}}(p) = \lambda w[p(w) = 1 \land \forall q \in \text{SUB}(p)[O(q)(w) = 1]]$
      (The prejacent $p$ is true, and the exhaustification of each sub-alternative of $p$ is false.)

Briefly speaking, applying an $O_{\text{dou}}$-operator above the existential modal turns a disjunctive answer into a free choice statement, making the answer space closed under conjunction and yielding a mention-all reading. A concrete example is given in (169).

(169) Who can chair the committee?
   a. Andy or Billy. I don’t know who exactly. (partial)
   b. Andy or Billy.

In this LF, an $O_{\text{dou}}$-operator is optionally present within the question nucleus and associated with the higher-order $\text{wh}$-trace $\pi$ across the existential modal $\text{can}$. With absence/presence of the global $O_{\text{dou}}$-operator, this LF yields the topical property in (170a)/(170b) and the answer of **dou** similar to the operation of recursive exhaustification proposed by Fox (2007) and the pre-exhaustification operator $O_{D\text{-Exu}}$-operator used by Chierchia (2006, 2013). See section 2.7 for a comparison.

35The additive presupposition of **dou** comes from the economy condition that an overt operator cannot be used vacuously. Hence, the covert counterpart should not have this presupposition.
space in (171a)/(171b). Again, arrows indicate entailments, shading marks the true answers, and underlining marks the max-informative true answers.

(170)  

a. \( P = \lambda \pi_{(er,f)}[\uparrow \text{people}(\pi) = 1.\hat{\pi}(\lambda x.O[\text{chair}(x)])] \) without \( O_{\text{dou}} \)  
b. \( P = \lambda \pi_{(er,f)}[\uparrow \text{people}(\pi) = 1.\hat{O}_{\text{dou}}\hat{\pi}(\lambda x.O[\text{chair}(x)])] \) with \( O_{\text{dou}} \)

(171) (w: Only Andy and Billy can chair the committee; single chair only.)

a. Without \( O_{\text{dou}} \): mention-some 
   b. With \( O_{\text{dou}} \): disjunctive mention-all

In both answer spaces, the conjunctive answers are contradictory. In (171a), the disjunctive answer is asymmetrically entailed by the individual answers and is semantically equivalent to the disjunction of the individual answers; hence, here the disjunctive answer is partial while the individual ones are complete. While in (171b), with the application of the \( O_{\text{dou}} \)-operator, the disjunctive answer takes a free choice interpretation and is semantically equivalent to the conjunction of the individual answers, as computed in (172); hence, with the presence of \( O_{\text{dou}} \), the disjunctive answer is complete while the individual ones are partial.

(172) \( O_{\text{dou}} \hat{\diamond}[O_f(a) \lor O_f(b)] \)  
= \( \hat{\diamond}[O_f(a) \lor O_f(b)] \land \neg \hat{O} \hat{\diamond} O_f(a) \land \neg \hat{O} \hat{\diamond} O_f(b) \)  
= \( \hat{\diamond}[O_f(a) \lor O_f(b)] \land [\hat{\diamond} O_f(a) \rightarrow \hat{\diamond} O_f(b)] \land [\hat{\diamond} O_f(b) \rightarrow \hat{\diamond} O_f(a)] \)  
= \( \hat{\diamond}[O_f(a) \lor O_f(b)] \land [\hat{\diamond} O_f(a) \leftrightarrow \hat{\diamond} O_f(b)] \)  
= \( \hat{\diamond} O_f(a) \land \hat{\diamond} O_f(b) \)

2.6.3.3. Disjunctive answers in non-modalized questions

In non-modalized questions, disjunctions take only existential readings and must be used as partial answers.

(173) Who came? 

a. Andy or Billy.../ I don’t know which. 
b. # Andy or Billy.

If the answer space of (173) is like (174a), then the partiality of disjunctive answers can be predicted easily. The disjunctive answer is semantically equivalent to the disjunction of two individual answers, which are strictly stronger. Hence, a disjunctive answer can never be a max-informative true answer: whenever it is true, there must be a stronger answer that is
simultaneously true. Nevertheless, a problem arises once we allow the presence of an $O_{\text{DOU}^-}$ operator: as the answer space (174b) shows, $O_{\text{DOU}}$ strengthens a disjunctive answer and makes it semantically equivalent to the corresponding conjunctive answer, as computed in (175).

(174) \[
\begin{array}{c}
\text{Without } O_{\text{DOU}} \\
\hline
f(a) \land f(b) \\
\downarrow \quad \lor \\
f(a) \lor f(b)
\end{array}
\quad
\begin{array}{c}
\text{With } O_{\text{DOU}} \\
\hline
O_{\text{DOU}}[f(a) \lor f(b)] \\
\downarrow \quad \land \\
O_{\text{DOU}}f(a) \quad O_{\text{DOU}}f(b) \\
\downarrow \quad \lor \\
O_{\text{DOU}}[f(a) \land f(b)]
\end{array}
\]

(175) \[
O_{\text{DOU}}[f(a) \lor f(b)]
= [f(a) \lor f(b)] \land \neg O_f(a) \land \neg O_f(b)
= [f(a) \lor f(b)] \land [f(a) \rightarrow f(b)] \land [f(b) \rightarrow f(a)]
= [f(a) \lor f(b)] \land [f(a) \leftrightarrow f(b)]
= f(a) \land f(b)
\]

Then, given that $O_{\text{DOU}}$ can turn the denotation of any disjunctive answer into a conjunctive inference, why is it that a disjunctive answer cannot be used as a complete answer of a non-modalized question? In the following, I show that applying $O_{\text{DOU}}$ to a non-modalized disjunctive answer always causes a contradiction. Consider the following two LFs, each of which involves an $O_{\text{DOU}^-}$-operator associated with the higher-order $wh$-trace $\pi$, where the only difference is that (176a) involves a local exhaustifier associated with the individual $wh$-trace $x$.

(176) Who came?

a. $[CP \ A\text{BedOM}(\text{who}) \lambda \pi [IP O_{\text{DOU}} \pi \lambda x [VP O [x \text{ came}]]]]$ $O_{\text{DOU}}[O_f(a) \lor O_f(b)]$

b. $[CP \ A\text{BedOM}(\text{who}) \lambda \pi [IP O_{\text{DOU}} \pi \lambda x [VP x \text{ came}]]]$ $O_{\text{DOU}}[f(a) \lor f(b)]$

First, disjunctive answers derived based on the LF (176b) have a contradictory truth condition, as computed in (177).\(^{36}\)

(177) \[
O_{\text{DOU}}[O_f(a) \lor O_f(b)]
= [O_f(a) \lor O_f(b)] \land \neg O_f(a) \land \neg O_f(b)
= [O_f(a) \lor O_f(b)] \land \neg O_f(a) \land \neg O_f(b)
= \bot
\]

\(^{36}\)In (177), $OO_f(a)$ and $OO_f(b)$ are reduced to $O_f(a)$ and $O_f(b)$, respectively, due to the following equation:

(1) $OO_f(a) = O_f(a) \land \neg O_f(b) = O_f(a) \land \neg [f(b) \land \neg f(a)] = O_f(a) \land \neg f(b) \lor f(a)$
$= [O_f(a) \land \neg f(b)] \lor [O_f(a) \land f(a)] = O_f(a) \lor O_f(a)$
$= O_f(a)$

Note that here the $O_{\text{DOU}^-}$-operator works differently from Fox’s (2007) recursive exhaustification: $O_{\text{DOU}}$ yields a contradiction; Fox’s recursive exhaustification on the other hand is semantically vacuous because the pre-exhaustified alternatives are not innocently excludable. See example (2) in footnote 38.
Second, under the LF (176a), applying $O_{\text{dou}}$ to a plain disjunction yields a conjunctive inference, which however contradicts the scalar implicature of this disjunction, as shown in (178).

\[(178) \quad O_{\text{dou}}[f(a) \lor f(b)] \text{ is deviant because:} \]
\[
\begin{align*}
\text{Scalar implicature:} & \quad \neg[f(a) \land f(b)] \\
O_{\text{dou}}[f(a) \lor f(b)] & = f(a) \land f(b) \quad \text{Contradictory}
\end{align*}
\]

The deviance of strengthening a non-modalized disjunction via $O_{\text{dou}}$ is supported by the fact in (179), namely that associating the Mandarin particle *dou* with a disjunction in a non-modalized sentence causes ungrammaticality (see section 7.6.3).

\[(179) \quad \text{[Yuehan huozhe Mali (*dou) jiao jichu hanyu. John or Mary (*dou) teach Introductory Chinese.} \]

By contrast, applying $O_{\text{dou}}$ to a disjunctive answer of a $\Diamond$-question does not yield a contradiction. First, due to the presence of the existential modal, the truth condition of a disjunctive answer is not contradictory, which is therefore free from the problem in (177). Second, as shown in the following, due to the presence of the local exhaustifier, the scalar implicature of a disjunctive answer is tautological, and thus does not suffer the problem in (178):

\[(180) \quad O_{\text{dou}} \Diamond [f(a) \lor f(b)] \text{ is not deviant because:} \]
\[
\begin{align*}
\text{Scalar implicature:} & \quad \neg \Diamond [Of(a) \land Of(b)] = \top \\
O_{\text{dou}} \Diamond [Of(a) \lor Of(b)] & = \Diamond Of(a) \land \Diamond Of(a) \quad \text{Consistent}
\end{align*}
\]

### 2.7. Comparing the exhaustifiers in deriving free choice

This section compares the following three exhaustifiers which have been proposed for the derivation of free choice inferences: the $O_{\text{dou}}$-operator for sub-alternatives proposed in this analysis, the recursive exhaustifier $O_R$ in Fox (2007), and the $O_{D\text{-Exh}}$-operator for domain (D)-alternatives in Chierchia (2006, 2013).

The operation of “recursive exhaustification” (abbreviated as ‘$O_R$’ henceforth) proposed by Fox (2007) has two major characteristics: first, exhaustification negates only alternatives that are innocently excludable; second, exhaustification is applied recursively. The definition of innocently excludable alternatives is repeated below: \(^{37}\)

\(^{37}\)The set of innocently excludable alternatives is also commonly defined as in (1). For example, in a disjunction $p \lor q$, the disjuncts are not innocently excludable because $(p \lor q) \land \neg p \rightarrow q$.

\[(1) \quad \text{IE}X\text{CL}(p) = \{ q : q \in \text{ALT}(p) \land \neg \exists q' \in \text{EXCL}(p)[p \land \neg q' \rightarrow q'] \}, \text{where EXCL}(p) = \{ q : q \in \text{ALT}(p) \land p \not\subseteq q \} \]

(The set of alternatives $p$ such that the inference of affirming $p$ and negating $q$ does not entail any excludable alternatives of $p$)

Definition (1), however, is inadequate. For example, the scalar sentence (2) is the strongest among the alternatives
(181) **Innocently excludable alternatives** (Fox 2007)

\[ \text{IEEXCL}(p) = \bigcap \{A : A \text{ is a maximal subset of ALT}(p) \text{ s.t. } A^\sim \cup \{p\} \text{ is consistent} \}, \]

where \( A^\sim = \{\neg q : q \in A \} \)

the intersection of the maximal sets of alternatives of \( p \) s.t. the exclusion of each such set is consistent with \( p \).

See (182) for a concrete example. The first exhaustification negates the scalar alternative and the focus alternatives; the D-alternatives are not negated in this round, because they are innocently excludable: \( \Diamond (p \lor q) \land \neg \Diamond p \land \neg \Diamond q = \bot \). The second exhaustification negates the pre-exhaustified domain alternatives.

(182) **Recursive exhaustifications** (Fox 2007)

\[ O_R \Diamond [p \lor q] \]

a. The first exhaustification:

\[ O \Diamond [p \lor q] = \Diamond [p \lor q] \land \neg \Diamond [p \land q] \land \neg \Diamond r \]

b. The second exhaustification:

\[ O' O \Diamond [p \lor q] \]

= \( O \Diamond [p \lor q] \land \neg O \Diamond (p) \land \neg O \Diamond (q) \)

= \( O \Diamond [p \lor q] \land [\Diamond p \rightarrow \Diamond q] \land [\Diamond q \rightarrow \Diamond p] \)

= \( [\Diamond [p \lor q] \land \neg \Diamond [p \land q] \land \neg \Diamond r] \land [\Diamond p \leftrightarrow \Diamond q] \)

= \( \Diamond p \land \Diamond q \land \neg \Diamond [p \land q] \land \neg \Diamond r \)

For an easier comparison with \( O_{\text{DOU}} \), I simplify the definition of \( O_R \) as (183a): \( O_R \) affirms the prejacent, negates the exhaustification of each sub-alternative, and negates the innocently excludable alternatives.\(^{38}\) It can be easily seen that \( O_{\text{DOU}} \) is semantically weaker than \( O_R \): both and thus has no excludable alternative, and thus vacuously satisfies the condition underlined in (1); therefore, definition (1) predicts that every alternative of (2) is I-excludable, which is clearly problematic.

(2) **EVERY** student came.

\(^{38}\)In particular cases, the definition for \( O_R \) in (183a) yields inferences different from what Fox’s proposal would expect: if the exhaustification of a sub-alternative is still not innocently excludable, the exhaustification of this sub-alternative would not be negated by \( O_R \) under Fox’s original definition. For instance, in (1), if we use definition (183a), affirming the prejacent and negating the exhaustification of each sub-alternative yield a contradiction. In contrast, if we follow Fox’s definition strictly, the D-alternatives \( O \phi_3 \) and \( \phi_4 \) are not innocently excludable even if pre-exhaustified; hence applying \( O_R \) does not exhaustify the D-alternatives and does not yield a contradiction.

(1) John read (only) some or all of the books.

a. Prejacent: \( O \phi_3 \lor \phi_4 \)

b. \( \text{Sub}(O \phi_3 \lor \phi_4) = \{O \phi_3, \phi_4\} \)

c. By definition (183), applying \( O_R \) yields a contradiction:

\[ [O \phi_3 \lor \phi_4] \land \neg O \phi_3 \land \neg O \phi_4 = [O \phi_3 \lor \phi_4] \land \neg [\phi_3 \land \neg \phi_4] \land \neg \phi_4 = [O \phi_3 \lor \phi_4] \land \neg \phi_3 = \bot \]

d. By Fox’s original definition, \( O_R \) would be applied vacuously:

\[ O_R [O \phi_3 \lor \phi_4] = O \phi_3 \lor \phi_4 \]

The same contrast arises in sentence (2), where a disjunctive coordinates two exhaustified propositions. Here the disjuncts \( O \phi_a \) and \( O \phi_b \) are not innocently excludable even if pre-exhaustified.
$O_{\text{disj}}$ and $O_R$ affirm the prejacent and negate the exhaustification of the sub-alternatives, but $O_{\text{disj}}$ does not negate the innocently excludable alternatives.

(183) \[a. \quad O_R(p) = p \land \forall q \in \text{Sub}(p)[\neg O(q)] \land \forall q' \in \text{IExcl}(p)[\neg q'] \\
b. \quad O_{\text{disj}}(p) = p \land \forall q \in \text{Sub}(p)[\neg O(q)]\]

Chierchia (2006, 2013) proposes an $O_{D-\text{exh}}$-operator for D-alternatives to derive free choice inferences. I summarize this idea as follows. First, the lexicon of a disjunction carries a grammatical feature [+D], which activates a set of D-alternatives and must be checked off by a c-commanding $O_D$ or $O_{D-\text{exh}}$-operator. Second, in semantics, employing $O_D$ negates the D-alternatives, while employing $O_{D-\text{exh}}$ negates the exhaustification of each D-alternative.

(184) **Exhaustifiers for D-alternatives** (Chierchia 2006, 2013)

a. \[O_D(p) = p \land \forall q \in D-\text{Alt}(p)[\neg q]\]
b. \[O_{D-\text{exh}}(p) = p \land \forall q \in D-\text{Alt}(p)[\neg O(q)]\]

The choice between $O_D$ and $O_{D-\text{exh}}$ is arbitrary unless employing one of them leads to a contradiction. Compare the following two sentences for a demonstration. In checking off the [+D] feature of the disjunctive or, the $\Diamond$-sentence (185) must use $O_{D-\text{exh}}$ while the $\Box$-sentence (186) must use $O_D$, giving rise to a contradiction otherwise.\(^{39}\)

(185) You can read some or all of the books.

a. \[\Diamond[O\varphi_3 \lor [+D] \phi_f]\] \hspace{1cm} prejacent
b. \[\Diamond[O\varphi_3 \lor \phi_f] \land \neg \Diamond O\varphi_3 \land \neg \Diamond \phi_f = \bot\] \hspace{1cm} #applying $O_D$
c. \[\Diamond[O\varphi_3 \lor \phi_f] \land \neg O\varphi_3 \land \neg O \phi_f = \Diamond O\varphi_3 \land \Diamond \phi_f\] \hspace{1cm} $\Box$applying $O_{D-\text{exh}}$

(You can read some of the books, and you can read all of the books.)

(186) You must read some or all of the books.

a. \[\Box[O\varphi_3 \lor [+D] \phi_f]\] \hspace{1cm} prejacent
b. \[\Box[O\varphi_3 \lor \phi_f] \land \neg \Box O\varphi_3 \land \neg \Box \phi_f = \Box \varphi_3 \land \Diamond O\varphi_3 \land \Diamond \phi_f\] \hspace{1cm} $\Box$applying $O_D$

(You must read some or all of the books, you can read some of them, and you can read all of them.)

---

\(^{39}\)The disjunct $\varphi_3$ is locally exhaustified due to the well-known Hurford’s Constraint (Hurford 1974): a sentence that contains a disjunctive phrase of the form ‘S or T’ is infelicitous if S entails T or T entails S.

(1) \[O\varphi_3 = \varphi_3 \land \neg \phi_f\] (You read some but not all of the books.)

I use (185) and (186) to demonstrate Chierchia’s (2006, 2013) system so as to avoid the complexities from scalar implicatures of disjunctions. The scalar implicature of $O\varphi_3 \lor \phi_f$, namely, $\neg[O\varphi_3 \lor \phi_f]$, is a tautology.
A major difference is that O_D-EH targets D-alternatives while O_DOU targets sub-alternatives. D-alternatives are defined grammatically; they grow point-wise from disjuncts or sub-domains. Sub-alternatives are defined purely semantically; they are not innocently excludable and are distinct from the prejacent. Therefore, if a D-alternative is innocently excludable, it will be used by O_D-EH but not by O_DOU; if a sub-alternative is not grammatically derived from a disjunct or a sub-domain, it will be used by O_DOU but not by O_D-EH.

For a simple illustration of this difference, let us revisit the two modalized sentences above. In (185), the D-alternatives are not innocently excludable and hence O_DOU yields the same effect as O_D-EH does. In (186), on the other hand, the D-alternatives are innocently excludable and are not sub-alternatives: [□[Oφ3 ∨ φ4] ∧ ¬O□Oφ3 ∧ ¬O□φ4] → □φ4. Then, as schematized in (187a), applying O_DOU is vacuous; when needed, we can further apply a regular O-operator to use up the D-alternatives as in (187b), which yields the desired existential free choice inference. Note that the presence of dou in (187b) is optional.

(187) You must read some or all of the books.
  a. O_DOU[Oφ3 ∨ φ4] = □[Oφ3 ∨ φ4]
  b. O_DOU[Oφ3 ∨ φ4] = □[Oφ3 ∨ φ4] ∧ ¬□Oφ3 ∧ ¬□φ4 = □φ3 ∧ □Oφ3 ∧ □φ4

In comparison, Fox’s (2007) O_R-operator negates innocently excludable alternatives and pre-exhaustified sub-alternative, and hence the interpretations of (185) and (186) cannot be handled with a single O_R.

(188) a. You can read some or all of the books.
    O_R[Oφ3 ∨ φ4] = □[Oφ3 ∨ φ4] ∧ ¬□Oφ3 ∧ ¬□φ4 = □Oφ3 ∧ □φ4
  b. You must read some or all of the books.
    O_R[Oφ3 ∨ φ4] = □[Oφ3 ∨ φ4] ∧ ¬□Oφ3 ∧ ¬□φ4 = □φ3 ∧ □Oφ3 ∧ □φ4

Table 2.2 summarizes the three approaches of free choice in modalized sentences.

<table>
<thead>
<tr>
<th>You can read some or all of the books.</th>
<th>Proposed</th>
<th>Chierchia</th>
<th>Fox</th>
</tr>
</thead>
<tbody>
<tr>
<td>You must read some or all of the books.</td>
<td>O_DOU</td>
<td>O_D-EH</td>
<td>O_R</td>
</tr>
</tbody>
</table>

Table 2.2: Comparison of exhaustifiers

In section 2.6.3, I have shown that in ◇-questions applying an O_DOU-operator above the existential modal derives disjunctive mention-all answers. This approach coincides with the fact that the presence of the Mandarin particle dou above the existential modal blocks mention-some. What will happen if we instead use O_R or O_D-EH?

These two exhaustifiers are of course not covert counterparts of the Mandarin particle dou. The O_R-operator invokes an exclusive inference, which is not observed with dou. For example, ‘John and Mary dou came’ does not suggest that only John and Mary came. The O_D-EH-operator
always operates on D-alternatives; therefore, it cannot capture the other functions of *dou*, such as the distributor use and the scalar marker use. See Chapter 7 for discussions of these uses.

Put aside the facts of *dou* for a moment. Can we use these two exhaustifiers to derive disjunctive mention-all answers? Consider the question in (189), where a \( \Diamond \)-construction is embedded under a universal quantifier.\(^{40}\) Intuitively, the disjunctive answer given by Speaker B is a true mention-all answer, expressing that *everyone can get gas from A and can get gas from B*.

(189) \( \langle w: \text{As for the considered gas stations ABC, A and B are accessible to everyone, but C is only accessible to John; each station has very limited stock and cannot serve all the people.} \rangle \)

Speaker A: ‘Where can everyone get gas?’

Speaker B: ‘Station A or station B.’

The proposed analysis predicts the following LF for the question nucleus: an \( O_{dou} \)-operator is inserted right above the existential modal and is associated with the higher-order \( wh \)-trace \( \pi \).

(190) Where can everyone get gas?

\[
\begin{align*}
\vdots \\
\text{IP} \\
\text{everyone} \\
\lambda x \\
O_{dou} \\
\text{VP} \\
\text{can[\pi(\lambda y. O[x get gas from y])]} \\
\end{align*}
\]

The disjunctive answer ‘Station A or station B’ is interpreted as in (191):

(191) \( \forall x \in \text{man}_{O_{dou} \Diamond [Of(x,a) \lor Of(x,b)]} \)

\( = \forall x \in \text{man}_{[\Diamond Of(x,a) \land \Diamond Of(x,b)]} \)

(Everyone is such that he can get gas from A and he can get gas from B.)

Employing Chierchia’s (2006, 2013) \( O_{D-exh} \)-operator also yields the desired semantics for (189), but this idea suffers some conceptual problems. On the positive side, employing \( O_{D-exh} \) yields the desired free choice inference regardless of whether it is applied below or above the universal quantifier. This is so because the \( O_{D-exh} \)-operator always negates the pre-exhaustified D-alternatives, regardless of whether the domain alternatives are innocently excludable.

(192) a. \( \forall x \in \text{man}_{O_{D-exh} \Diamond [Of(x,a) \lor Of(x,b)]} \)

\( = \forall x \in \text{man}_{[\Diamond Of(x,a) \land \Diamond Of(x,b)]} \)

\(^{40}\)With the condition that none of the stations can serve all the people, the existential modal must take scope below the universal quantifier, otherwise the question has no true answer in the given discourse.
Accordingly, to license the presence of mention-some readings, Fox has the option of applying the scope ambiguity of the higher-order wh-trace. As a desired prediction, any individual answer that specifies one full possible choice can be used as a mention-some answer.

I have also developed two approaches to capture the mention-some/mention-all ambiguity, both of which attribute this ambiguity to a structural ambiguity within the question nucleus. One approach is based on the scope ambiguity of the higher-order wh-trace: interpreting the...
higher-order *wh*-trace above the existential modal yields a conjunctive mention-all answers. The other approach is based on the optional presence of the covert $O_{\text{dou}}$-operator: applying a covert $O_{\text{dou}}$-operator above the existential modal generates disjunctive mention-all. The second approach is inspired by observations with the Mandarin particle *dou*: *dou* functions as an exhaustivity-marker in $\Diamond$-questions and evokes universal free choice inferences in disjunctive declaratives.