TOPIC-FOCUS STRUCTURE AND
QUANTIFICATION OF *DOU* 'ALL'[*]

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ABSTRACT

This paper examines a type of *dou* quantification found in *wh*-questions such as *ta dou mai le shenme?* 'What are all the things that he bought?' This type is different from the well-known *dou* quantification in that the leftness condition cannot be applied to the former. I propose that the former type of quantification is subject to the topic-focus structure rather than to the syntactic structure, which means that the domain of the quantification is determined in relation to 'old' and 'new' information of a sentence. Sentences including *dou* can be divided into topic and focus, and each part is mapped onto the restrictor and the nuclear scope in a tripartite structure of *dou* quantification. This analysis accounts for the reason why a list answer is appropriate to questions with *dou*, why *wh*-words in the questions cannot be quantity expressions, and why *wh*-words should either have a plural interpretation or take the plural form. This analysis also explains the distribution of *dou*, i.e., *dou* should c-command a focused phrase. Finally, I point out that the analysis can extend to declaratives which are rare but still observable, and that the two types of *dou* quantification can arise simultaneously.

Key words: topic-focus structure, *dou*, quantification, *wh*-question

1. INTRODUCTION

Previous studies have observed that the quantification of *dou* 'all' is subject to the leftness condition, i.e., *dou* quantifies over a plural element to its left. For example, the topicalized object *na xie shu* 'those books' in (1a) precedes *dou* and is plural, so *dou* quantification is legitimate. In (1b), however, the object occurs *in situ*. Although it is plural, *dou* quantification does not hold, resulting in ungrammaticality.

(1) a. na   xie   shu,   ta   dou   mai   le.[1]
       that CL   book   he   all   buy   ASP
       'He bought all those books.'
    b. *ta   dou   mai   le   na   xie   shu.
        he   all   buy   ASP   that CL   book

The above observation, however, does not cover all phenomena. Some studies refer to sentences such as (2), in which no plural element precedes *dou* (Lu *et al* 1980, Ma 1983, Li, J. 1995, Li, X. 1996, among others). For convenience, we will call *dou* in sentences like (1) *dou*1, and *dou* in sentences like (2) *dou*2.[2]

(2) ta   dou   mai   le   shenme?
    he   all   buy   ASP what
    'What are all the things that he bought?'

Questions arise: What does *dou*2 quantify over in this kind of examples? Is there another function of *dou* which is not related to the *dou*1 quantification seen in (1a)? As for the latter question, Li, J. (1995) argues that *dou*2 does not serve as an emphatic particle but still preserves a quantificational force. The former question is disputable. Lin (1998) and Zhang (1997) argue that *dou*2 is taken to quantify (or distribute) over a *wh*-word (or *wh*-operator); Li, X. (1996) suggests that *dou*2 quantifies over an event argument which implicitly precedes *dou*; and there are still others who suggest different solutions (cf. Section 2.2).

In this paper, I propose that *dou*2 quantification is free in directionality since *dou*2 quantification is subject to the topic-focus structure rather than syntactic structure. My analysis is based on Partee (1991, 1995) and Hajičová *et al.* (1998) in which various kinds of

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[1] The abbreviations used in this work are:

CL: classifier; ASP: aspect; DE: genitive marker, relative marker or nominal marker.

[2] These terms are used in cases where the distinction between them is needed.

quantificational interpretations are related to the topic-focus structure as well as the syntactic structure and this relation can be uniformly represented with the tripartite structure – operator, restrictor, and nuclear scope. That is to say, the topic part or old information is mapped onto the restrictor and the focus part or new information is onto the nuclear scope. In the *dou*2 quantification, *wh*-words (or bare NPs in declaratives), as the focus part, go into the nuclear scope while the rest of sentences in which a variable is substituted for a focused phrase, as the topic part, go into the restrictor. For example, the *wh*-question in (2) can be divided into *shenme* 'what' and an open proposition *ta mai le x* 'he bought x', consisting of the focus and the topic, and these two parts are mapped onto the tripartite structure of the quantification.

This paper is organized as follows. In Section 2, I describe the distribution of *dou*2 and its properties, and review several previous studies. In Section 3, Partee (1991, 1995) and Hajičová *et al.*'s theory (1998) are introduced and my own proposal on *dou*2 quantification follows. In Section 4, the analysis is extended to the cases of declarative sentences which are also regarded as containing *dou*2 and another type of sentences which exhibits *dou*1 and *dou*2 quantification simultaneously. Section 5 sums up the discussion.

2. OBSERVATIONS AND LITERATURE REVIEW

2.1 The Distribution and Properties of *Dou*2

In (3) and (4), we have two more examples in which we can not straightforwardly identify what *dou* quantifies over to its left. In addition to occupying the object position as in (2), *wh*-words can occupy the subject position as in (3) and the adjunct position as in (4). Most importantly, the relative order between *dou* and a *wh*-word is preserved in all cases.

(3) zhe ci   huiyi   dou shi shei lai (de)?
    this CL conference all   be who come DE
    'Who are all the persons that took part in this conference?'
(4) ni   dou gen shei   da   guo jia?
    you all with who strike ASP fight
    'Who are all the people with whom you have fought?'

Notice that we have to make a distinction among cases that we have seen in (2)-(4) and those that involve phonetically empty plural elements. Let us see the following dialogue which shows the latter case:

(5) A: na   ji   ci   huiyi,   wo   mei   jiandao   Zhangsan.
      that several CL   conference I   not   see   Zhangsan
      'I didn't see Zhangsan in those conferences.'
   B: keshi ta   shuo   ta   dou   lai   le.
      but   he   say   he   all   come ASP
      'But he said that he attended all those conferences.'

In (5B), there is no phonetically overt element that *dou* can quantify over, but the sentence does not violate the leftness condition. This is so because, if we assume with Huang (1984), there is a phonetically empty topic referring back to *na ji ci huiyi* 'those conferences' which *dou* quantifies over. The type of sentences that this present work focuses on is like the sentence in (3), where *zhe ci huiyi* 'this conference' is understood as a unitary occasion and is thus not a legitimate expression for *dou*1 quantification.

The frequency adverb *dou* should be also distinguished from *dou*2. One may think that *dou* in (6) is the frequency adverb *dou* rather than *dou*2, since (6) may roughly mean 'Which people are always there in your home?'

(6) ni   jia   li   dou   you   shenme   ren?
    you home in   all   have   what   people
    'Who is your family member?'
    (lit. 'Which people are there in your home?')

The sentence (7) below illustrates the frequency adverb usage of *dou*. *Dou* can be taken to express the frequency of an event, with a co-occurrence with another frequency adverb as in (7b) or without it as in (7a). If *dou* occurs with *yixiang* 'always' in (6), then *dou* is only considered to be connected to the frequency adverb and thus it can not be construed as *dou*2, as (8) shows. Thus one may infer from this fact that *dou* in (6) can just be taken to express the frequency of the event.

(7) a. ta dou zai nabian paobu.
     he all at there jog
     'He always jogs there.'
   b. ta yixiang dou zai nabian paobu.
     he always all at there jog
     'He always jogs there'
(8) ni jia li yixiang dou you shenme ren?
    you home in always all have what person
    (lit. Which persons are always there in your home?)

There is, however, a piece of evidence that *dou* in (6) shows the same distribution as *dou*2. As we will see below, *dou*2 cannot co-occur with *wh*-words such as *ji/duoshao* 'how many or how much'. The example (9a) below has the interpretation related to frequency of the event, with no conflict between *dou* and *ji ge ren* 'how many persons', while (9b) shows a conflict between the two. This contrast illustrates that *dou* in (6) is *dou*2.

(9) a. ni jia li yixiang dou you ji ge ren?
     you home in always all have several CL person
     (lit. How many persons are there in your home, always?)
   b. *ni jia li dou you ji ge ren?
     you home in all have several CL person

The above examples all involve *wh*-interrogatives, which previous studies have focused on with respect to *dou*2. The examples below, however, demonstrate that *dou*2 quantification can also be found in declaratives.[3] These sentences could be a possible answer to (2) and (3),

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[3] Ma (1983) provides various kinds of declarative examples as well as *wh*-questions. Below are some examples:
  (i) ni dou kan xie meiyong de dongxi!
     You all see CL useless DE thing
     'All the things that you saw were useless one!'
  (ii) ta mei chi bie de, dou chi de mantou.
     he not eat other DE all eat DE steamed bun
     'He didn't eat other things, but all the things that he ate were steamed buns.'
 In addition to the examples of *dou*, Ma also discusses examples including *quan* 'all', as in (iii). Although *quan* also can function as a universal quantifier sometimes and the

respectively, and show more restrictions in usage than *wh*-questions. For instance, the sentence (10) is barely addressed other than answered to the question (2), and judged unacceptable or odd by some informants, although it is still acceptable for many others.[4] For this reason, perhaps, previous studies did not take them into consideration. Nevertheless, the proposal made in this paper can cover declarative examples, which I will discuss in Section 4.

(10) ta   dou   mai   le   shuiguo.
     he   all   buy   ASP   fruit
     'All the things that he bought are fruit.'

(11) Zhe ci   huiyi   dou   shi   jiaoshoumen   canjia (de).
     this CL conference   all   be   professors   attend DE
     'All the people that attended this conference were professors.'

Now let us move on to the properties of *dou*2 and *wh*-questions which contain it. First of all, *wh*-questions involving *dou*2 have an implication relevant to universal reading. For instance, the question in (2) implies that all the things bought by the person should be identified in the answer. Thus, an appropriate answer to (2) is (12a) in which all the things bought by the person are enumerated, while (12b) can not be a proper answer to (2) because there is only one item in the answer.

(12) a. ta   mai   le   pingguo, xiangjiao, he   xigua
         he   buy   ASP   apple   banana   and watermelon
         'He bought apples, bananas, and watermelons.'
     b. #ta   mai   le   pingguo.
         he   buy   ASP   apple
         'He bought apples.'

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sentence presents the same kind of quantification as that with which we are concerned here, we will not discuss the case of *quan* in this paper.

  (iii) ta   quan   shuo   xie   fei   hua.
       he   all   say   CL   useless   talk
       'All the things that he said are absurd remarks.'

[4] Some informants judge (10) to be odd. If the NP *pingguo* 'apple' is modified with an appropriate phrase as in (i), then (10) is perfectly accepted.

  (i) ta dou   mai   le hen   xinxian de   pingguo / jinkou   de   pingguo.
    he all   buy   ASP very   fresh   DE   apple   import   DE   apple
    'He bought fresh apples / imported apples.

Secondly, *wh*-words like *ji* and *duoshao* 'how many/much' are not allowed in questions involving *dou*2, as seen in (13) and (14). In this respect, *dou*2 is different from *dou*1 which has no conflict with the two quantity *wh*-words as in (15).

(13) *ni dou mai le   ji-ge   pingguo / duoshao pingguo?
      you all buy ASP how many-CL apple   how many   apple
(14) *zhe ci huiyi   dou shi   ji-ge   ren /
      this CL conference all   be   how many-CL   people
      duoshao   ren   lai (de)?
      how many   people   come DE
(15) mei ge ren   dou mai le   ji-ge   pingguo /
      every people all   buy ASP   how many-CL apple
      duoshao   pingguo?
      how many   apple
      'How many apples did everyone buy?'

Finally, *wh*-words should either take a plural form or have a plural interpretation if they have no plural form, as Li, J. (1995) observes. The example (16) is legitimate only if a classifier in the *wh*-phrase expresses plurality. In the above examples, *shenme* 'what' in (2) and *shei* 'who' in (3) and (4) do not take plural forms, but should be interpreted as denoting a plural. By contrast, there is no such condition on plurality with *dou*1, as in (17).

(16) ni dou qu guo *na-ge   difang / na-xie   difang?
      you all   go ASP which-CL(sg) place   which-CL(pl) place
      '*Which place / which places are all the places you have been to?'
(17) meige ren   dou qu guo na   ge   difang /
      every person all   go ASP which   CL(sg) place
      na   xie   difang?
      which CL(pl) place
      'Which place / which places has/have everyone been to?'

These properties not only give us a key to explain quantification of *dou*2 but also raise problems. We will answer the following questions. First, why do *wh*-questions containing *dou*2 have an implication to require the plurality of the constituent that is asked? Second, why are

particular *wh*-words such as *ji* and *duoshao* 'how much, how many' unable to co-occur with *dou*2? Lastly, why should *wh*-words take plural forms or have a plural interpretation? If our analysis is correct, then these questions will be naturally answered.

2.2 Previous Studies

There have been some studies trying to solve the aforementioned problems. These studies can be divided into three groups: one taking *dou* to quantify over a *wh*-word or *wh*-operator (Li, J. 1995, Zhang 1997 and Lin, J.-W. 1998); another taking *dou* to quantify over event argument (Li, X. 1997); the other taking *dou* to be a sum operator (Huang, S.Z. 1996). In this section, we will review these approaches.

Li, J. (1995) argues that since *dou*2 and *dou*1 occur pre-verbally and share the quantificational properties including plurality, distributivity, and exhaustiveness,[5] *dou*2 is a universal quantifier rather than an emphatic particle or something other. In addition, he suggests that since *wh*-words can be universally quantifiable in the light of Reis' (1992) work on *alles* 'all' in German, *dou*2 quantifies over a *wh*-word.

Zhang (1997) argues, adopting a non-*wh*-movement analysis, that when a sentence like (18a) below exhibits a distributive quantificational interpretation, *dou* is bound (and c-commanded) by an interrogative operator, as in (18b). Lin J.-W.(1998) also argues for a similar view but adopts a *wh*-movement analysis, contrary to Zhang (1997). According to Lin's argument, the *wh*-word moves to Spec of CP in LF, and a structure like (18c) is yielded. In these two analyses, the problem of directionality does not arise, since the *wh*-word still precedes *dou*.

(18) a. dou   shei   kan   le   zhe   ben   shu?
          all   who   read   ASP   this   CL   book
          'Who are all the people who have read this book?'
     b. OP$_{[Q]i}$ [dou shei$_i$ kan le zhe ben shu]
     c. shei$_i$ [dou t$_i$ kan le zhe ben shu]

The three arguments above have a common view that *dou* quantifies over a *wh*-word or an operator associated with a *wh*-word. Considering

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[5] In his terms, *dou*2 and *dou*1 are I-*dou* (Interrogative) and Q-*dou* (Quantificational), respectively.
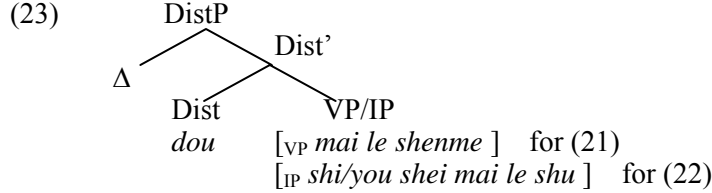
examples from other languages like German and West Ulster English as in (19) and (20), we might conclude that the above arguments are plausible, since *alles* and *all* undergo movement with *wh*-words *wen* and *what* in (19a) and (20a) and thus German *alles* and English *all* seem to quantify over a *wh*-word.

(19) a. Wen   alles   hat   Hans besucht?
        Whom all   have   Hans visit
        'Who are all the people that Hans visited?'
      b. Wen (alles) hat er (alles) gestern   (alles) besucht?
         Whom all   have he   all   yesterday   all   visit
         'Who are all the people that he visited yesterday?'

                                                        (Reis 1992: 465)
(20) a. What all did you get for Christmas?

                                                (McCloskey 2000: 58)
      b. What (all) did he say (all) that he wanted (all)?

                                                (McCloskey 2000: 61)

As Cheng (1995) argues, however, *dou* is not a floating quantifier like *alle* and *all* which can be stranded at the original position or floating positions as in (19b) and (20b). Moreover, *alle* and *all* can undergo long distance movement as in (20b) (*all* in the leftmost position), but *dou* cannot. Hence, having a rigid distribution, *dou* is different from *alles* and *all*.

Now let us consider the view, proposed by Li, X. (1996, 1997), that *dou* quantifies over the event argument. Li assumes that *dou* occupies the head position of DistP, which is a functional projection giving rise to a distributive reading. The Spec of DistP is occupied by the element that *dou* distributes over, which can be the event argument in the sense of Higginbotham (1985) and Parsons (1991). Thus (21) and (22) can be analyzed in the way represented in (23).

(21) ta   dou   mai   le   shenme?
     he   all   buy   ASP   what
     'What are all the things that he bought?'
(22) dou (shi/you) shei   mai   le   shu?
     all   be/have   who   buy   ASP book
     'Who are all the people that bought books?'

(23)

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            DistP
                     Dist'
      Δ
         Dist        VP/IP
         dou      [VP mai le shenme ]    for (21)
                  [IP shi/you shei mai le shu ]    for (22)
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In Li's discussion, the problem of the leftness does not arise, since *dou* distributes over the event argument to its left. However, the interpretations of the sentences are questionable. Li suggests that the sentence (21) conveys only one event, and that it is interpreted via artificially "slicing" the single event into sub-events; the slicing furthermore is restricted to *wh*-questions.[6] The sub-events, which are plural, can be distributed over by *dou*.

Li's 'slicing of event' explanation is *ad hoc*. If the buying event happens for more than one time (see Footnote 6 though) and each event is sliced into sub-events, then *dou* distributes over all the sub-events of the events. I doubt whether such an interpretation is plausible or not. In addition, the restriction of 'slicing of event' to *wh*-questions serves only to make the operation itself more unusual.

Lastly, let us see Huang S.-Z.'s (1996) analysis. In Huang's view, *dou* is not a quantifier but a sum operator that takes an event variable as its argument[7], and the set of individuals denoted by '*dou* PRED' has a

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[6] Li mentions that the sentence (21) also has a meaning that the buying event happens for more than one time. In this reading, *dou* quantifies over a set of events. The semantic interpretation of the reading is as follows:

 (i) For all x, x a buying event, for which y, y a thing, he bought y in x.

  Li supposes a circumstance in which an addresser knows that *ta* 'he' went to Lucky, then to Target and lastly to Alphabeta, and then the addresser can ask a question like (21) with the intention to know what are the things that *ta* 'he' bought in all the three visits. I think that 'all the three visits' denotes three different events or situations. In Section 2.1, we have already observed that *dou* can quantify over implicit elements, including situations. Thus, if the addressor and the addressee both know the fact that *ta* 'he' went to three shops, we can legitimately assume that *dou* quantifies over these situations implicitly.

[7] The logical representation of 'dou PRED' and definition of 'DOU(e, PRED)' are as below: 'dou PRED' is associated with a plural event argument which is a sum of minimum events; this entails that the set of individuals denoted by 'dou PRED' has more than one member.

 (i) $\{x \mid \text{DOU PRED}(x)\} = \{x \mid \text{AT(PRED}(x,e)) \wedge \text{DOU}(e, \text{PRED})\}$

partial order '≤' with the set of individuals denoted by XP in the left of '*dou* PRED'.[8] Since the order is important to the interpretation of *dou*, the directional problem still remains to be solved in Huang's analysis.

Under the assumption that a question operator binds a *wh*-phrase variable following Cheng (1991), Aoun and Li (1993), and Tsai (1994), Huang firstly denies the possibility that the question operator may be an element occurring to the left of '*dou* PRED', since the operator is not a set denoting element, and then argues that there is a potential set that has an 'equal to' relation with a set denoted by '*dou* PRED' and the potential set is identified when the denotation of '*dou* PRED' is determined. Below is an interpretation of the question (21):

(24) Tell Me! x, {x} = {y | AT (He-BOUGHT y, e) ∧ THING (y)
      ∧ DOU (e, He-BOUGHT y)}

<div align="right">(Huang 1996: 120)</div>

The question operator is translated as Tell Me!.[9] The potential set goes into the left side in the partial order '=', while the set denoted by '*dou* PRED' goes into the right side. As a result, the interpretation (24) states that an identified set in an answer is equal to the set denoted by 'dou PRED', i.e., the set of things that he bought.

Although *dou* is not a quantificational operator interpreted universally in Huang's analysis, it is insightful to indicate that the interpretation of *dou* has to do with the two sets among which one is the set to be identified and the other is the set denoted by open proposition. However, Huang does not characterize the relation between the two sets, which is, in my view, the relation between topic and focus. In addition, as Huang recognizes herself, the above analysis cannot account for the case with *wh*-words in the subject position (cf. Huang 1997: 121-2).

(ii) DOU(e, PRED) = ∪ {ePRED1, ePRED2, … ePREDn}, and DOU(e, PRED) is true iff e is an event of minimum size consistent with the semantics of PRED.

<div align="right">(Huang 1996: 72)</div>

[8] In Huang (pp.75-76, ibid), a partial order represented as ≤ can be taken to show the subset/superset relation between the NP denotation and the predicate VP denotation. The element to the left of the symbol is said to have a less than or equal to relation with the element to the right. Thus, a ≤ b iff a ∧ b = a.
[9] Following Wachowicz (1978) (among others), Huang translates the question operator as Tell Me!.

To sum up, we have reviewed the previous analyses and found that they share the same view that the leftness is an absolute condition in *dou* quantification. This rigid view forces them to think that a syntactic element should be realized to the left of *dou*. Under this view, however, the nature of *dou*2 quantification cannot be fully grasped and the differences between *dou*1 and *dou*2 quantification cannot be accounted for. In order to understand *dou*2 quantification, we need to loosen this rigid view and look for another way. Such a move does not mean that the leftness condition is unnecessary. The leftness condition can still be maintained only if there is an element preceding *dou* and taken to be quantified over.

3. QUANTIFICATION OF *DOU*

In this section, we will see that the topic-focus structure plays an important role in *dou*2 quantification. This fact helps us to understand the meaning of such *wh*-questions and gives us the answer to the question as to what *dou*2 quantifies over. Section 3.1 introduces Partee's theory, Section 3.2 proposes our thesis, and Section 3.3 discusses more about the nuclear scope in *dou*2 quantification.

3.1 Quantification and Topic-Focus Structure

Partee (1991, 1995) and Hajičová *et al.* (1998) propose that various kinds of quantificational interpretations have to do with topic-focus structure, in addition to syntactic structure. Topic-focus structure is the articulation of the sentence into its topic and focus in which "'topic' is a linguistic counterpart of the presystemic notion of 'known' or 'given' information and 'focus' is that part of the sentence structure that conveys 'new information' in the prototypical case" (Hajičová *et al.* 1998:3).[10] Furthermore, Partee suggests that all kinds of quantificational interpretations can be represented uniformly with a tripartite structure -

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[10] In Partee's terminology, the topic-focus structure is also called focus structure, and the dichotomy includes topic - comment, focus - background, focus - focus-frame, etc. The discussion between Partee and Praguean scholars about the terminology is introduced in Ch.5, Hajičová *et al.* (1998). There is large literature on the dichotomy and its notions. Kruijff-Korbayov´a and Steedman (2003) review its variations and historical development.

operator, restrictor and nuclear scope - which originated from Lewis's (1975) analysis on adverbs of quantification and was later developed in Kamp (1981) and Heim's (1982) analysis on indefinite NPs. In Partee's theory, topic, focus-frame, presupposition, *If*-clause, etc., go into the restrictor while comment, focus, assertion, main clause, etc., go into the nuclear scope.[11]

The statement below shows Partee's claim clearly:

(25) "The main claim is […] that the syntax (if we don't count focus structure as part of the syntax) sometimes leaves unspecified or underspecified what goes into the restrictor clause of a tripartite structure, and focus structure frequently plays an important role in determining how the parts of the meaning of a sentence are divided up in tripartite structures, information that can be essential to assigning truth-conditions to a sentence." (Partee 1991: 162)

This statement gives us inspiration for examining quantification of *dou*2. That is, while quantification of *dou*1 is subject to the syntactic structure, that of *dou*2 is related to the topic-focus structure.

Before moving on to *dou*2 quantification, we need to take a look at an example of the focus-sensitive constructions so that we can see how the constructions are represented with the tripartite structure. In many works, constructions such as adverbs of quantification, modals, focalizers, *why*-questions, etc are analyzed as focus-sensitive and also quantificational in some sense. For instance, Rooth (1985) notes that adverbs of quantification (or Q-adverbs) such as *always* associate with focus, and that the association with focus can affect the truth-condition.[12] The two sentences below have different truth-conditions according to which focused phrase *always* associates with.
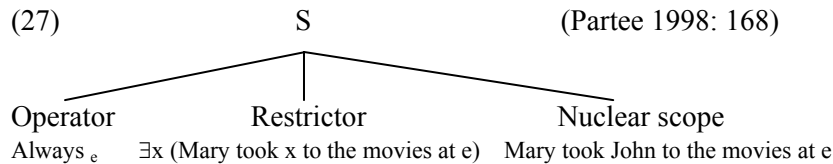
(26) a. Mary always took [John]$_F$ to the movies.
       b. Mary always took John to [the movies]$_F$.

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[11] As for the detailed list and explanation, readers can refer to Partee (1991, 1995) and Hajičová *et al.* (1998).

[12] The term 'association with focus' comes from Jackendoff (1972) according to which some adverbs, so called focalizers such as *even, only,* and *just* associate their reading with a focused phrase. In Rooth (1985), it extends to the adverbs of quantification such as *always*, *usually,* etc.

Assume that when Mary takes someone to the movies, she always takes John among any others. In this case, (26a) is true but (b) is false. If Mary always takes John to the movies when she takes him to some places, then (26b) is true but (a) is false. Both cases can be explained with the notion of 'association with focus.'

According to Partee (1991, 1995) and Hajičová *et al.* (1998), the semantics of (26a), for example, can be represented with the tripartite structure in (27),[13] where the focus-frame, in which the NP marked with focus is replaced with a variable, is mapped onto the restrictor while the focus part, actually a sentence including focus and an event variable, goes into the nuclear scope.

(27)   S   (Partee 1998: 168)

Operator	Restrictor	Nuclear scope
Always $_e$	$\exists x$ (Mary took x to the movies at e)	Mary took John to the movies at e

3.2 Proposal: Quantification of *Dou*2

Now, let us consider the case of *dou*2. Our main inquiry question – 'what does *dou*2 quantify over?' can be replaced by the question of 'what is the restrictor in the *dou*2 quantification?' In our approach, we also have to ask 'What goes into the nuclear scope in *dou*2 quantification?' As mentioned in the above section, Partee's statement inspires us to propose that *dou*2 quantification is subject to the topic-focus structure. Below, we clarify the topic-focus structure of *dou*2 *wh*-questions, and also describe the tripartite structure of *dou*2 quantification.

It is well-known that in the answers to *wh*-questions, the focus falls on a constituent correspondent to a *wh*-word, since the constituent is new information. In *wh*-questions, *wh*-words themselves are not new information, but are vehicles introducing new information. For this reason, it is plausible to say that the *wh*-words in *dou*2 questions are focused phrases. Taking the *wh*-question in (2) for example, the *wh*-word *shenme* 'what' is marked with focus, as below:

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[13] Partee indicates that there are several proposals for the semantics of Q-adverbs. Thus, she mentions that the analysis in her work (1991) is rough. Other analysis can be found in von Fintel (1994), Rooth (1985), and Swart (1993), etc.

(2) ta dou mai   le shenme?
    he all   buy ASP what
    'What are all the things that he bought?'
(2)′ ta dou mai   le [shenme]$_F$

The topic part is a sentence minus focus, which is also called the focus-frame or the background, i.e., an open proposition in which a variable is substituted for a focused phrase. The topic part provides the set of alternatives for the focused element. In the case of (2), since the focus is the *wh*-word, the topic will be *ta mai le* x 'he bought x'.

    At this point, we can represent the tripartite structure of the *wh*-question (2) as in (28), where the topic part, *ta mai le* x 'he bought x', goes into the restrictor and the focus part, *shenme* 'what', goes into the nuclear scope. Its truth conditional representation is in (29) (following Hamblin (1973) and Kattunen (1977)).

(28) Dou$_x$ [he bought x] x = what ^{14}
(29) P^ ∧ P = ∀x∃y [buy(he, x) → thing(y) ∧ x = y]

Note that a variable also occurs in the nuclear scope, so the quantification is not vacuous. The variable has an equal relation with the *wh*-word, which means the variable will be identified with its property.

    The proposed tripartite structure can capture the two properties of *dou*2 quantification shown in Section 2.1: one is the list answer and the other is the distribution of *wh*-words. Firstly, let us see the former case. A list answer is appropriate to *dou*2 *wh*-questions, as in (12) (repeated below) which is an answer to the question in (2), while questions without *dou*2 do not implicate such an answer.

(12) a. ta mai le pingguo, xiangjiao, he xigua
        he buy ASP apple   banana   and watermelon
        'He bought apples, bananas, and watermelons.'
    b. #ta mai le pingguo.
      he buy ASP apple
     'He bought an apple.'

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^{14} Since 'what' in the nuclear scope is an operator or a variable bound by an interrogative operator, it has to be outside of the nuclear scope or there is an operator binding it. At the present moment, however, we temporarily ignore this for our purpose.

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The tripartite structure (28) shows that the set, whose elements are things that he bought, restricts the domain of *dou* quantification; thus the set should be composed of more than one element. The structure also tells us that the set is asked to be identified, and hence it will be expected that all entities in the set are identified and listed in the answer.

Let us now look at the second case: the distribution of *wh*-words. Notice that the representation (28) shows that only the *wh*-word is mapped onto the nuclear scope in *dou*2 quantification in contrast to the *dou*1 quantification in which usually an open proposition is mapped onto the nuclear scope. This explains the restriction on the distribution of *wh*-words mentioned in section 2.1, which says, on the one hand, that quantity *wh*-words such as *ji* or *duoshao* 'how many/much' cannot occur in the *dou*2 questions, and on the other hand, that a *wh*-word should either have a plural interpretation or, if possible, take a plural form. An example for each is given again in (30) and (31).

(30) ni dou mai le shenme / *ji-ge   pingguo ?
    you all buy ASP what   how many-CL   apple
    'What /* how many apples are all the things that you bought'
(31) ni dou qu guo *na-ge   difang / na-xie   difang?
    you all go ASP which-CL(sg) place which-CL(pl) place
    '*Which place / which places are all the places you have been to?'

Since the representation in (28) shows that all members of a set in the restrictor will be identified, *wh*-words in the nuclear scope should not be quantity *wh*-words. In addition, since the set is plural, the *wh*-words should also be marked as plural in consideration of agreement.

This kind of distribution can be found in *dou*1 quantification of copular sentences, as in the examples below:

(32) ni mai de dou shi shenme / *ji-ge   pingguo ?
    you buy DE all be   what   how many - CL   apple
    'What /* how many apples are all the things that you bought'
(33) ni   qu guo de dou shi *na-ge   difang /
    you go ASP DE all   be which-CL(sg) place
    na-xie   difang?
    which-CL(pl) place
    '*Which place / Which places are all the places you have been to?'

In these sentences, the *wh*-words are also neither quantity expressions nor singular. This is, on the one hand, because the *wh*-words are taken to identify, but not to count, entities denoted by the subjects which are quantified over by *dou*1, and on the other hand, because the *wh*-words, as complements of copular, should agree with the subject in number.

The same distribution of *wh*-words between (30- 31) and (32-33) can be explained, if we take account of the tripartite structure of them. If we assume that the constituent followed by and quantified over by *dou*1 goes into the restrictor and the rest of the sentence goes into the nuclear scope, then in the above sentences, the subjects, the free relative clauses, go into the restrictor while the *wh*-words, *shenme* 'what' and *na-xie difang* 'which places', go into the nuclear scope. Although (30-31) and (32-33) have a different syntactic structure, their tripartite structure is similar in that *wh*-words are mapped onto the nuclear scope.

In summary, I have suggested a new analysis for *dou*2 quantification in this section. *Dou*2 *wh*-questions can be divided into the topic, an open proposition in which a variable is substituted for a focused phrase, and the focus, a *wh*-word. Each part is mapped onto the restrictor and the nuclear scope respectively in the tripartite structure. Also, we have seen that the analysis can explain two phenomena well: a list answer to the *dou*2 questions and the distribution of *wh*-words.

3.3 More on the Nuclear Scope

The distribution of *wh*-words seen in the above section leads us to reconsider the relation between *dou* and the part which goes into the nuclear scope. In *dou*1 quantification, that part is mostly VP or IP in which a variable is substituted for a quantified element. In *dou*2 quantification, as seen in (28), the part going into the nuclear scope is just a *wh*-word, even when *dou* is followed by a VP. This is also true in another case in which *dou* is followed by the subject:

(34) (zheci   huiyi)   dou (shi/you)   shei   canjia?
      this time conference   dou   be/have   who   attend
      'Who are all the persons that attended this conference?'
(35) Dou$_x$ [x attend this conference]   x = who

In (34), *zheci huiyi* 'this conference', the topicalized NP which is originally in the object position, can be omitted, and *shi* or *you*

optionally occur between *dou* and the subject.[15] (35) shows the tripartite structure of (34) in which *shei* 'who' goes into the nuclear scope and the proposition minus the *wh*-word goes into the restrictor. In this example, although *dou* is followed by the IP, only the *wh*-word is mapped onto the nuclear scope. From this and the observations in the last section, we can pinpoint two properties about the nuclear scope in *dou*2 quantification: one is that the nuclear scope is open to phrases either associated with focus or introducing new information; the other is that the order between *dou* and the phrases can be syntactically determined, i.e., more generally, the operator should c-command the nuclear scope.

   The second point is verified from the fact that *dou* occurs sentence-initially in (34). As an adverb, *dou* can occur in another position in (34), i.e., in front of the verb, but as we see in (36) below, whether *shi* or *you* occurs or not, both examples in which *wh*-words precede *dou* are ruled out.[16] *Dou* should precede *wh*-words in order to get the correct interpretation of *dou*2 quantification.

(36) a. *shei   dou   canjia
        who   dou   attend
     b. *shi/you   shei   dou   canjia
         be/have   who   dou   attend

However, there seem to be some counter examples to the second point. (37) is a modified sentence of (2) in which, with the occurrence of *shi*, *dou* is followed by the subject and precedes *shenme* 'what'. If the second

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[15] Some works such as Li, X. (1997) mention that *shi/you* can be optional. However, my informants judge that they are obligatory. I think that the judgment from my informants is due to the fact that *dou* is an adverb. Quantificational adverbs in Mandarin usually occur in front of the subject with the help of *shi* or *you* insertion. Below is an example of *changchang* 'usually', one of the Q-adverbs. As for the optional occurrence of *shi/you*, we do not know the reason at the moment. We leave it as an open question.

   (i) changchang *(shi)   ta   qu   Taibei.
       usually   shi   he   go   Taipei
       'Usually, it is he who goes to Taipei'

[16] (36a) might be grammatical if it is modified as below. In all these modified sentences, however, *wh*-words are interpreted as indefinite *wh*-words and *dou* is no longer *dou*2, but *dou*1 or a focus marker.

   (i) shei   dou   hui   canjia.
       who   dou   will   attend
       'No matter who it is, he will attend (this conference).'

point is correct, then the example (37) should be grammatical, contrary to the fact.

(37) *dou shi ta mai-le shenme?
       dou be   he buy-ASP what

The ungrammaticality of (37) is explained if we take other focus-sensitive constructions into consideration. In Mandarin Chinese, focusing adverbs such as *zhi / zhiyou* 'only' and focus markers such as *shi* 'be' in *shi-de* construction show locality property. For example, when *zhi* adjoins to the VP, a focused element occupies the object position as in (38a). If the focus falls on the subject, then the sentence cannot be interpreted correctly as in (38a)′. Likewise, when *zhiyou* is followed by the subject, a focused element occupies the subject position as in (38b), but if the object is associated with focus, then the sentence cannot be interpreted as in (38b)′.

(38) a. ta zhi mai le [na-ben shu]$_F$.
         he only buy ASP that-CL book
         'He only bought that book.'
     b. zhi you [ta]$_F$ mai le na-ben shu.
         only have/exist he buy ASP that-CL book
         'Only he bought that book.'
(38)′ a. # [ta]$_F$ zhi mai le na-ben shu.
      b. # zhi you ta mai le [na-ben shu]$_F$.

The contrast tells us that a focusing adverb should c-command a focused element and be close to it in that there should be no other focused elements between them.

Let us take a look at another example of the *shi-de* construction containing a *wh*-word. The contrast in (39) shows the same pattern as above, i.e., a focus marker *shi* 'be' c-command *shenme* 'what', the focused element, and the occurrence of *ta* 'he' between *shi* and *shenme* yields an illegitimate sentence as in (39b).[17] [18]

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[17] The case in which a focused element occupies the subject position can be found in Tang (1988). Tang (1988:135) indicates that since the focus falls upon a *wh*-word in *Wh*-questions, *shi*, as a focus marker, only occurs immediately before the *wh*-word.

   (i) a. shi shei dapo bolibei de ne?
           be   who strike-break glass DE Q

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(39) a. ta   shi   mai   le   [shenme]$_F$?
        he   be   buy   ASP   what
        'What is it that he bought?'
     b. *shi   ta   mai   le   [shenme]$_F$?
         be   he   buy   ASP   what

The contrast in (39) is very similar to that between (2) and (37). If we assume that *dou*2 is an operator which associates with focus,[19] then the problem of (37) can be considered as a general issue. Although we do not know what is going on in this contrast, it is certain that, at least in Mandarin, an operator in a focus-sensitive construction should c-command a focused element and there should be no other focused elements between them. Therefore, the second point, that the operator should c-command the nuclear scope, can be maintained.

4. OTHER PROBLEMS

4.1 *Dou*2 in Declarative Sentences

In this section, we will see that the above analysis can be extended to declarative sentences which include *dou*2, as in (40) and (41) (originally (10) and (11)).[20] As we mentioned in Section 2.1, little attention has been paid to this kind of examples, mainly because some native speakers do

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'Who is it that broke the glass?'
     b. *shei   shi   dapo   bolibei   de   ne?
         who   be   strike-break   glass   DE   Q

[18] There might be another problem relevant to (39b), i.e., even if the focus falls on *ta* 'he', the sentence is still unacceptable. According to Yang (2006), however, this is because of the intervention effect related to the focus, that is, the *wh*-word cannot move to [Spec, CP] across the focused element.
   (i) *shi   [ta]$_F$ mai   le   shenme?
        be   he   buy   ASP what
[19] This does not mean that *dou*2 is a focus marker or a focalizer like *zhi* 'only' or *shi* 'be'. 'Association with focus' is not understood as 'focusing' or 'focus marking' (at least to my knowledge) (cf. Jackendoff 1972 and Rooth 1985).
[20] The analysis, such as Zhang (1997) and Lin (1998), in which *wh*-movement or *wh*-binding is the key to explain *dou*2 quantification can not account for the case of declaratives.

not accept it at all. However, since many of my informants judge the sentences as acceptable, we have to take it into consideration.

(40) ta   dou   mai   le   shuiguo.
 he   all   buy   ASP   fruit
 'All the things that he bought are fruits.'

(41) zhe ci   huiyi   dou   shi   jiaoshoumen   canjia (de).
 this CL conference   all   be   professors   attend DE
 'All the persons that attended this conference are professors.'

(40) means that he bought fruits and nothing else; (41) means that only professors attended this conference and no others. This exhaustive reading is from the *dou*2 quantification in which universally quantified entities are not *shuiguo* 'fruits' nor *jiaoshoumen* 'professors', which are new information, but 'things which he bought' and 'professors who attended this conference', which have already been mentioned in the context. Thus, it is certain that the topic-focus structure affects *dou*2 quantification in declarative sentences as well as in *wh*-questions. Below are the tripartite structures and truth conditionals for (40) and (41):

(42) a. Dou_x (he bought x)   x is fruit.
 b. $\forall x$ [buy (he, x) $\rightarrow$ fruit (x)]
(43) a. Dou_x (x attended this conference)   x is professor
 b. $\forall x$ [attend (x, this conference) $\rightarrow$ professor (x)]

As seen in the above structures, NPs mapped onto the nuclear scope are interpreted as predicates whose arguments (i.e. variables) are bound by *dou* rather than by other operators such as existential operators. This explains the reason why the expressions occurring in the focused position are too limited as shown in examples below. (44) and (45) demonstrate that the elements which go into the nuclear scope cannot be definite expressions, lists or quantificational expressions.

(44) *ta   dou   mai   le   na ge   pingguo   / san ge   pingguo
 he   all   buy   ASP   that CL   apple   three CL   apple
  / pingguo,   xiangjiao   he   xigua.
   apple   banana   and   watermelon
  '*What he bought all are that apple / three apples/ apples, bananas, and watermelons'

(45) *zhe ci   huiyi   dou shi na ge ren   / san ge ren
     this CL conference all   be that CL person three CL   person
      / Zhang jiaoshou,   Li jiaoshou… canjia   de.
       Zhang professor   Li professor   attend   DE
    '*All the persons that attend this conference are that person /
     three persons / Professor Zhang, Professor Li…'

In addition, *dou* precedes the NPs which go into the nuclear scope. For example, in (41), *dou* cannot occur in front of the verb, though, as an adverb, it can adjoin to VP. If *dou* occurs pre-verbally, then the meaning of the sentence will change, as in (46).[21] In (46), *jiaoshoumen* 'the professors' is old information which had already been mentioned before, and therefore this expression goes into the restrictor in *dou* quantification.

(46) zhe-ci   huiyi   shi jiaoshoumen dou   canjia (de).
     this CL conference   be   professors   all   attend DE
     'It is all the professors that attended this conference.'

In the above discussion, we have seen that the analysis on *dou*2 quantification in *wh*-questions can be extended to declarative sentences. As mentioned at first, however, some native speakers do not accept this kind of examples. Thus, we have to find out why declarative sentences with *dou*2 are less acceptable than interrogative sentences and under what circumstances declaratives with *dou*2 can be acceptable. In this paper, however, we leave this as an open question.

4.2 *Dou*1 and *Dou*2

In the previous discussion, we have only seen examples of *dou*2 quantification. In this section, we will see what happens when *dou*1 and *dou*2 quantification arise simultaneously in a sentence. According to Zhang's (1997) interpretation, the sentence below can have three meanings, as in (47).

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[21] The example (46) might be said even if there are students or others, while (41) cannot.

(47) tamen dou mai le   shenme? [22]
 they   all   buy ASP what
 a. 'What all did they buy collectively?'
 b. 'What did each of them buy?'
 c. 'What all did each of them buy?'

(Zhang 1997: 206)

The meanings of (47a) and (47b) are common instances of *dou*2
quantification and *dou*1 quantification, respectively. Thus, a possible
answer to (47a) will be (48a) in which a list of 'what they bought
collectively' is given, and an answer to (47b) will be (48b) in which a
pair list is given, but note that in the list, each of them can be paired with
a single item.

(48) a. (tamen mai le)   pingguo, xiangjiao he xigua.
      they buy ASP apple   banana   and watermelon
      '(They bought) apples, bananas, and watermelons'
   b. Zhangsan mai le pingguo, Lisi mai le xiangjiao, haiyou
      ZS   buy ASP apple   LS   buy ASP banana   and
      Wangwu mai le   xigua.
      WW   buy ASP watermelon
      'Zhangsan bought an apple, Lisi bought a banana,
       and Wangwu bought a watermelon.'
   c. Zhangsan mai le pingguo, xiangjiao he xigua;
      ZS   buy ASP apple   banana   and watermelon
      Lisi mai le lajiao, luobo   he fanqie;
      LS buy ASP pepper radish and tomato
      haiyou Wangwu mai le   niurou, zhurou he yangrou.
      and   WW   buy ASP beef   pork   and mutton
      'Zhansan bought apples, bananas, and watermelons; Lisi bought
       peppers, radishes, and tomatoes; and Wangwu bought beef,
       pork, and mutton.'

The meaning of (47c) is interesting because it shows that *dou*1
quantification and *dou*2 quantification arise simultaneously. (48c) will be
a possible answer to (47c), consisting of a pair list (resulting from *dou*1

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[22] One of the anonymous reviewers reminded me of this example.

quantification) in which each pair contains plural items (resulting from *dou*2 quantification).

The example tells us that *dou*1 and *dou*2 is actually one item, functioning as a universal quantifier. The difference between them is the way in which the quantification operates: *dou*1 quantification observes the leftness condition because there is a plural element on the left of *dou*, while *dou*2 quantification is subject to the topic-focus structure because there is no element, explicit or implicit, on the left of *dou*.

5. CONCLUSION

We have seen in this paper that there is a type of *dou* quantification different from that of the well-known *dou* quantification in which a plural element is quantified over to its left. The former, called *dou*2 quantification, is subject to the topic-focus structure rather than to the syntactic structure, which means that the domain of the quantification is determined in connection to 'old' information and 'new' information of the sentence. Sentences including *dou*2 can be divided into topic and focus and each part is mapped onto the restrictor and the nuclear scope in a tripartite structure. This analysis accounts for two peculiar properties of *dou*2, i.e., a list answer to the *dou*2 questions and the distribution of *wh*-words.

Before ending the paper, let us reconsider *dou*1 quantification which has been argued to be subject to the syntactic structure, i.e., the leftness. If all sentences have the information structure, however, then we cannot ignore the feasibility that *dou*1 quantification could also be subject to the topic-focus structure. Phrases preceded and quantified by *dou* include topicalized NPs, subjects, preposed objects and *ba*-NPs which are definite expressions and are mostly 'given' information. If we follow Tsao (1990), then all these expressions can be regarded as the topic. In addition, the rest of the sentence is the comment, i.e., 'new information'. So, we could propose that *dou*1 quantification and *dou*2 quantification are both subject to the topic-focus structure. However, this issue needs deeper inquiry and I leave it for further research.

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主題-焦點結構與「都」量化現象

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這篇文章討論在一些 wh-疑問句裡可見的「都」量化現象，如『他都買了什麼？』。這個量化現象與眾所周知的「都」量化現象不同，也就是左向條件（the leftness condition）不能適用於前者。對於前者「都」量化現象，我提出了新的分析：這個「都」量化現象要參考的不是句法結構，而是主題－焦點結構，也就是說，決定量化的領域與一個句子所表達的舊信息與新信息有關聯。包含這個「都」的句子可以分成為主題和焦點，這兩個部份分別地投射到在「都」量化的三分結構（the tripartite structure）上的限制（the restrictor）與核心（the nuclear scope）。這個分析能夠說明，為什麼列舉的回答適合於「都」疑問句，為什麼疑問詞不能是表達數量的，還有為什麼疑問詞一定要帶複數的語意或者要帶量詞「些」。這個分析也能夠說明這個「都」的在句子裡面的分布，就是這個「都」一定要 C－控制焦點的詞組。最後，我指出這個分析可以擴展到一些很少見但還是可以觀察到的陳述句上面，並指出這兩種「都」量化現象其實也可以在一個句子中同時出現。

關鍵詞: 主題-焦點結構，*都*，量化現象，*wh*-疑問句