MANDARIN WH-IN-SITU AND QR*

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1. Introduction

In-situ wh-phrases have been subject to intensive discussions and debates since Huang 1982. However, puzzles and questions still remain. For example, Huang (1982) proposes that wh-in-situ's are exactly like moving wh-phrases in that they move to CP for scope reasons, only that they move covertly in Logical Form (LF). Tsai (1994), on the other hand, argues that nominal wh-in-situ's actually do not move in LF; rather, they stay in-situ throughout the derivation and receive an interpretation through binding (also see Cole and Hermon 1994, 1998). There are still other proposals.[1] For instance, Reinhart (1998) argues for a theory of choice function binding. All these different theories indicate that there are still important questions about wh-in-situ that remain unresolved.

In this work, we examine the scope properties of Mandarin in-situ wh-phrases, in particular the scope of the wh-object of the Wh/QP interaction (see Lin 1991, Aoun and Li 1993, 2003). After showing that the wh-object of the Wh/QP interaction invariably exhibits the narrow scope, we argue that Mandarin wh-in-situ patterns with existential quantifiers in Mandarin with respect to the scope properties. We therefore make the following proposal. The Mandarin wh-in-situ is an existential quantifier with inherent quantificational force. It undergoes QR just like other quantifiers (see Lin 2013). Though it is widely assumed that Mandarin wh-in-situ's are base-generated as variables (see for example Cheng 1991, Li 1992, Tsai 1994, Cheng and Huang 1996, among others), actually they are not. In those cases where a Mandarin wh-in-situ behaves as a semantic variable, it has undergone the process of *existential disclosure* (Chierchia 2000). It is bound to a CP-level operator (the question operator Q or a choice function) only after it undergoes QR as an existential quantifier.

This paper is organized as follows. In section 2, we introduce the phenomena of the Wh/QP interaction, in particular the case of Mandarin. In section 3, we point out some questions in previous research on the scope of the wh-object in the Mandarin case of the Wh/QP interaction, specifically the question of why the collective reading is not available for the universal QP subject, and the question of whether the wh-object really has a "true" wide-scope reading. We

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[1] See, for example, Chomsky 1995, Pesetsky 2000, and Soh 2005 for feature movement in LF, and Murphy 2017 for semantic accounts of wh-in-situ. We will not discuss these approaches.

also point out that the previous approaches to the Mandarin wh-in-situ cannot provide a satisfactory account for the complete set of scope phenomena in the Mandarin case of the Wh/QP interaction. In section 4, we present the proposed theory, and argue for the following proposals. First, the so-called wide-scope reading of the wh-object in the Mandarin case of the Wh/QP interaction is actually an "illusive scope" (borrowing a term from Fox and Sauerland 1996); as a consequence, the wh-object in the Mandarin case of the Wh/QP interaction always takes the narrow scope in relation to the universal QP subject. Second, the Mandarin wh-in-situ's, e.g. the wh-object in the Wh/QP interaction, pattern with existential quantifiers in scope properties, and this fact motivates us to propose that the Mandarin wh-in-situ is actually an existential quantifier that undergoes QR, in the way shown in Lin 2013. They are bound to a CP-level question operator only after the application of QR. Section 5 concludes this paper.

2. Wh/QP interaction

It is known that wh-phrases are quantifiers and interact with QPs yielding scope ambiguity, by means of Quantifier Raising (QR) (see Karttunen 1977, May 1977, 1985, Fox 2000, among many others). However, May (1985) observes that there is a "subject-object asymmetry" when a wh-phrase interacts with a universal QP: in English, if the subject of a sentence is a universal QP and the object a wh-phrase, the sentence exhibits scope ambiguity; on the other hand, if the subject of the sentence is a wh-phrase and the object a universal QP, there is no scope ambiguity. See (1a-b).

(1) a. What did everyone buy for Max?
(*everyone* > *what*, *what* > *everyone*)
b. Who bought everything for Max?
(*who* > *everything*, **everything* > *who*)

May (1985) accounts for this "subject-object asymmetry" by a special version of Scope Principle, according to which if two quantifiers are in a mutual c-command relation, scope ambiguity arises (May 1985: 34). In May's analysis, the two sentences in (1) have the following permissible and impermissible LF structures:

(2) a. [$_{CP}$ what$_i$ [$_{IP}$ everyone$_j$ [$_{IP}$ ***t***$_j$ buy ***t***$_i$ for Max]]]
b. *[$_{CP}$ who$_i$ [$_{IP}$ everything$_j$ [$_{IP}$ ***t***$_i$ bought ***t***$_j$ for Max]]]
c. [$_{CP}$ who$_i$ [$_{IP}$ ***t***$_i$ [$_{VP}$ everything$_j$ [$_{VP}$ bought ***t***$_j$ for Max]]]]

In (1a), both the universal subject and the wh-object move to the initial area of the sentence (via QR and wh-movement respectively), resulting in mutual c-command. This yields scope ambiguity and the two possible readings of (1a). In (1b), on the other hand, the universal object cannot QR to the initial area of the sentence, because the resulting LF structure, as in (2b), violates the Path Containment Condition (PCC) of Pesetsky 1982.[2] As a consequence, the

[2] PCC demands that two movement dependencies can be disjoint or in an embedding relation, but cannot be (properly) overlapped. See Pesetsky 1982 for details.

universal object can only QR to VP, as in (2c), yielding the reading where the wh-subject asymmetrically scopes over the universal object.

Now we look at the case of Mandarin. Lin (1991) and Aoun and Li (1993) argue that Mandarin sentences corresponding to (1a-b) exhibit the same subject-object asymmetry (also see Aoun and Li 2003). See (3a-b).

(3) a. Zuotian meige ren dou mai-le shenme?
yesterday every person all buy-PERF what

'What did everyone buy yesterday?'

b. Zuotian shei mai-le meiyang dongxi?
yesterday who buy-PERF every.CL thing

'Who bought everything yesterday?'

It is claimed that the Mandarin sentence (3a) exhibits scope ambiguity just like the English sentence (1a). One can, for instance, use (4a) or (4b) as the answer to (3a).

(4) a. Zhangsan mai-le shu, Lisi mai-le bi …
Zhangsan buy-PERF book Lisi buy-PERF pen

'Zhangsan bought a book, Lisi bought a pen…'

b. Meige ren dou mai-le *Shijian* *Jianshi.*
every person all buy-PERF time brief.history

'Everyone bought *A Brief History of Time*.'

(4a) represents the reading where the wh-phrase takes the narrow scope, namely the *pair-list reading*, and (4b) represents the reading where the wh-phrase takes the wide scope, namely the *individual reading*.

On the other hand, for the question (3b), one can only give an answer like (5a), namely the individual reading.

(5) a. Zhangsan.
Zhangsan

'Zhangsan [did].'

b. #Zhangsan mai-le shu, Lisi mai-le bi …
Zhangsan buy-PERF book Lisi buy-PERF pen

'Zhangsan bought a book, Lisi bought a pen …'

One cannot answer with the pair-list reading, such as (5b). These permissible and impermissible answers indicate that the wh-object in (3a) can freely assume the wide scope or the narrow

scope, whereas the wh-subject in (3b) asymmetrically scopes over the universal object.

In the discussion that follows, we will focus on the scope properties of the universal subject and the wh-object of the sentence (3a). It will be shown that there are actually questions that cast doubt on the so-called wide-scope reading of the wh-object in (3a).

3. Questions

3.1. The collective reading

The first question is whether the so-called wide-scope reading of the wh-object in (3a) is a real one. It is true that (4a) and (4b) are possible answers to the question (3a), and it is also true that (4a) represents the narrow-scope reading of the wh-object in (3a). But it is a question whether (4b) indeed represents the wide-scope reading of the wh-object in (3a). The answer (4b) actually means that each of the persons in question bought an individual copy of the book *A Brief History of Time*; it does not mean that all the persons in question *collectively* bought a copy of the book *A Brief History of Time*. So, the answer (4b) is actually a pair-list reading in disguise. Consider again the Wh/QP sentences in May's discussion, given in (6) (May 1985: 38).

(6) Q: What did everyone buy for Max?
   a. Mary bought Max a tie, Sally a sweater, and Harry a piano.
      (∀ > wh; pair-list reading)
   b. Everyone bought Max a Bosendorfer piano.
      (wh > ∀; collective reading)

Note that the answer that represents the wide-scope reading of the wh-object, namely (6b), involves a *collective reading* of the universal subject. That is, according to this reading, everyone collectively bought an expensive piano for Max.

However, the Mandarin case is different. Specifically, the sentence (3a), repeated here as (7a), crucially *does not* permit the collective reading (7b).

(7) a. Zuotian meige ren dou mai-le shenme?
   yesterday every person all buy-PERF what

   'What did everyone buy yesterday?'

   b. #Meige ren dou mai-le yitai gangqin.
   every person all buy-PERF one.CL piano

   Intended: 'Everyone [collectively] bought a piano.'

It permits the pair-list reading (4a) and the "copy reading" (4b), but not the collective reading (7b), namely the reading that each person contributed some money and collectively bought a piano.

The phenomenon, therefore, casts doubt on the so-called wide-scope reading of the wh-object in (3a). Specifically, the lack of collective reading for the universal subject (when the wh-object allegedly takes the wide scope) needs an explanation.

3.2. The role of *dou*?

Notice that in the sentence (3a)/(7a), the quantificational adverb *dou* 'all' occurs, which is known to trigger the distributive reading (J.-W. Lin 1998). See (8a-b).

(8) a. Tamen mai-le yidong fangzi.
they buy-PERF one.CL house

'They bought a house.' (*Tamen* 'they' collective reading)

b. Tamen dou mai-le yidong fangzi.
they all buy-PERF one.CL house

'They all bought a house.' (*Tamen* 'they' distributive reading)

Thus, one may wonder if the lack of collective reading of the universal subject in (3a)/(7a) should be attributed to the distributivity function of *dou*.

Further examination of the data, however, shows that this is not the case. The absence of the collective reading of the universal subject in (3a)/(7a) is not a result of the function of *dou*. Rather, the presence of *dou* makes the individual reading (namely the answer (4b)) possible.

Though the *mei* 'every' subject in Mandarin sentences typically requires the presence of *dou* in the same sentence for some sort of semantic licensing (see Cheng 1995), *dou* actually can be omitted in some special contexts. For instance, Lin (1998) observes that *dou* need not occur in an imperative sentence with a *mei* 'every' subject. See the example (9), which can be understood as an order given to a group of soldiers by an officer (Lin 1998: 232):

(9) Meige ren zuo yi-bai xia fudi-tingshen!
every person do one-hundred time push-up

'Each [of you] do one hundred push-ups!'

Now we can do a test. We embed the sentence (3a)/(7a) in an imperative context and thereby take *dou* away, as in (10). This sentence could be thought of as a question by a police detective interrogating a group of suspects:

(10) Gaosu wo, zuotian meige ren mai-le shenme?
tell me yesterday every person buy-PERF what

'Tell me, what did each [of you] buy yesterday?'

Interestingly, the sentence (10) strongly favors the pair-list reading. That is, the favored answer

would be like "Zhangsan bought a book, Lisi bought a pack of cigarettes, …" rather than an individual-reading answer, such as "Steven Hawking's *A Brief History of Time*." Thus, the function of *dou* in the sentence (3a)/(7a) seems to make the individual reading available. Without *dou*, it would be hard (at least less easy) to obtain the individual reading for the universal *mei* 'every' subject. Thus, the lack of collective reading for the universal subject in (3a)/(7a) cannot be attributed to the working of *dou*.

In the examples so far, we use the verb *mai* 'buy' in the Mandarin examples. Other verbs also show the same effects. For instance, in (11) and (12), the verbs used are *yaoqing* 'invite' and *aishang* 'fall in love with', and again, the wh-object permits an individual answer, namely, the so-called wide-scope reading for the wh-object.

(11) a. Meige jiaoshou dou yaoqing-le shei?
every professor all invite-PERF who

'Who did every professor invite?'

b. (A possible answer:)
Shidifen Huojin.

'Steven Hawking.'

(12) a. Meige xuesheng dou aishang-le shei?
every student all fall.in.love.with-PERF who

'Who did every student fall in love with?'

b. (A possible answer:)
Nichi Mina.

'Nikki Minaj.'

Once again, however, if we put these sentences in an imperative context and remove *dou*, the resulting sentences strongly (if not exclusively) prefer the pair-list reading, as in (13a) and (13b).

(13) a. Gaosu wo, meige jiaoshou yaoqing-le shei?
tell me every professor invite-PERF who

'Tell me, who did every professor invite?'
(Pair-list reading strongly preferred)

b. Gaosu wo, meige xuesheng aishang-le shei?
tell me every student fall.in.love.with-PERF who

'Tell me, who did every student fall in love with?'
(Pair-list reading strongly preferred)

A felicitous answer to (13a) would be "Professor A invited Dr. John Smith, Professor B invited Dr. Mary Claudia, ...," but much less felicitous with an answer like (11b) and (12b) above. The same holds for the question (13b). This shows again that the lack of collective reading for the universal subject in (3a)/(7a) cannot be attributed to *dou*. In fact, it seems to be *dou* that makes the so-called "wide scope" of the wh-object salient or even possible.

3.3. The LF-movement approach

As mentioned in the beginning, there are different approaches to wh-in-situ in Mandarin. Two of them are the most influential: the LF-movement approach (Huang 1982), and the binding approach (Tsai 1994, Reinhart 1998). However, these approaches cannot account for the complete set of scope phenomena of the sentence (3a)/(7a).

If we adopt the LF-movement approach, since the wh-in-situ moves to CP in LF, we obtain precisely the same LF structure for the Mandarin sentence (3a)/(7a) as the corresponding English sentence, namely the LF structure (2a). It is given in (14). ((15) is repeated from (2a), with the change of IP in (2a) to TP.)

(14) [$_{CP}$ shenme$_i$ [$_{TP}$ meige ren$_j$ [$_{TP}$ t_j dou mai-le t_i]]]
what every person all buy-PERF

(15) [$_{CP}$ what$_i$ [$_{TP}$ everyone$_j$ [$_{TP}$ t_j buy t_i for Max]]]

Now the problem arises: Why does the structure (14) *not* generate the group reading for the universal subject *meige ren* 'everyone' when the wh-object takes the wide scope? If the English LF structure (15) can generate such a reading, why can't the Mandarin LF structure (14)?[3] Huang's (1982) approach of LF wh-movement does not provide an account for this phenomenon.

A further challenge to the LF-movement approach is that, we do find cases of scope interaction in Mandarin where a wh-in-situ takes the wide scope and the *mei* 'every' QP takes the group reading. First, consider the sentence (16).

(16) Zhangsan song-le shenme gei meiyige xiaohai?
Zhangsan send-PERF what to every.one.CL child

'What did Zhangsan send to every child?'

It is known that the dative argument and the theme argument of a ditransitive verb enter into

[3] It should be mentioned that Huang (1982) himself does not accept QR as an LF operation. He suggests that scope ambiguity of sentences like *Someone loves everyone* in English results from some kind of LF restructuring that re-locates the object QP rightward to a higher structural position c-commanding the subject QP. Huang also suggests that, since Mandarin sentences corresponding to *Someone loves everyone* do not exhibit scope ambiguity, the Mandarin grammar does not permit such restructuring in LF.

scope interaction yielding scope ambiguity (see Takano 1998, Bruening 2010, among others; also see Lin 2013). In (16), the theme argument is a wh-in-situ, and the dative argument is a universal QP. This sentence permits three possible readings:

(17) Three possible readings for (16):
  a. The pair-list reading:
     e.g. "Zhangsan sent child 1 a book, child 2 a pen…"
  b. The "individual" reading:
     e.g. "Zhangsan sent every kid a copy of *A Brief History of Time*."
  c. *Shenme* 'what' wide scope, and *meige xiaohai* 'every child' narrow scope and collective.
     e.g. "Zhangsan sent an honorary medal to every child [as a group]."

The readings (17a) and (17b) are similar to the two possible readings for (3a)/(7a). But clearly, (16) also permits a reading (17c), which is similar to the reading (6b) for the English sentence (1a), namely the reading where the wh-phrase takes the wide scope and the universal QP takes the narrow scope and the collective reading. This example shows that the collective reading of the universal *mei* 'every' phrase is indeed possible in Mandarin sentences. This poses a further challenge to the LF-movement approach and the LF structure (14) that is derived.

The sentence (18) is another example where the universal *mei* 'every' phrase takes the collective reading.

(18) Zhangsan shenme shihou gen meige xuesheng jianmian?
Zhangsan what time with every student meet

'When [will] Zhangsan meet with every student?'

If the time adverb and the object of a sentence are both quantificational, they enter into scope interaction yielding scope ambiguity (see Stepanov and Stateva 2009; also see Lin 2013). In (18), either the time adverb *shenme shihou* 'when' or the prepositional object *meige xuesheng* 'every student' can take the wide scope. What is important is that when *shenme shihou* 'when' takes the wide scope, *meige xuesheng* 'every student' can take the collective reading (namely, the meeting is meant to be with all students as a group). This example, once again, shows that the universal *mei* phrase in Mandarin sentences can take the collective reading when there is scope interaction. The lack of collective reading in (3a)/(7a), therefore, is puzzling and needs an explanation, if the wh-object in the sentence is indeed in the wide-scope reading.

3.4. The binding approach

The binding approach also faces difficulties. According to the binding approach, a (nominal) wh-in-situ is a variable without inherent quantificational force. It is bound by a question operator Q in CP.[4] The wh-in-situ itself, therefore, does not have scope property, because it is

[4] Or a choice function, in the theory of Reinhart 1998.

a variable; it assumes the scope of its binder, namely the question operator Q in CP. Then, we are led to the conclusion that a Mandarin wh-in-situ always assumes the *wide scope* in a clause, because the binder Q is in the highest position, namely CP, of a clause. See the structure (19).

(19) [$_{CP}$ Q_i [$_{TP}$ meige ren dou mai-le shenme$_i$]]
every person all buy-PERF what

This conclusion, however, does not seem right. We have seen that the wh-object in (3a)/(7a) can take the narrow scope resulting in the pair-list reading. If the wh-in-situ is a variable bound by the binder Q in CP, there is no obvious way for the universal subject of (3a)/(7a) to scope over the wh-object.[5] Besides, even if we assume that the universal subject in (19) undergoes QR and adjoins to TP, and a specific version of Scope Principle like the one postulated by May (1985) is employed to derive scope ambiguity between the universal subject and Q as they enter into mutual c-command relation in May's (1985) theory,[6] we still have to explain why the universal subject cannot take the collective reading when Q (and the wh-object) takes the wide scope.

In conclusion, we find that neither the LF-movement approach nor the binding approach can account for the full range of scope phenomena in the Mandarin case of Wh/QP interaction, in particular the permissible and impermissible scope readings for the sentence (3a)/(7a).

4. Toward the account

In this section, we present the proposed analysis. We start with the role of *dou* 'all'.

4.1. The "wide scope" of the wh-object reconsidered

We suggest that the so-called "wide scope" of the wh-object in (3a)/(7a), repeated as (20), is actually an "illusive scope," to borrow a term used in Fox and Sauerland 1996. That is, (20) only has the reading where the universal subject takes the wide scope and the wh-object takes the narrow scope. The so-called "wide scope" reading of the wh-object, i.e. the individual reading, arises from the situation quantification of *dou*.

(20) Zuotian meige ren dou mai-le shenme?
yesterday every person all buy-PERF what

'What did everyone buy yesterday?'

[5] In Aoun and Li's (1993) theory, if X c-commands Y or the trace of Y, then X has a wide scope over Y. One might guess if this theory could be applied to the case of (3a)/(7a). That is, though the universal subject of (3a)/(7a) does not c-command Q in CP, it nonetheless c-commands the variable that Q binds, namely the wh-object. This might result in the wide scope of the universal subject over Q. This proposal, however, needs to be argued for independently, because the wh-object is not a member of a movement chain of which Q is the head and the wh-object is the tail. Since Q and the wh-object do not constitute a movement chain, Aoun and Li's (1993) theory is not readily applicable.

[6] But see Dayal 1996 and Szabolcsi 2010 for criticisms of May's (1985) Scope Principle.

S. Huang (1996) argues that the semantic function of *dou* is to provide situation quantification. It is known that when a Mandarin sentence contains a subject that is a universal *mei* 'every' phrase, *dou* typically occurs to provide some sort of semantic support. S. Huang (1996) argues that this phenomenon arises from the universal-distributive nature of the universal quantificational determiner *mei* 'every'. S. Huang proposes that *mei* denotes a universal Skolem function, in the sense that it demands a set of one-to-one pairings in its denotation. Thus, in the argument structure of the generalized quantifier *mei*, there are two variable positions that need to be satisfied. The first variable is the NP that *mei* is composed with, and the second variable comes from the predicate of the sentence. S. Huang points out specially that the second variable in the predicate must be morpho-syntactically available; for instance, if the predicate contains an indefinite or a reflexive pronoun, the sentence would be grammatical because the second variable of *mei* could be satisfied by the indefinite or the reflexive pronoun. In such sentences, *dou* need not occur. See the following examples (taken from S. Huang 1996: 33, 34, with adaptation).

(21) a. Meiyige nühai chang-le yishou ge.
every.one.CL girl sing-PERF one.CL song
'Every girl sang a song.'

b. Meiyige houxuanren tan-le-tan ziji.
every.one.CL candidate talk-PERF-talk self
'Every candidate talked about himself/herself.'

But when there is no morpho-syntactic variable available, *dou* comes in. The function of *dou* is to provide a quantification over sub-events of the event argument associated with the predicate of the sentence, and the sub-events will be the required second variable for the Skolem function of *mei*. In S. Huang's (1996) theory, the semantics of *dou,* when it is composed with a predicate PRED, is as follows (S. Huang 1996: 39, (47); AT is a function that introduces the event argument *e*, which restricts the truth of the sentence to *e* (S. Huang 1996: 20)):

(22) $\{x \mid \text{dou PRED}(x)\} = \{x \mid \text{AT}(\text{PRED}(x, e)) \text{ and DOU}(e, \text{PRED})\}$,
where DOU(*e*, PRED) is true iff *e* is an event of minimum size consistent with the semantics of PRED.

In effect, *dou* has the function to provide a sub-event to pair with each member of the set denoted by the universal *mei* subject, thereby satisfying the Skolem function of the universal quantifier *mei* (also see Lasersohn 1995).[7]

[7] S. Huang (1996) also proposes that *dou* has the function to generate a series of "minimal" sub-events that are compatible with the meanings of the predicate and the subject; in this sense, *dou* is a "minimizer." But, as a consequence, this also makes *dou* a "maximizer," in the sense that it maximizes the number of the sub-events to be paired with the individuals denoted by the universal *mei* subject. Similar ideas have been developed by other linguists, though under different terms, such as *dou* as an "exhaustifier," a "maximality operator," and so on. See Giannakidou and Cheng 2006, Xiang 2008, Zhang 2008, and Cheng 2009.

With this in mind, we find that the so-called "wide scope" reading of the wh-object in (20), namely the individual reading of the wh-object, is simply a reading where the wh-object takes a wide scope over *dou*. Since *dou* introduces quantification of a series of sub-events, each of which contains a buying action and a theme that is bought, if the object out-scopes *dou*, we obtain the reading where the thing bought is the same.[8] Conversely, if the object is out-scoped by *dou* and hence takes a narrow scope in relation to *dou*, then we obtain the pair-list reading, namely the reading where each person bought a different thing. In either case, however, the wh-object does not have a wide scope over the universal subject.

The following phenomenon provides evidence for our proposal. It is known that the Mandarin counterpart of (23), e.g. (24), does not exhibit scope ambiguity (Huang 1982, Aoun and Li 1993, among others).

(23) Someone loves everyone.
($\exists > \forall$, $\forall > \exists$)

(24) Mouge nansheng xihuan meige nüsheng.
some boy like every girl

'Some boy likes every girl.'
($\exists > \forall$, *$\forall > \exists$)

However, Lin (2013) observes that, if a Mandarin sentence like (24) is embedded in a nonfinite context, e.g. as the complement clause of a subjunctive verb, then scope ambiguity becomes available. For example, the existential subject in (25) asymmetrically scopes over the universal object; the reverse scope is unacceptable. The sentence (26) has (25) as a subjunctive complement, and interestingly, scope ambiguity arises. That is, in the complement clause of (26), either the existential subject or the universal object can take the wide scope.

(25) Zhishao yiwei laoshi bangzhu-le meiyige xuesheng.
at.least one.CL teacher help-PERF every.one.CL student

'At least one teacher helped every student.'
($\exists > \forall$, *$\forall > \exists$)

(26) Xiaozhang yaoqiu zhishao yiwei laoshi bangzhu meiyige xuesheng.
principal ask at.least one.CL teacher help every.one.CL student

'The principal asked at least one teacher to help every student.'
($\exists > \forall$, $\forall > \exists$)

We turn to the sentence (20). We claim that the sentence (20) only has the reading where

[8] In the case of a buying event, the thing bought is construed in the "token of the same type" reading because of pragmatic or world-knowledge reasons. In the case of an inviting event or a falling-in-love event, as in sentence (11) and (12), the object can denote the same individual, since such events do not involve exclusive possession. These differences are not relevant to the logical scope of the wh-object.

the wh-object takes the narrow scope; the so-called "wide scope" of the wh-object is just an "illusive scope." Our question is: if the wh-object can take the wide scope, why can't the universal subject be interpreted in the collective reading? Furthermore, we have seen the absence of the collective reading cannot be attributed to the quantificational adverb *dou* 'all'; if *dou* is removed, the collective reading does not become possible; rather, without *dou*, the narrow-scope reading of the wh-object, i.e. the pair-list reading, becomes even more salient. Now, we can do a test. Let us follow the pattern of (25)-(26) and embed the sentence (20) in a nonfinite context, with *dou* removed. Surprisingly, the collective reading becomes possible to the universal. See (27).

(27) Xiaozhang yaoqiu meige ren mai shenme?
principal ask every person buy what

'What did the principal ask everyone to buy?'

1. The pair-list reading:
"Person 1 is asked to buy A, person 2 is asked to buy B, …"
2. The individual reading:
"Each person is asked to buy a book."
3. The collective reading:
"Everyone as a group is asked to collectively buy a certain thing."

This sentence permits the familiar pair-list reading and the individual reading, as in the answers 1 and 2. In addition, it also permits the wide-scope reading of the wh-object along with the collective reading of the universal subject, as in answer 3. This is exactly the same wide-scope reading for the wh-object in the English sentence (1a) (also see (6a-b)). Answer 2, therefore, is not a real wide-scope reading of the wh-object. It is a narrow-scope reading of the wh-object in disguise.

4.2. Mandarin wh-in-situ as an existential quantifier

We have argued that in the sentence (20), the universal subject takes the wide scope, and the wh-object takes the narrow scope. Namely, the universal subject asymmetrically scopes over the wh-object. This is the same as Mandarin sentences like (24) and (25), where the subject QP asymmetrically scopes over the object QP. In this section, we explore this phenomenon further and show that the wh-in-situ in Mandarin, in fact, patterns with an existential quantifier.

We start with the QR effects in Mandarin sentences. Lin (2013) uses a number of syntactic constructions to show that there are QR effects in Mandarin sentences, but they are limited to the domain of vP. For example, the subject quantifier of a finite clause asymmetrically scopes over the object quantifier (see (28), repeated from (25)); the two internal arguments of a dative sentence exhibit scope interaction (see (29)); and, the frequency adverb of a sentence enters into scope interaction with the quantificational object (see (30)):

(28) Zhishao yiwei laoshi bangzhu-le meige xuesheng.
at.least one.CL teacher help-PERF every student

'At least one teacher helped every student.'
(∃ > ∀, *∀ > ∃)

(29) Zhangsan song-le yiben shu gei meiyige xiaohai.
Zhangsan send-PERF one.CL book to every.one.CL child

'Zhangsan sent a book to every child.'
(∀ > ∃, ∃ > ∀)

(30) Zhangsan jingchang gen meiyige xuesheng chi fan.
Zhangsan often with every.one.CL student eat meal

'Zhangsan often dines with every student.'
('often' > ∀, ∀ > 'often')

According to Lin 2013, these scope phenomena can be accounted for if we assume that, in Mandarin finite clauses, an object quantifier QRs to vP but not to TP. The analysis goes as follows.

- Lin follows Manzini (1992), Lasnik and Saito (1992), and others in assuming that a referential tense projects a "definiteness" island, or a *specificity island*, which blocks binding (Chomsky 1973, Fiengo and Higginbotham 1981).
- It is assumed that a principal parametric difference between English and Mandarin is that the tense in the English finite clause is located in C^0, whereas the tense in the Mandarin finite clause is located in T^0.[9, 10] As a consequence, in English, CP is a specificity island, but in Mandarin, TP is.
- As a consequence, in the case of English, an object quantifier may QR to vP or TP. Note in particular that when the quantifier adjoins to TP as a result of QR, no problem arises, because TP in English is not a specificity island. In Mandarin, however, the object quantifier can only QR to vP. If it QRs to TP, since TP is a specificity island, adjunction to TP amounts to moving out of the specificity island (May 1985 and Kayne 1994). This results in ungrammaticality. See the diagrams below:[11]

(31) a. English
$\underbrace{[_{CP}\ C_{Tense}\ [_{TP}\ \ldots\ T\ \ldots\ [_{vP}\ \ldots\ v\ \ldots\ QP]]]}_{\textit{Specificity Domain}}$ ⇒ Possible QR sites: vP, TP

[9] Also see Chomsky 2013, 2015 for the hypothesis that the tense in English sentences is in C^0.

[10] This may be the result of the T-to-C movement in English (Lasnik and Saito 1992, Pesetsky and Torrego 2001) and lack of it in Mandarin. We leave the relevant questions open.

[11] We will come back to the subject QP. We assume that the subject QP need not undergo QR. See the discussion in section 6.2.

b. Mandarin
[$_{CP}$ C [$_{TP}$ … T$_{Tense}$ … [$_{vP}$ … *v* … QP]]] ⇒ Possible QR site: *v*P only
Specificity Domain

Lin's (2013) analysis accounts for the scope phenomena in (28)-(30). In (28), the object QP can only QR to vP; if it QRs to TP, the specificity condition is violated, resulting in ungrammaticality. Thus, in (28), the subject QP asymmetrically scopes over the object QP. In (29)-(30), the two vP-internal QPs QR to vP. This does not violate the specificity condition, so the two QPs can freely enter into scope interaction, yielding scope ambiguity between the two vP-internal QPs.

Lin (2013) further makes a prediction. A referential tense makes a clause a specificity island. Thus, if we manage to embed a finite clause like sentence (28) in a nonfinite context, so that the tense of the clause in question becomes non-referential, the object QP of the clause should be able to take the wide scope over the subject QP of the clause. As we have already seen in the previous subsection, this prediction is borne out. The following examples are repeated from (25)-(26).

(32) Zhishao yiwei laoshi bangzhu-le meige xuesheng.
at.least one.CL teacher help-PERF every student

'At least one teacher helped every student.'
(∃ > ∀, *∀ > ∃)

(33) Xiaozhang yaoqiu zhishao yiwei laoshi bangzhu meiyige xuesheng.
principal ask at.least one.CL teacher help very.one.CL student

'The principal asked at least one teacher to help every student.'
(∃ > ∀, ∀ > ∃)

Now we return to the wh-in-situ in Mandarin. In the previous discussion, we have seen that the wh-object in the sentence (20) (= (3a)/(7a)) obtains the wide-scope reading, along with the collective interpretation of the universal subject, when it is embedded in a subjunctive context. We repeat the relevant examples here.

(34) Zuotian meige ren dou mai-le shenme?
yesterday every person all buy-PERF what

'What did everyone buy yesterday?'
(wh > ∀, *∀ > ∃)

(35) Xiaozhang yaoqiu meige ren mai shenme?
principal ask every person buy what

'What did the principal ask everyone to buy?'
(wh > ∀, ∀ > wh)

In addition, we have also seen that a theme wh-phrase enters into scope interaction with a dative universal quantifier, and that a time wh-adverbial enters into scope interaction with a universal object. The examples are repeated here.

(36) Zhangsan song-le shenme gei meiyige xiaohai?
Zhangsan send-PERF what to every.one.CL kid

'What did Zhangsan send to every child?'
(∀ > wh, wh > ∀)

(37) Zhangsan shenme shihou gen meiyige xuesheng jianmian?
Zhangsan what time with every student meet

'When [will] Zhangsan meet with every student?'
(wh > ∀, ∀ > wh)

Theses scope phenomena prove that the Mandarin in-situ wh-phrases pattern with existential quantifiers. They exhibit the same scope properties. Thus, just like an existential quantifier that QRs to vP only in a finite clause, but to vP or TP in a nonfinite clause, a wh-in-situ also QRs to vP in a finite clause, but to vP or TP in a nonfinite clause. The wh-in-situ in Mandarin is an existential quantifier.

4.3. Mandarin wh-in-situ and QR

To provide a theoretical basis for our analysis, we follow Bayer's (2006) proposal in teasing apart the interrogative force and the existential force of wh-phrases. Bayer (2006) investigates the grammatical properties of wh-phrases in partial wh-movement constructions, and proposes that the partial wh-movement may have resulted from the wh-phrase being an existential quantifier. The interrogative force of the wh-phrase is manifested in a different way, namely in the merger of a semantically neutral wh-phrase in the scope position. We follow Bayer's theory and propose that the existential component and the interrogative component of the Mandarin wh-in-situ are not bundled together and are represented in different ways, exactly like what Bayer (2006) suggests.

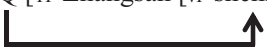
As an existential quantifier, Mandarin wh-in-situ undergoes QR, in the same way that an existential quantifier does.[12] For example, the sentence (38a) has the LF structure in (38b), where the in-situ wh-object *shenme* 'what' QRs to vP.

(38) a. Zhangsan mai-le shenme?
Zhangsan buy-PERF what

'What did Zhangsan buy?'

[12] Taking wh-in-situ's as quantifiers is not unprecedented; e.g. Murasugi and Saito (1993) and Saito (1994) treat in-situ wh-phrases as "wh-quantifiers".

b. [$_{CP}$ Q [$_{TP}$ Zhangsan [$_{vP}$ shenme$_i$ [$_{VP}$ mai-le ***t***$_i$]]]]



Notice that the wh-phrase *shenme*, now at vP, is bound by the question operator Q at CP. This is possible because of the separation of the interrogative force and the existential force of the wh-phrases, as mentioned above. The existential force of the Mandarin wh-in-situ is realized by the operation of QR, and its interrogative force is realized by the binding of the question operator Q.

In what follows, we look at the working of QR and binding in the relevant scope phenomena that we have seen so far.

1. The Wh/QP interaction. (39a) and (40a) are the relevant examples, and (39b) and (40b) are their LF structures.

(39) a. Zuotian meige ren dou mai-le shenme?
yesterday every person all buy-PERF what

'What did everyone buy yesterday?'
(∀ > wh, *wh > ∀)

b. [$_{CP}$ Q$_i$ [$_{TP}$ meige ren ... [$_{vP}$ shenme$_i$ [$_{vP}$ mai-le ***t***$_i$]]]

(40) a. Zuotian shei mai-le meiyang dongxi?
yesterday who buy-PERF every.CL thing

'Who bought everything yesterday?'
(*∀ > wh, wh > ∀)

b. [$_{CP}$ Q$_i$ [$_{TP}$ shei$_i$ … [$_{vP}$ meiyang dongxi$_j$ [$_{vP}$ mai-le ***t***$_j$]]]

In (39b), *shenme* 'what' QRs to vP. It cannot QR to TP, just like other quantifiers. This yields the scope relation ∀ > *wh* but not the reverse, as the universal quantifier asymmetrically c-commands the wh-object.[13] The question operator Q then binds the wh-phrase at vP. This completes the interpretation process of wh-object. In (40a), the universal object, likewise, can only QR to vP. The wh-subject remains in-situ bound by Q, as it cannot QR to TP, for the reason of the specificity condition. Thus, the wh-subject asymmetrically c-commands the universal object, resulting in the scope relation wh > ∀.

[13] We assume that in sentences like (39a), the universal subject need not undergo QR. The reasons are the following. First, the Spec of TP position itself is a derived position, as the subject appears there by movement from Spec of vP. Second, the trace left by the movement can serve as the variable for semantic interpretation, after the application of a lambda-insertion rule (see Heim and Kratzer 1998: 227ff). This yields an effect similar to the QR of the subject. See (i) for demonstration, where "λ_1" is inserted at LF.

(i) [$_{TP}$ meige ren … λ_1 [$_{vP}$ t_1 … [$_{v'}$ …

2. Nonfinite context. (41a) is the example, and (41b) is its LF structure. In this case, the embedded clause exhibits scope ambiguity.

(41) a. Xiaozhang yaoqiu meige ren mai shenme?
principal ask every person buy what

'What does the principal ask everyone to buy?'
(∀ > wh, wh > ∀)

b. [$_{CP}$ Q_2 [$_{TP}$ Xiaozhang yaoqiu ...
[$_{CP}$ [$_{TP}$ (shenme$_2$) [$_{TP}$ meige ren$_1$ [$_{vP}$ (sheme$_2$) [$_{TP}$ ***t***$_1$ mai ***t***$_2$]]]]

The embedded wh-object now can assume either the wide scope or the narrow scope in relation to the embedded universal subject. This is because the embedded wh-object can QR to the embedded TP and scope over the embedded universal subject. It can also QR to the embedded vP and fall within the scope of the embedded universal subject. The situation, again, is exactly like other quantifiers.

3. The dative construction. (42a) is the example, and (42b-c) are the two possible LF structures.

(42) a. Zhangsan song-le shenme gei meiyige xiaohai?
Zhangsan send-PERF what to every.one.CL child

'What did Zhangsan send to every child?'
(∀ > wh, wh > ∀)

b. [$_{CP}$ Q_1 [$_{TP}$ Zhangsan [$_{vP}$ meiyige xiaohai$_2$ [$_{vP}$ shenme$_1$ [$_{vP}$ song ***t***$_1$ gei ***t***$_2$]]]]]
c. [$_{CP}$ Q_1 [$_{TP}$ Zhangsan [$_{vP}$ shenme$_1$ [$_{vP}$ meiyige xiaohai$_2$ [$_{vP}$ song ***t***$_1$ gei ***t***$_2$]]]]]

Either the wh-in-situ or the universal QP can take the wide scope, because each of them can freely QR to vP, resulting in different c-command relations shown in (42b-c). The wh-object is bound by Q at vP.

4. Time adverbial modification. (43a) is the example, and (43b-c) are the two possible LF structures.

(43) a. Zhangsan shenme shihou gen meige xuesheng jianmian?
Zhangsan what time with every student meet

'When [will] Zhangsan meet with every student?'
(wh > ∀, ∀ > wh)

b. [$_{CP}$ Q_1 ... Zhangsan ... [$_{vP}$ meige xuesheng$_2$ [$_{vP}$ shenme shihou$_1$ [$_{vP}$ ***t***$_1$ ... ***t***$_2$ ...]]]]
c. [$_{CP}$ Q_1 ... Zhangsan [$_{vP}$ shenme shihou$_1$ [$_{vP}$ meige xuesheng$_2$ [$_{vP}$ ***t***$_1$ ... ***t***$_2$ ...]]]]

Just like the dative construction, the time wh-phrase and the universal QP can freely QR to vP, resulting in different c-command relations shown in (43b-c). Again, the time wh-phrase is bound by Q at vP.

These examples, therefore, demonstrate that the proposal that the Mandarin wh-in-situ undergoes QR provides a principled explanation for the scope phenomena of the Mandarin wh-in-situ.

4.4. When the wh-in-situ behaves as a variable

If the Mandarin wh-in-situ is an existential quantifier with inherent quantificational force, then a question arises: this proposal seems to contradict a widely accepted theory about the Mandarin wh-in-situ, namely that in-situ wh-phrases in Mandarin are *variables* without inherent quantificational force (Cheng 1991, Li 1992, Tsai 1994, Cheng and Huang 1996, and others; also see Reinhart 1998), and that their semantic interpretations depend on the quantificational properties of their licensors. For example, in (44a), the wh-in-situ receives a universal interpretation that is attributed to it by the universal quantificational adverb *dou* 'all'; in (44b), the wh-in-situ *shenme dongxi* '(lit.) what thing' receives an existential interpretation that comes from the epistemic modal adverb *dagai* 'possibly' (Li 1992); and, in (44c), the wh-in-situ receives a universal interpretation that comes from a phonetically empty necessity operator which is responsible for the conditional meaning of the sentence (Cheng and Huang 1996).

(44) a. Shenme ren Zhangsan dou xihuan.
what person Zhangsan all like

'Zhangsan likes everyone.'
(wh-in-situ = ∀)

b. Zhangsan dagai chi-le shenme dongxi.
Zhangsan probably eat-PERF what thing

'Zhangsan probably has eaten something.'
(wh-in-situ = ∃)

c. Shei dang laoban, shei fuze.
who be boss who be.responsible

'Whoever is the boss should be responsible.'
(wh-in-situ = ∀)

The theory that the Mandarin wh-in-situ is a base-generated variable is incompatible with our theory, namely, the theory that is, the Mandarin wh-in-situ is an existential quantifier. This is a question that we need to explain.

Our proposal is as follows. If the wh-in-situ in Mandarin is an existential quantifier, then those sentences in which a wh-in-situ behaves as a variable, e.g. (44a-c), must be the result of

existential disclosure. This is precisely what Chiercha (2000) argues for. According to Chierchia, Mandarin wh-in-situ's are indefinites and are inherently existential. But indefinites can undergo "existential disclosure" and become variables. The process of existential disclosure is an operation similar to existential instantiation in standard predicate logic. For instance, on the premise of (45a) (a theorem in standard predicate logic), the sentence "a man is blond" can be existentially disclosed in the way shown in (45b-e) ((35) and (43) of Chierchia 2000, p.19 and 21).

(45) a. $[\exists x\Phi] \& \Psi \leftrightarrow \exists x[\Phi \& \Psi]$
b. $\exists x$ [x is a man & x is blond]
c. $[\exists x$ [x is a man & x is blond] & x = y]
d. $\exists x$ [x is a man & x is blond & x = y]
e. y is a man & y is blond

The process of (45b-e), essentially, is to instantiate the bound variable *x* by an open variable *y*, thereby "undoing" the existential quantification of *x*. After existential disclosure, an indefinite is ready for further quantification by some other quantifier, such as the adverbial *usually* in (46) ((44) of Chierchia 2000, p.22).

(46) a. If a man is blond, he is usually from the north.
b. MOST_i [a man_i is blond] [he_i is usually from the north]
c. MOST (λx_i [x_i is a man & x_i is blond], λx_i [x_i is from the north])[14]

As a result, there is actually no conflict in assuming that a Mandarin wh-in-situ is an existential quantifier *and* that it behaves like a variable. It undergoes existential disclosure and becomes a variable in sentences such as (44a-c).

5. Conclusion

In this work, we proposed a new analysis for the Mandarin wh-in-situ. We argued that Mandarin wh-in-situ is an existential quantifier with independent quantificational force. It undergoes QR and interacts with other quantifiers. It can be existentially disclosed and become a variable. When it is in the interrogative use, it is still bound by the question operator Q in CP, but the binding applies after the QR of the wh-in-situ.

Before ending this work, we would like to make a brief comment on the parametric differences between Mandarin and English. The most salient distinctions between Mandarin and English with respect to the wh-in-situ phenomena are the following. (A) An English wh-phrase cannot stay in-situ in principle, unless there is another wh-phrase that has overtly moved to CP. (B) A wh-in-situ in English (licensed by an overtly moved wh-phrase) cannot take a non-interrogative interpretation; that is, it cannot be used as a variable.[15] We suggest that this is a

[14] The lambda operator in (46c), according to Chierchia (2000: 22), functions as a "disclosure operator".

[15] Though with additional morphological structures, they can be used as indefinites or universals, such

result of the fact that, for an English wh-phrase, the existential force is always bundled with its interrogative force. In other words, a wh-phrase in English is always interrogative. It does not have an independent existential use apart from the interrogative use. Suppose that a parameter in grammar is responsible for this phenomenon. Let us call it *Paramter Wh*:

(47) *Parameter Wh*
A language may have the interrogative feature and the existential feature of the wh-phrases bundled together, or not.

The grammar of Mandarin chooses the negative value for this parameter, while the grammar of English chooses the positive value for this parameter. This value setting leads to the two phenomena in English (A) and (B) mentioned above. First, because a wh-phrase in English always needs to be interrogative, a wh-in-situ requires licensing from an overtly moved wh-phrase in a CP, as movement to CP is the only way to obtain the interrogative interpretation in English (for the checking of a morphological wh-feature, for instance). Since a wh-in-situ in English always has its interrogative feature and existential feature bundled together, it cannot take a non-interrogative interpretation, hence not the variable use. The Mandarin wh-in-situ, on the other hand, can have its interrogative feature and existential feature satisfied in different ways. This makes it very easy to freely take the interrogative interpretation or the existential interpretation in different syntactic contexts. There are still interesting questions that need to be explored, which we leave for future research.

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