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System Repairing Strategy at Interface: *Wh*-in-situ in Mandarin Chinese

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Abstract

This article presents an argument in support of the Interface Strategy hypothesis that Reinhart (2006) defends. When the output of the computational system fails to meet an interface need, some repair mechanisms will be activated, such as QR (scope shift) and main-stress shift. These mechanisms are costly; however, the computational system can tolerate them since they do not create any interpretation redundancy. It is acknowledged that Chinese *wh*-words can be treated as polarity items (Huang 1982, Cheng 1991) and that in certain contexts they are ambiguous between an existential reading and an interrogative reading. In actual conversational situations, when speakers put different combinations of stress with intonation on the sentences, the relevant *wh*-words are not anymore ambiguous. This observation serves as evidence to show that the prosodic licensing of *wh*-in-situ is in fact a repair strategy at interfaces. The ambiguity of the interpretation is due to the imperfection of the system, but the optimal design of the language provides us with a possibility to repair it by using other mechanisms at interfaces. Different combinations of the stress with the prosodic forms construct a Reference-Set in the sense of Reinhart. This point of view also makes the Clausal Typing hypothesis proposed in Cheng (1991) more general in that in addition to the morpho-syntactic typing, prosody can also function as a clausal typing device to license *wh*-in-situ. The prosodic marking only works when the morpho-syntax fails to type a clause; in other words, it is only activated as a last resort in case of ambiguity. I will offer a new account for the Chinese *wh*-in-situ questions based on the prosodic licensing mechanism. Namely, in the Minimalist Program, the encoded prosodic forms are generated as a part of the Lexicon before entering into the numeration. They can be analyzed as phonological features in the feature bundles associated to a given lexical item. Since these prosodic features have a semantic effect on the output of the computational system at the C-I component, they satisfy the Legibility conditions and therefore, they do not violate the Inclusiveness condition.

Key words: *wh*-in-situ, prosody, interface, Mandarin Chinese

1. Introduction

1.1 Historical review of the problem

Reinhart (2006) defends the thesis that human language is optimally designed but the actual human computational system is not perfect. When the output of the computational system fails to meet an interface need, some repair mechanisms will be activated, such as QR (scope shift), main-stress shift, and etc. Concretely, when the Surface-Structure is not sufficient to generate different semantic interpretations according to the requirement of different contexts, some necessary strategies should be allowed to generate those possible readings. These mechanisms are costly, but the computational system can tolerate them since they do not create any interpretation redundancy. In this paper, I will present an argument based on *wh*-in-situ questions in Mandarin Chinese to defend this hypothesis.

In the languages resorting *wh*-movement, such as English, *wh*-elements move to the scope position, [Spec, CP], to be properly interpreted and they are treated as quantifiers that possess an inherent quantificational force. Therefore, the nature of *wh*-movement is Quantifier Raising (QR). A moved *wh*-phrase binds the trace that it left in-situ as variable. Chinese is known as a *wh*-in-situ language in that the relevant *wh*-element stays in their base position instead of undergoing an overt movement to the [Spec, CP] position, as illustrated in (1).

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(1) Ni xihuan shenme?
you like what
'What do you like?'

The research questions are the following ones. First, what is the nature of Chinese in-situ *wh*-words? More concretely, are they quantifiers like their English counterparts or are they bound variables? Second, since *wh*-words do not undergo overt raising to the scope position, how is a *wh*-in-situ question interpreted properly at LF? I will present several classic analyses proposed previously.

Chomsky (1977) proposes an LF-movement analysis to capture the wide scope reading of the indefinites in English. Sentences like (2a) is ambiguous between two possible readings: either the universal quantifier phrase *every man* (∀) scopes over the existential quantifier phrase *a woman* (∃), as represented in (2b) or the existential quantifier phrase scopes over the universal quantifier phrase, as indicated in (2c). The ∃ quantifier takes a narrow scope in (2b) and a wide scope in (2c) respectively. The reading in (2c) is also referred to as the "reverse reading" since the semantic scope relation between these two quantifiers is the opposite of their syntactic c-command relation. (2d) is the LF representation of the reading in (2c), in which the ∃ quantifier undergoes covert movement to the scope position at LF and this mechanism is known as QR (Quantifier Raising).

(2) a. Every man met a woman.
b. Every man met a potentially different woman. (∀ > ∃)
c. Every man met the same woman. (∃ > ∀)
d. LF: [a women$_i$ [Every man met t_i]]? (∃ > ∀)

Higginbotham & May (1981) use LF-movement to interpret the *wh*-in-situ in multiple *wh*-questions in English. In (3a), the second *wh*-word *what* obligatorily stays in-situ; however, it still gets a wide scope reading, which is evidenced by that fact that the question in (3a) permits answers like 'Mary read *Harry Potter*.' In this answer, *what* also gets a root question reading. Higginbotham & May (1981) propose that *what* undergoes a covert LF-movement to the scope position so that it can be interpreted properly. Importantly, the in-situ *wh*-word is treated as a quantifier in their analysis and it possesses an inherent quantificational force. This analysis explains how it gets a wide scope reading.

(3) a. Who read what?
b. LF: [what$_j$ Who$_i$ [t_i read t_j]]?

Inspired by these analyses, Huang (1982) systematically derives the *wh*-in-situ questions in Chinese with LF-movement; an in-situ *wh*-word undergoes covert movement to the scope position at LF to get its interpretation (cf. 4). This analysis makes Chinese and English behave in the same way at different levels. Therefore, Chinese in-situ *wh*-words are also treated as quantifiers just like their English counterparts.

(4) LF: [$_{CP}$ shenme$_i$ [$_{IP}$ Ni xihuan t_i]]?
what you like
'What do you like?'

In a general way, LF-movement is criticized by many scholars, especially within the framework of Minimalist Program. In 1980s', it is realized that QR cannot always correctly

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capture the scope of the indefinites (cf. Reinhart 1997). Aoun & Li (1993) also have a critical point of view on LF-movement analysis of *wh*-in-situ in Chinese and they propose that in case of multiple *wh*-questions, each *wh*-word is bound by a corresponding *QU*-operator.

An alternative way to interpret the *wh*-in-situ is based on an "unselective binding" mechanism that was firstly adopted by Baker (1970) to interpret the in-situ *wh*-words in a multiple *wh*-question in English (cf. 5). A covert question operator Q is generated in the scope position at S-S and simultaneously binds both *wh*-words as variables by providing them with a wide scope reading.

(5) a. Who read what?
b. S-S: [Q $_{<i, j>}$ [Who$_i$ read what$_j$]]?

This mechanism was later developed in Heim (1982) to interpret the indefinites. Under the unselective binding approach, in-situ *wh*-words and the indefinites are treated as pure variables without any inherent quantificational force on their own and their interpretations depend only on the unselective binder that binds them. The analysis of *wh*-in-situ for Chinese proposed in Tsai (1994) is based on the unselective binding approach. Huang (1982) and Cheng (1991) show that Chinese *wh*-words behave like polarity items in that when a *wh*-item appears in a *yes-no* question (cf. 6a) or in an *if*-conditional clause (cf. 6b), it gets an existential reading and when it appears in a negative context (cf. 6c) or in the scope of a non-factive verb (cf. 6d), it is ambiguous between an interrogative reading and an existential reading. When the *wh*-word appears on the left side of the adverb *dou* 'all', traditionally treated as a universal quantifier, it gets a universal reading, as shown in (6e).

(6) a. Ta chi-le shenme **ma**? Yes-no *question*
he eat-Perf what Q$_{yes\text{-}no}$
'Did he eat anything ?' (∃)

b. **Ruguo** ni xiang chi shenme jiu gaosu wo. If-*conditional*
if you want eat what then tell me
'If you want to eat anything, tell me then!' (∃)

c. Ta **mei** chi shenme *Negation*
he Neg eat what
'What didn't he eat?' (Q)
'He did not eat anything.' (∃)

d. Zhangsan **renwei** ta mai-le shenme *Non-factive verbs*
Zhangsan think he buy-Perf what
'What does Zhangsan think that he bought?' (Q)
'Zhangsan thought that he bought something.' (∃)

e. Ta shenme **dou** chi. Dou-*quantification*
he what all eat
'He eats everything.' (∀)

In English, the negative polarity item *any* is licensed in the same contexts.

(7) a. Did you meet anyone? Yes-no *question*
b. I didn't eat anything. *Negation*

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c. If you have any idea, please let me know. If-*conditional*

Therefore, Cheng (1991) treats Chinese *wh*-words as polarity items. In a simple *wh*-question as (8), it is the sentence-final particle *ne* that contributes the interrogative force to the question and *ne* is analyzed as a true operator that binds the in-situ *wh*-word as variable. For Cheng, every clause should be syntactically or morphologically typed. English *wh*-questions are typed by *wh*-movement, and Chinese *wh*-questions are typed by the "typing particle" *ne*. This hypothesis is called "Clausal Typing Hypothesis".

(8) Ni chi shenme (ne)?
you eat what NE
'What do you eat?'

This hypothesis attempts to establish a tight relationship between the syntactic form of a clause-type and its semantic interpretation; it also requires a direct mapping between syntax and semantics. Specifically, each syntactic form corresponds to a single semantic interpretation and each semantic reading is considered as an unambiguous output of the computational system. This implies that the output of the computational system should not be ambiguous at interfaces. As the reader will see later, this is a very important assumption in my analysis.

Tsai (1994) proposes that *wh*-nouns are intrinsically variables bound by a null interrogative operator Op that is generated in the widest sentential scope position. Op is considered as the null counterpart of the *wh*-typing particle *ne* (*à la* Cheng 1991) and behaves like an unselective binder that binds all of the variables under its scope. Since the binary binding construal between Op and the in-situ *wh*-word is realized at the sentential level, no island effect is observed, as demonstrated in (9).

(9) [$_{CP}$ Op$_i$ [$_{TP}$ Ni xihuan [$_{NP}$ [$_{CP}$ shei$_i$ xie de [$_{N°}$ shu]]]]]? (S-S/ LF)
you like who write DE book
'For which person x, such that you like the books that x wrote?'

Reinhart (1997, 2006) discusses respectively the problems posed by QR and by unselective binding mechanism. The general criticism on the unselective binding approach is based on a semantic interpretation problem known as "Donald Duck problem". Instead, Reinhart proposes a Choice Function mechanism to capture correctly the scope effects of the indefinites and of the *wh*-in-situ. The crucial claim is that the traditional ECP asymmetry between a *wh*-argument and a *wh*-adjunct should be reformulated more precisely as an asymmetry between a *wh*-noun and a *wh*-adverb in a general fashion. Adopting the choice function mechanism, Tsai (1994) correctly resolves the ECP asymmetry in Chinese by assuming that only *wh*-adverbs are intrinsically operators and systematically undergo LF-movement that obeys island conditions, as shown in (10).

(10) a. * Ni xihuan Luxun weishenme xie de shu? (S-S)
you like Luxun why write DE book
'For what reason x, such that you like the books that Luxun wrote for x?'

b. *[$_{CP}$ weishenme$_i$ [$_{TP}$ Ni xihuan [$_{NP}$ [$_{CP}$ Luxun t$_i$ xie de [$_{N°}$ shu]]]]]? (LF)
why you like Luxun write DE book
'For what reason x, such that you like the books that Luxun wrote for x?'

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Different analyses on indefinites and on *wh*-in-situ in English are summarized in Table 1 and some of the previous analyses of *wh*-in-situ in Chinese that I presented in this section are summarized in Table 2.

Interpretation mechanisms	**Indefinites**	***Wh*-in-situ**
LF-movement (QR)	Chomsky (1977)	Higginbotham & May (1981)
Unselective Binding	Heim (1982)	Baker (1970), Pesetsky (1987)
Choice Functions	Reinhart (1997)	Reinhart (1998)

Table 1

Nature of *wh*-words	**Interpretation mechanism**	
Operators	LF-movement of *wh*-words to the scope position.	Huang (1982)
Polarity items	Typing particle *ne* binds the in-situ *wh*-word.	Cheng (1991)
Wh-nominals: variables *Wh*-adverbs: operators	- Null operator 'Op' generated in the scope position binds unselectively the in-situ *wh*-nouns as variables; - *Wh*-adverbs undergo LF-movement.	Tsai (1994)

Table 2

1.2 Main proposals

The analyses based on a null operator binding of the *wh*-in-situ relatively rely on the morphological existence of the so-called *wh*-typing particle *ne* that is taken as the counterpart of the null Q operator in Cheng (1991) or as the counterpart of Op in the sense of Tsai (1994). However, the non-interrogative semantic and pragmatic function of the particle *ne* have been extensively discussed by the scholars like Paris (1981), King (1986), Guo Wu (2005), Boya Li (2006), Paul (2014, 2015), Pan (2015a, b), Pan & Paul (2016) and Paul & Pan (*to appear*). Guo Wu (2005) argues that *ne* is a discourse particle that signals the adjustment of the sharing common ground between the co-speakers. These authors agree that *ne* does not contribute any interrogative force to questions. Namely, the fact that *ne* is compatible with questions does not necessarily imply that it transforms a declarative sentence into a question (*contra* Cheng 1991). Once we admit that *ne* is not an interrogative particle, the consequence is that it cannot function as a *wh*-typing particle and that it cannot bind the in-situ *wh*-word as variable. Thus, one important question is where the interrogative force of a *wh*-variable comes from if *ne* cannot provide it with the interrogative reading.

In this paper, I will present some empirical evidence to argue for the prosodic licensing of *wh*-in-situ analysis in Chinese. First, I will show that Chinese *wh*-words are underspecified and that they contain two features: [+Q] and [-Q]. The positive value (i.e. interrogative feature) is the default value and [+Q] is "weak" in the sense that it can be overruled by the negative value (i.e. non-interrogative) in "licensing contexts". In certain types of licensing contexts that create an ambiguity, a *wh*-word is ambiguous between [+Q] and [-Q]. The choice of the value depends on the prosodic form that is associated with the relevant sentence. A prosodic form can be treated as an overt phonetic realization of the relevant operator that binds the in-situ *wh*-word as variable. Such a mechanism is called "Prosodic Licensing of *wh*-in-situ". Technically, this analysis seems incompatible with the traditional T-model in which PF branch and LF branch are separated after Spell-Out. The analysis based on a prosodic licensing of *wh*-in-situ requires prosodic forms to be only realized after Spell-Out at PF and this will create a timing contradiction. Thus, the question is how these elements transferred to PF still affect the semantic interpretation at LF. My suggestion is that the relevant prosodic

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forms are generated as a part of the Lexicon before entering into the computation. During the computation process, even after "Transfer" takes place, these prosodic forms are still combined with the lexical items at LF. This analysis then ensures that at LF, prosodic elements can still be treated as the realization of the relevant operators that bind the in-situ *wh*-word as variable. We will explore this possibility in more detailed way in Section 2.3.1.

In my analysis, the interpretative ambiguity of the sentences such as those in (6) could be due to the imperfection of the computational system, but the optimal design of the human language makes it possible to repair such an imperfection by using prosody at interfaces. Different combinations of the word stress with the prosodic forms construct a Reference-Set in the sense of Reinhart (2006). Each prosodic form only corresponds to one specific semantic interpretation and in this sense, no interpretive redundancy is created and the economy principle is not violated. Therefore, such a repair mechanism is tolerated by the computational system. My analysis also serves as evidence in support of the hypothesis of Reinhart. Prosodic licensing of *wh*-in-situ also makes the Clausal Typing Hypothesis proposed by Cheng (1991) function in a more general way. In addition to the morpho-syntactic typing, the prosodic typing is also a possibility to interpret a *wh*-question properly. This article is organized as follows. Section 2 is devoted for a detailed description of prosodic licensing of *wh*-in-situ in Chinese. I will also discuss the empirical consideration behind this analysis and its theoretical consequences in Section 3. Section 4 concludes the paper.

2. Prosodic licensing of *wh*-in-situ in Chinese

2.1 General consideration

As discussed in Section 1, previous studies show that Chinese *wh*-words are ambiguous between several possible readings in certain contexts, such as negative contexts, non-factive verb contexts and etc. In the ambiguous cases presented in (2), Tsai's (1994) solution is that *wh*-words are bound by a morphologically null operator unselectively to get an interrogative reading. From the point of view of processing, if this operator is morphologically and phonetically null, one wonders how the co-speaker can successfully identify such a sentence as a question. Let us take the following non-factive verb context for example,

(11) Zhangsan renwei Lisi mai-le shenme *Non-factive verbs*
Zhangsan think Lisi buy-Perf what
'What does Zhangsan think that Lisi bought?' (Q)
'Zhangsan thought that Lisi bought something. (∃)

If the PF representations of these two different readings in (11) are exactly the same, the co-speaker who heard such a sentence would have no way to get the correct interpretation. In other words, if the speaker who utters this sentence does not make any prosodic difference between these two readings, her/his co-speaker will not react appropriately with regard to the speaker's expectation because the co-speaker does not know whether s/he should interpret the *wh*-word as a question word or as an existential phrase. Crucially, the two readings can be differentiated by the corresponding prosodic contours in real conversational situations, as demonstrated in (12).

(12) a. Zhangsan renwei Lisi MAI-le shenme *Non-factive verbs*
Zhangsan think Lisi buy-Perf what
(Stress on the embedded verb *mai* 'buy'; no stress on the *wh*-word; neutral or slight falling intonation at the end of the sentence.)
'What does Zhangsan think that Lisi bought?' (Q)
Ok 'Zhangsan thought that Lisi bought something.' (∃)

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b. Zhangsan renwei Lisi mai-le shenme *Non-factive verbs*
Zhangsan think Lisi buy-Perf what
(No stress on the embedded verb *mai* 'buy'; no stress on the *wh*-word; slight rising intonation at the end of the sentence)
Ok 'What does Zhangsan think that Lisi bought?' (Q)
'Zhangsan thought that Lisi bought something.' (∃)

What (12a, b) show is that, on the one hand, each target reading is associated with a specific prosodic pattern and on the other hand, each specific prosodic pattern is associated with a single target reading. The mapping between prosody and semantics is strictly one-to-one. Let us compare (11) with (12). The observation based on (11) suggests that the mapping between syntax and semantics is not direct enough to disambiguate the *wh*-word in an ambiguous licensing context in that a specific syntactic form is not always sufficient to guarantee a unique output at LF. (12) demonstrates that iff such a syntactic form is associated with a specific prosodic contour, the sentence gets an unambiguous output at LF. From this perspective, the sentence in (11) is only ambiguous on its syntactic representation. In fact, all of the ambiguous cases presented in (6) can be systematically disambiguated by prosody, which is an important piece of empirical evidence supporting my analysis. I will come back to this point in detail in the next section.

A general consideration behind my analysis is that the illocutionary force of a sentence should be overtly indicated in case of ambiguity; otherwise, the output of the computational system is still ambiguous for the co-speaker, which is not a desirable situation. This consideration is based on the spirit of the Clausal Typing hypothesis in that every clause must be typed and that each syntactic type is associated with a single semantic interpretation or with a single type of illocutionary force. However, there is an important difference between my proposal and the original Clausal Typing hypothesis. In Cheng's (1991) sense, the clausal typing is only realized by means of morpho-syntax. Typologically, the typing realized by a morphological interrogative particle, such as in Chinese, and the typing realized by a syntactic *wh*-movement, such as in English, are two alternative ways to type a *wh*-question; these two ways of typing are equal and have the same status. As the reader will see in the next section, the prosodic typing of *wh*-in-situ that I will present does not have the same status as the morpho-syntactical typing. Prosodic elements intervene in ambiguous licensing contexts when the relevant sentence still remains ambiguous at interfaces because morpho-syntax fails to type it. From this point of view, the prosodic licensing of *wh*-in-situ only works as a last resort.

2.2 Underspecified *wh*-words

In the previous section, I assume that an illocutionary force should be overtly indicated either by morpho-syntax or by prosody; otherwise, the output of the computational system still remains ambiguous. In Chinese, it has been convincingly argued that the so-called particle *ne* is not a *wh*-question typing particle and that it cannot transform declarative sentences into questions (Paris 1981; King 1998; Guo Wu 2005; Boya Li 2006; Paul 2014, 2015; Pan 2015a, 2015b; Pan & Paul 2016; Paul & Pan *to appear*). It has also been observed in the example (8) that the presence of *ne* in a *wh*-question is never obligatory. Furthermore, the following examples show that *ne* is even compatible with declarative and exclamative sentences.

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(13) a. Ta zai kan dianshi ne.
he Prog watch television NE
'He is watching TV.'

b. Zhangsan hui zuo shi ne!
Zhangsan can write poem NE
'Zhangsan can (even) write poems!'

Clearly, the particle *ne* does not type the above sentences into questions. The concrete discourse function of *ne* has been extensively studied previously in the cited works and I will not go into the detail here. However, it is important to repeat that *ne* does not function as interrogative typing particle in Chinese.

Crucially, a simple *wh*-question can get an unambiguous question reading without any specific intonation.

(14) Ni xihuan shenme?
you like what
'What do you like?'

In (14), the in-situ *wh*-word *shenme* 'what' can get an interrogative reading without being licensed by any overt typing particle or prosodic contour; in other words, the *wh*-question in (14) is not typed morpho-syntactically or prosodically. Then the question is how such a question is typed. My assumption is that *shenme* 'what' in (14) bears an inherent interrogative feature, noted as [+Q]. The fact that this [+Q] value is systematically activated in simple *wh*-questions without any overt licensor suggests that the interrogative reading is a default reading of *wh*-words such as *shenme* 'what' in Mandarin. Second, it is also observed that in the contexts such as *yes-no* questions, A-not-A question, *if*-conditionals and *dou* 'all'-quantification, a *wh*-word receives non-interrogative readings (cf. 6a, b, e). In these contexts, *wh*-words take a non-interrogative [-Q] value. Third, in the contexts with negation or with non-factive verbs (c.f. 6c,d), a *wh*-word is underspecified between the two values (i.e. [+Q] and [-Q]) and they can get either an interrogative reading or a non-interrogative reading. I call this type of contexts "ambiguous licensing contexts". In the next section, I will list other licensing contexts and examine the possible readings of *wh*-words.

Based on the above observation, I assume that *wh*-words in Chinese are inherently bi-value [±Q] elements in the sense that they are underspecified. The positive value [+Q] is their default reading because in a very simple sentence without any overt interrogative particle or any special prosodic contour or any licensing context, a *wh*-word gets an unambiguous interrogative reading. However, the [+Q] value is weak in the sense that it can be overruled in licensing contexts. When a *wh*-word appears in such a context, either it gets an unambiguous non-interrogative reading [-Q], such as in *dou*-quantification, *if*-conditionals and *yes-no* questions, or it is ambiguous between an interrogative reading and non-interrogative readings, such as in negative contexts or in non-factive verb contexts. In the latter case, only prosody can disambiguate the relevant sentences.

2.3 Licensing contexts

Previous studies have extensively discussed the nature of the in-situ *wh*-words, i.e. operators, variables or polarity items. However, the study merely on the nature of *wh*-words is not enough to account for the distribution of their different readings in a given context. The reason why they are unambiguous in certain contexts but ambiguous in the others still remains unexplained. The discussion on the nature of the in-situ *wh*-words is not enough to make a

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distinction between the contexts that permit such an ambiguity and those that do not. Whether a *wh*-word is ambiguous does not only depend on its status as variable but also depend on the contexts in which they appear and this leads me to make a distinction between different types of licensing contexts. As demonstrated earlier, these contexts do not have the same tolerance with regard to the ambiguity of the relevant *wh*-words. Based on this observation, I roughly divide them into two categories: the first type is called "unambiguous licensing contexts" in which a *wh*-word gets a unambiguous reading (i.e. only one reading), for instance, *if*-conditionals and *dou*-quantification; the other type is called "ambiguous licensing contexts" in which a *wh*-word is ambiguous between several possible readings, for instance, negative contexts and non-factive verb contexts. Let us now examine these two types of contexts.

2.3.1 Unambiguous licensing contexts

Huang (1982) shows that in *yes-no* questions, *if*-conditional clauses and A-not-A questions, a *wh*-word can get an existential reading and that in the sentences containing *dou*-quantification, it can get a universal reading. Importantly, in these contexts, the relevant *wh*-word cannot get any interrogative reading. I also found other contexts that share this property. For instance, when a *wh*-word is under the scope of *haoxiang* 'seem', it gets an unambiguous existential reading[1], as in (15).

(15) a. Ta **haoxiang** yijing chi-le shenme
he seem already eat-Perf what
'It seems that he has already eaten something.'

b. Ta **haoxiang** zai shenme difang ku ne.
he seem at what place cry NE
'It seems that she is crying somewhere.'

It seems difficult to maintain the idea that Chinese *wh*-words behave as polarity items because the contexts such as (15) are not the typical ones that license negative polarity items. Accordingly, it is more appropriate to say, at this stage, that a *wh*-word behaves as true variable in all of the unambiguous contexts. Its positive value [+Q] is overruled in these contexts and it obligatorily takes the [-Q] value. In this case, no special prosodic element is needed. Such an observation confirms that the prosodic licensing of *wh*-in-situ is only activated when the output of the computational system still remains ambiguous; by contrast, prosody does not intervene when no interpretative ambiguity is detected at LF. As an anonymous reviewer points out, the verb *kan-qi-lai* 'it looks/ it seems' behaves in a similar fashion.

(15') Akiu kaqilai [yijing chi-le shenme].
Akiu seem already eat-Perf what
Ok 'Akiu seems to have already eaten something.'
'What does Akiu seem to have already eaten?'

2.3.2 Ambiguous licensing contexts

2.3.2.1 Prosodic licensing of *wh*-in-situ

Previously examined contexts containing either negation or non-factive verbs are considered as ambiguous contexts in which a *wh*-word can receive several possible readings and only the

[1] In fact, an echo question reading is available in this case; however, an echo question reading is not considered as a true interrogative reading because it is not interpreted as an information-seeking question.

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prosodic contours can disambiguate them (cf. 12). I will list more ambiguous contexts in this section. (16) demonstrates a progressive aspectual sentence containing a *wh*-word, and this sentence is four ways ambiguous.

(16) a. Ta zai chi-zhe shenme ?
he Prog eat-Dur what
(no stress on the verb ; no stress on the *wh*-word but a slight rising intonation at the end of the sentence)[2]
'What is he eating?' (*Interrogative reading*)

b. Ta zai **CHI**-zhe shenme.
he Prog eat-Dur what
(a stress on the verb *chi* 'eat' and a falling intonation or a neutral intonation at the end of the sentence)
'He is eating something.' (*Existential reading*)

c. Ta zai chi-zhe **SHENME** !
he Prog eat-Dur what
(a stress on the *wh*-word and a falling intonation at the end of the sentence)
'What he is eating! (It smells bad!)' (*Exclamative reading*)

d. **TA** zai chi-zhe shenme ?!
he Prog eat-Dur what
(a stress on the subject *he* and a falling or a neutral intonation at the end of the sentence)
'What is HE eating?! = He is eating nothing!' (*Rhetorical question*)

Another ambiguous context is built on the quantified phrase (*yi*)*dianr* 'a little of'.

(17) a. Ta xiang **HE** dianr shenme.
he want drink a.little what
(a stress on the verb *he* 'drink' and a falling intonation or a neutral intonation at the end of the sentence)
'He wants to drink something.' (*Existential reading*)

b. Ta xiang he dianr shenme ?
he want drink a.little what
(no stress on the verb ; no stress on the *wh*-word but a rising intonation at the end of the sentence)
'What does he want to drink ?' (*Interrogative reading*)

[2] The rising intonation is not systematical with the interrogative reading; many native speakers do accept a flat intonation with the Q-reading. For those who need such an intonation, they also prefer a slight rising contour.

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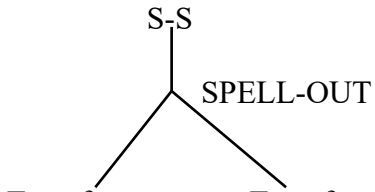
In an ambiguous context, the weak default positive value [+Q] is overruled and the relevant *wh*-word still remains underspecified between the two values (i.e. [+Q] and [-Q]). This type of context is not quantificationally "strong enough" to provide a sentence with a single operator to bind the *wh*-word. In this case, prosody is activated as a last resort to disambiguate the sentence. Prosodic forms can be treated either as the overt realization of the relevant operators or as the triggers that activate the unselective binders in Tsai's (1994) sense. The mechanism that establishes the licensing relationship between the corresponding prosodic forms and the relevant *wh*-words is called "prosodic licensing of *wh*-in-situ". Prosodic licensing is only activated when a single syntactic form is not sufficient to generate different interpretations at LF in a given context. However, this analysis encounters a technical difficulty in the traditional T-model. As shown in the following diagram, the PF branch and the LF branch are departed after the point of Spell-Out. Prosodic forms are only realized after Spell-Out at the PF side. A potential problem is how the prosodic elements located at PF influence the interpretation at LF. Technically, there is no direct mapping relationship between these two branches after Spell-Out.



(Prosodic elements) --? --> (Unambiguous interpretation)

A possible solution is to allow these prosodic forms to be generated in the Lexicon before the numeration process begins. In this sense, word stress and the sentential intonation enter into the numeration as a part of the Lexicon in the computational system. Different combinations of the word stress with the intonation construct the Referent-sets in the sense of Reinhart (2006). During the computation, even after the Transfer operation, these prosodic elements are still combined with the lexical items at LF; therefore, they can still be treated as an overt realization of the relevant operators that bind the in-situ *wh*-word and give it the corresponding readings. Concretely, each of the sets corresponds to one and only one specific semantic interpretation, and this guarantees a single output at interfaces. Let us take (16) for example. The four referent-sets are given in (18)[3].

(18) a. {ta, zai, chi, zhe, shenme, ↑} ➔ Q (16a)
b. {ta, zai, CHI, zhe, shenme, →} ➔ ∃ (16b)
c. {ta, zai, chi, zhe, SHENME, ↓} ➔ ! (16c)
d. {TA, zai, chi, zhe, shenme, ↓} ➔ Q! (16d)

Importantly, (18a-d) are four different sets of Lexicon. After Spell-Out, prosodic elements are transferred to the PF branch with the phonetic form of the lexicon. This analysis ensures that each LF output corresponds to a single fixed PF output; and therefore, the output of the computational system is not anymore ambiguous at interfaces. The following diagram illustrates the existential reading in (18b).

[3] Capitalized words are stressed; ↑= rising intonation; → = neutral intonation; ↓ = falling intonation.

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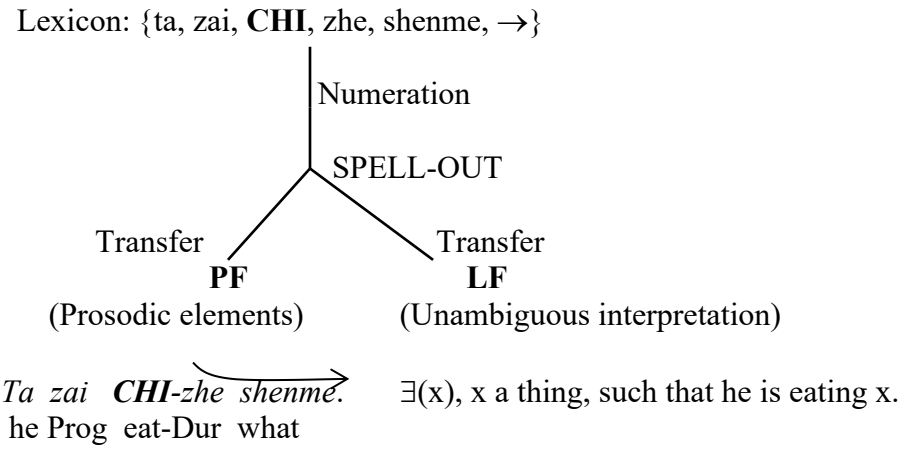

One important question is whether the introduction of stress patterns in the Lexical Array violates the Inclusiveness condition in the Minimalist Program (Chomsky 2000, 2001). This condition says that no new elements (objects, features) are introduced in the course of computation apart from rearrangements of lexical properties (in particular, no indices, no traces, or levels in the sense of X-bar theory, etc.) Treating prosodic elements as features associated to lexical items does not really violate the Inclusiveness condition in that all of the prosodic features already exist as a part of lexical items in the Lexical Array before the process of the numeration begins. Therefore, no new element is introduced during the derivation.[4] According to Legibility conditions, the expressions generated by the Faculty of Language (FL) must be "legible" to systems that access these objects at the interface between FL and external systems, for instance the Articulatory-Perceptual system and Conceptual-Intentional system. Under such a consideration, the Strong Minimal Thesis treats language as an optimal solution to interface conditions that Language Faculty must satisfy in that language is an optimal way to link sound and meaning, thus, an optimal solution to Legibility conditions (Chomsky 2000, 2001, 2004, 2008). As will be detailed immediately below, these phonological features associated with lexical items directly contribute to semantic interpretation at the C-I system; therefore, they satisfy Legibility conditions. As a result, they do not violate the Inclusiveness condition.

Prosodic licensing is costly in the sense of Economy Principle, but how come can the computational system tolerate such a mechanism? My answer to this question is inspired by the notion of "repair system" in the sense of Reinhart (2006). The idea is that when a syntactic form is not sufficient to generate different semantic interpretations at LF, some other mechanisms will be activated, such as QR viewed as a Scope Shift operation and Main Stress shift. These mechanisms are treated as repair systems in the sense of Reinhart. In her analysis of English focus structure, Main Stress Shift is an operation that creates different focus patterns and each of these stress patterns corresponds to one and only one specific focus structure; meanwhile, each focus structure corresponds to one and only one specific semantic reading. Different stress patterns construct a Reference-Set. The mechanisms are costly in the sense of Economy Principle; however, the computational system can still tolerate them since they do not create any interpretation redundancy. Similarly, in my analysis, different prosodic elements combined with sentence intonation and word stress generate different semantic interpretations at LF. Prosodic elements trigger the relevant operators, such as the interrogative operator, the existential quantifier and etc., to bind the in-situ *wh*-variables and give them the corresponding readings. The relationship between a prosodic pattern and a

[4] As one of the anonymous reviewers suggests, an alternative analysis is that prosodic elements form a prosodic structure (cf. Zubizarreta 1998).

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semantic interpretation is strictly one-to-one. From this perspective, the prosodic licensing of *wh*-in-situ can also be treated as a repair mechanism in the sense of Reinhart (2006). Therefore, no interpretation redundancy is created and the economy principle is not violated. Such a repair mechanism is thus tolerated by the computational system. My analysis thus serves as evidence in support of the hypothesis of Reinhart.

The idea that it is the prosodic elements that license *wh*-in-situ is not new. Cheng & Rooryck (2000) argue that *wh*-in-situ in French is licensed by a specific intonational morpheme on Syntax, labeled as [Q:__]. The underspecified intonational morpheme Q licenses both *yes-no* questions (cf. 19a) and *wh*-in-situ questions (cf. 19b). The Q morpheme analysis is also supported by the existence of the lexicalized interrogative phrase *est-ce que* 'is it that'. In French, *est-ce que* is placed in the sentence initial position and it transforms declarative sentences into *yes-no* questions. In their analysis, *est-ce que* is taken as a lexicalized item that is phonetically realized as [ɛsk], as shown in (19c). Cheng & Rooryck observe a strong parallel between the function of *est-ce que* and that of the intonational morpheme [Q:__]. Thus, [ɛsk] (*est-ce que*) is treated as the phonetically overt counterpart of the Q morpheme. They claim that (19a), (19b) and (19c) show the same intonational pattern.

(19) a. [Q:__] Jean a acheté un livre?
Jean has bought a book
'Has Jean bought a book?'
* 'Jean has bought a book.'

b. [Q:__] Jean a acheté quoi?
Jean has bought what
'What has Jean bought ?'

c. **Est-ce que** Jean a acheté un livre?
is-it that Jean has bought a book
'Has Jean bought a book?' Cheng & Rooryck (2000)

Analyses based on a similar prosodic licensing can be found in Krein (2007). A recent joint experimental work by Sichel-Bazin, Buthke & Meisenburg (2012) shows that prosody plays a crucial role in the licensing of different types of *wh*-constructions in French. Ishihara (2005) observes that prosody can mark the scope of *wh*-in-situ questions in Tokyo Japanese. Her analysis also provides us with a piece of cross-linguistic evidence to support the analyses of *wh*-in-situ based on a prosodic licensing. In Mandarin, prosody does not necessarily mark a wide or a narrow scope of the in-situ *wh*-words; however, it triggers the relevant operators that are able to bind the *wh*-words as variables.

2.3.2.2 ∃ and Q readings

An ambiguous licensing context permits the existential, interrogative, exclamative, rhetorical and echo question readings of the relevant *wh*-word under certain prosodic forms. I will concentrate on the distribution and the generation of the ∃-reading and of the Q-reading in this section.

Every licensing context (both ambiguous and unambiguous contexts) has its "key element", for instance, *ruoguo* 'if' is the key element of an *if*-conditional clause and a negative context has a negative word as its key element. I will show that there is a close relationship between the syntactic position of the existential quantifier generated in these licensing contexts and the position of the key elements of these contexts. Iff a *wh*-word appears in the c-command domain of the key element, the former is considered to be within

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such a context. This precisely excludes the case where the *wh*-word and the key element appear in the same sentence but the latter does not c-command the former. Under such a consideration, if we take the contexts in which the key elements are located at T' level for example, subjects, direct objects and adverbials are not expected to behave uniformly. This is because subjects are higher than T' and objects are lower than T'. There are different positions for adverbials; some are higher than T' and the others are lower.

Let us examine an ambiguous licensing context created by probability adverbs, such as *keneng* 'probably', *yexu* 'perhaps', *dagai* 'probably' and etc. Under the scope of these adverbs, a *wh*-word is ambiguous between an existential reading and an interrogative reading. Probability adverbs are located at T' level; they scope over direct objects and VP-level adverbials. By contrast, they do not scope over subjects. Therefore, in a context containing a probability adverb, we only expect an ambiguity from *wh*-objects or from VP level *wh*-adverbials but not from *wh*-subjects. This prediction is borne out, as shown in (20). In the following examples, instead of showing prosodic contours in a detailed way, I will only indicate whether the target reading needs or not a specific prosody.

(20) a. Ta yi-ge ren **dagai** hui qu <u>shenme difang</u>
she one-Cl persone probably would go what place
'She would probably go somewhere alone (for relaxing…)' (∃) with prosody
'Where would she probably go alone?' (Q) with prosody

b. Ta **keneng** hui zai <u>shenme difang</u> ku
she probably would at what place cry
'She is probably crying somewhere.' (∃) with prosody
'Where is she probably crying?' (Q) with prosody

c. <u>Shei</u> **keneng** hui lai ?
who probably will come
'Who will come probably?' (Q) <u>without</u> prosody
'Someone will come probably .' (∃)

In (20a), the post-verbal complement *shenme difang* 'what place' is in the scope of the probability adverb *dagai* 'probably' and with the corresponding prosodic contours, the former gets either an existential reading *somewhere* or an interrogative reading *where*. Similarly, in (20b), the VP pre-verbal adverbial *zai shenme difang* 'at what place' is also ambiguous between an existential reading and an interrogative reading. By contrast, the *wh*-subject *shei* 'who' in (20c) is not in the scope of the adverb *keneng* 'probably' and it cannot get an existential reading. These examples show that in an ambiguous context, the existential reading always needs a prosodic contour and that the existential quantifier ∃ is triggered by probability adverbs. The c-command domain of these adverbs overlaps with the scope of the ∃ quantifier. As for the interrogative reading Q in an ambiguous context, such a reading is always available; however, we must make a distinction between two sub-cases. When a *wh*-word is generated within the scope of a probability adverb (cf. 20a, b), the corresponding interrogative reading requires an appropriate prosodic form; by contrast, when the former is generated outside the scope of the latter (cf. 20c), an interrogative reading is also available but without requiring any specific prosodic contour. In the latter case, such an interrogative

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reading is in fact the default reading of the *wh*-word itself and the *wh*-word takes its inherent positive value [+Q].[5]

A subset of matrix verbs can also trigger the existential closure that allows an in-situ *wh*-word to get an ∃-reading. Here are some more examples to support this observation. Recall Huang's (1999) treatment of long passives in Chinese, where *bei* is considered as a matrix verb that takes a clausal complement. The following example shows that passive constructions also create an ambiguous licensing context.

(21) a. Zhangsan **bei** shenme zhuang-le yi-xia
Zhansan Passive what bump-Perf once
'Zhangsan was bumped by something.' (∃) with prosody
'Zhangsan was bumped by what?' (Q) with prosody

b. Zhangsan shenmeshihou **bei** men zhuang-le yi-xia
Zhangsan when Passive door bump-Perf once
* 'Zhangsan was bumped by a door sometime.' (*∃)
'When was Zhangsan bumped by a door?' (Q) without prosody

In (21a), the *wh*-word *shenme* 'what' is generated in the scope of the passive verb *bei*; thus, *shenme* is considered to be within the passive licensing context. *Shenme* keeps its underspecified bi-values [±Q] and the relevant sentence is ambiguous between an existential reading and an interrogative reading. Each of these readings needs a specific prosodic contour respectively. The prosodic form that licenses the ∃-reading activates the [-Q] value of *shenme* 'what' and the one that licenses the Q-reading activates the [+Q] value of the *wh*-word. Importantly, the Q-reading triggered by prosody in this case is not the default interrogative reading of the relevant *wh*-word itself. By contrast, the *wh*-adverbial *shenme shihou* 'when' in (21b) is generated outside the scope of the passive verb *bei* and the former is thus not considered to be within the licensing context created by passives. Recall that when a *wh*-word is not located within a licensing context, such a *wh*-word is considered to be in an ordinary simple context where its default positive value [+Q] is activated. This is precisely the reason why the interrogative reading of *shenme shihou* 'when' in (21b) does not require any specific prosodic form to be associated with. Such an interrogative reading is the default Q-reading of the *wh*-word itself. More examples are given below to show that certain matrix verbs can trigger the existential closure to license the indefinite reading of *wh*-variables. As demonstrated earlier, previous studies show that a *wh*-word is ambiguous in the contexts containing non-factive verbs. Since a non-factive verb usually takes a subordinate clause as complement, I will examine the distribution of the ∃-reading and of the Q-reading of the relevant *wh*-word when it appears in the main clause and in the embedded clause respectively.

(22) *Wh*-object of the embedded clause
Ta **juede** [wo ma-le shei]
he think I insult-Perf who

[5] Adverbs such as *keneng* 'probably' and verbs such as *haoxiang/kan-qi-lai* 'it seems' express an epistemic modality; however, as one of the reviewers points out, the former permits both the existential reading and the interrogative reading; while the latter only permits the existential one. The contrast between these two types of elements is morpho-syntatic. Namely, *haoxiang* 'seem' is a matrix verb that seals off its complement with some form of existential closure, which in turn licenses the obligatory indefinite reading of the *wh*-in-situ in question. By contrast, *dagai* is only a sentential adverb which does not has this kind of property and therefore, it allows the alternative interrogative interpretation. More discussion on the relationship between the adverbs of probability and the existential force can be found in Lin (1996).

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'He thought that I had insulted someone.' (∃) with prosody
'Who did he think that I had insulted?' (Q) with prosody

(23) *Wh*-subject of the embedded clause
Ta **yiwei** [shei da-le Zhangsan]
he think who hit-Perf Zhangsan
'He thought that someone hit Zhangsan.' (∃) with prosody
'Who did he think that hit Zhangsan?' (Q) with prosody

(24) *Wh*-adverbial of the embedded clause
Zhangsan **renwei** [Lisi zai nali xue-guo fawen]
Zhangsan think Lisi at where learn-Exp French
'Zhangsan thought that Lisi had learnt French somewhere.' (∃) with prosody
'For what place x, such that Zhangsan thought that Lisi had learnt French at x?'
(Q) with prosody

(25) *Wh*-subject of the main clause
Shei renwei [ni tou-le qian]
who think you steal-Perf money
* 'Someone thought that you had stolen the money.' (*∃)
'Who thought that you had stolen the money ?' (Q) without prosody

(26) *Wh*-adverbial of the main clause
Zhangsan shenmeshihou juede [ta-ziji shangdang-le]
Zhangsan when think he-himself be-fooled-Perf
* 'Zhangsan felt that he was fooled sometime/once.' (*∃)
'When did Zhangsan feel that he was fooled ?' (Q) without prosody

The *wh*-object *shei* 'who' in (22), the *wh*-subject *shei* 'who' in (23) and the *wh*-adverbial *zai nali* 'where' in (24) are located in the embedded clause and are in the scope of a non-factive verb in each sentence. Thus, they appear within an ambiguous licensing context and they are ambiguous between an existential reading and an interrogative reading. Each of these two readings needs a corresponding prosodic contour. The *wh*-subject *shei* 'who' in (25) and the *wh*-adverbial *shenme shihou* 'when' in (26) of the main clause are located outside the scope of non-factive verbs and therefore, they can only get an unambiguous Q-reading. Since this Q-reading is the default interrogative reading of the relevant *wh*-words themselves, it does not require any specific prosodic contour to be associated with. A licensing context containing the verb *pa* 'be afraid of' behaves in a similar way as shown in (27-31).

(27) *Wh*-object of the embedded clause
Ta-baba **pa** [ta zuo-cuo-le shenme]
his-dad be-afraid he do-wrong-Perf what
'His father is afraid that he did something wrong.' (∃) with prosody
'For what x, such that his father is afraid that he did x?' (Q) with prosody

(28) *Wh*-subject of the embedded clause
Ta **pa** [shei hui da Zhangsan]
he be-afraid who will hit Zhangsan
'He is afraid that someone will hit Zhangsan .' (∃) with prosody
'For what person x, such that he is afraid that x will hit Zhangsan?' (Q) with prosody

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(29) *Wh*-adverbial of the embedded clause
Ta zui **pa** [ni shenme shihou hui likai ta]
he most be-afraid you when will leave him
'He is most afraid [that you will leave him sometime].' (∃) with prosody
'For what time x, such that he is most afraid [that you will leave him at x]?'
(Q) with prosody

(30) *Wh*-subject of the main clause
Shei **pa** [Zhangsan hui chidao]
who be-afraid Zhangsan will be-late
'Someone is afraid that Zhangsan will be late.' (∃)
'Who is afraid that Zhangsan will be late?' (Q) without prosody

(31) *Wh*-adverbial of the main clause
Ta shenmeshihou zui **pa** [ni likai ta]
he when most be-afraid you leave him
'He is most afraid sometime [that you will leave him].' (∃)
'For what time x, such that he is most afraid at x [that you will leave him]?'
(Q) with prosody

One more argument in support of the prosodic licensing of *wh*-in-situ comes from the so-called islands. Certain islands behave like ambiguous licensing contexts. (32)-(34) illustrate three types of strong islands for *wh*-movement: complex NP islands, such as the complement clause of noun in (32), the relative clause in (33), and adjunct islands, such as the temporal clause in (34). In Chinese, *wh*-nominals do not give rise to any island effect and the wide scope interrogative reading survives (cf. Tsai 1994). In fact, when a *wh*-nominal appears within islands, it can get either an interrogative reading or an existential reading. Both readings require the corresponding prosodic contours. Accordingly, these three types of islands behave exactly like any other ambiguous context that we examined.

(32) *Complement clause of noun*
[Zhangsan da-si-le shenme ren] de yaoyan shi zhende
Zhangsan beat-die-Perf what person DE rumor is true
'For what person x, the rumor that Zhangsan beat x to death is true?' (Q) with prosody
'The rumor that Zhangsan beat someone to death is true.' (∃) with prosody

(33) *Relative clause*
Zhangsan yudao-le [zuotian zai shangdian-li
Zhangsan meet-Perf yesterday at shop-in
ba shenme da-sui-le] de na-ge ren
BA what break-Perf DE that-Cl person
'For what x, such that Zhangsan met the person who broke x into pieces in the shop yesterday?' (Q) with prosody
'Zhangsan met the person who broke something into pieces in the shop yesterday.'
(∃) with prosody

(34) *Temporal clause*
Zhangsan [kandao shei de shihou] jiu hui lian hong
Zhangsan see who DE moment then will face red

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'For what person x, such that when Zhangsan meets x, his face turns red?'
(Q) with prosody
'When Zhangsan meets someone, his face turns red.' (∃) with prosody

Let us summarize the distribution of the existential reading and of the interrogative reading in an ambiguous licensing context. For the ∃-reading, if the *wh*-element is located within the scope of the key-element of an ambiguous licensing context, it is possible for the relevant *wh*-word to get an existential reading and such an ∃-reading always requires a specific prosodic contour to be associated with. In this case, the *wh*-word takes its inherent negative value [-Q]. By contrast, if the *wh*-word is located outside the scope of the key-element, it cannot get the existential reading. As for the Q-reading, if the *wh*-element is located within the scope of the key-element, it is possible for this *wh*-word to get an interrogative reading and this Q-reading requires a specific prosodic contour. If the *wh*-word is located outside the scope of the key-element, it can also get an interrogative reading; however, in this case, the Q-reading is the inherent default interrogative reading of the *wh*-word itself and such a reading does not require any specific prosodic form to be associated with. In this case, the relevant *wh*-word takes its inherent positive value [+Q]. Table 3 summarizes this part.

	Within the c-command domain	**Outside the c-command domain**
∃	yes (+ prosody): prosodic licensing	no
Q	yes (+ prosody): prosodic licensing	yes (-prosody): by its default interrogative reading

Table 3 Distribution of the ∃ and Q readings in an ambiguous context

Another way to interpret Table 3 is that iff a *wh*-word is generated within the scope of the key element of an ambiguous licensing context, such a *wh*-word is considered to be within this context and it keeps its underspecified bi-values [±Q]. In this case, both the ∃-reading and the Q-reading are possible under the prosodic licensing. By contrast, when the relevant *wh*-word is located outside the scope of the key element, such a *wh*-word is not considered to be within this licensing context and in this case, only the weak inherent default positive value [+Q] is activated. Table 4 gives a general view of the distribution of the ∃-reading and of the Q-reading in the three types of contexts that we examined.

		∃	**Q**
Simple context		*	√ (- prosody)
Unambiguous licensing contexts		√ (- prosody)	*
Ambiguous licensing contexts	*Wh* is in the scope of the key element	√ (+ prosody)	√ (+ prosody)
	Wh is outside the scope of the key element	*	√ (- prosody)

Table 4 Distribution of the ∃ and Q readings in three types of the licensing context

It is not surprising to see that in Table 4, both the ∃ and the Q readings have exactly the same distribution in a simple context as in an ambiguous context when the *wh*-word is outside the c-command domain of the key element.

2.4 *Wh*-topicalization argument

In the previous section, we observed that unambiguous contexts are quantificationally strong in the sense that on the one hand, they require a *wh*-word in the scope of the key element and on the other hand, they do not permit the relevant *wh*-word to get more than one reading. We have also observed that when a *wh*-word is located in the scope of the key element of an

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ambiguous context, it can get several possible readings. Tang (1998), Wu (1999), Pan (2011, 2014, 2015) argue that in some cases, a *wh*-phrase can be fronted to the left periphery and that the nature of this fronting is topicalization. I will not repeat their reasoning here; however, I would like to point out that if this *wh*-phrase is topicalized to the left periphery from a licensing context, it will be extracted outside the scope of the key element of this context and such an extraction would cause different results in the two types of licensing context. Concretely, if a *wh*-phrase is topicalized out of an unambiguous context, the prediction is that the sentence will be ungrammatical since an unambiguous context obligatorily requires a *wh*-word in the scope of the key element. However, if the relevant *wh*-phrase is topicalized out of an ambiguous context, the prediction is that the relevant *wh*-phrase is not anymore ambiguous between an ∃-reading and a Q-reading and that it can only get a Q-reading. This interrogative reading does not need any specific prosodic licensor because it is the inherent Q-reading of the *wh*-word itself.

Let us now examine the unambiguous contexts. (35) and (36) show that when a *wh*-phrase is topicalized to the left periphery, thus out of the scope of the key elements (i.e. the *yes-no* question particle *ma* and the A-not-A element) of these two sentences respectively, the sentences become ungrammatical. According to Huang (1982), the *yes-no* question particle *ma* and the A-not-A form trigger the existential quantifier at VP level[6]. In (35b) and (36b), after the topicalization of the relevant *wh*-words, the existential quantifier ∃ binds no variable within its scope and the sentence becomes ungrammatical due to a vacuous quantification. On the other hand, the topicalized *wh*-phrases cannot get an interrogative reading either because the sentence cannot be interpreted both as *wh*-question and as *yes-no* question simultaneously. Traditionally, it has been described that two different types of illocutionary forces cannot co-exist.

(35) *Yes-no* questions with the interrogative particle *ma*

a. [$_{CP}$ [$_{TP}$ Ta [$_{T'}$ chi-le $\exists_x$ [shenme dongxi]$_x$]] ma]?
he eat-Perf what thing $Q_{yes/no}$
'Did he eat anything?' (∃)

b. *[$_{TopP}$ [Shenme dongxi]$_j$, [$_{CP}$ [$_{TP}$ ta chi-le $\exists_x$ t_j] ma]]
what thing he eat-Perf $Q_{yes/no}$

(36) A-*not*-A questions

a. [$_{CP}$ [$_{TP}$ Ta [$_{T'}$ zuotian yu-mei-yujian $\exists_x$ [shenme ren]$_x$]] ?
he yesterday meet-not-meet what person
'Did he meet anybody yesterday?' (∃)

b. *[$_{TopP}$ [Shenme ren]$_j$, [$_{CP}$ [$_{TP}$ ta zuotian yu-mei-yujian $\exists_x$ t_j]]]
what person he yesterday meet-not-meet

The same observation is obtained in the context containing the verb *haoxiang* 'seem'. In (37b), the *wh*-phrase *zai shenme difang* 'at what place' is topicalized out of the scope of *haoxiang* 'seem', the sentence becomes ungrammatical.

(37) a. [$_{TP}$ Ta [$_{T'}$ haoxiang $\exists_x$ [zai shenme difang]$_x$ xue-guo fayu]] .
he seem at what place study-Exp French

[6] Huang (1982) shows that the subject in the position of [Spec, IP] can never get an existential reading. Thus, he assumes that the existential quantifier cannot scope over the subject and that ∃ cannot be higher than VP.

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'Il seems that he had already studied French somewhere.' (∃)

b. *[$_{TopP}$ [Zai shenme difang]$_j$, [$_{TP}$ ta [$_{T'}$ haoxiang $\exists_x$ t_j xue-guo fayu]]]
at what place he seem study-Exp French

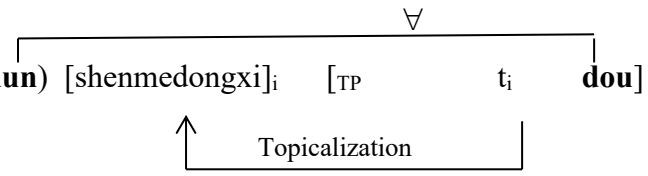
Let us turn to *dou*-quantification cases. *Dou* 'all' is treated as a universal quantifier that has a strong quantificational force and it scopes over the variable on its left. A prediction is that if we topicalize the *wh*-phrase out of the scope of *dou* 'all', the sentence will be ungrammatical due to a vacuous quantification. However, the grammaticality of (38b) seems to suggest that this prediction is wrong.

(38) a. Ta shenme dongxi dou xihuan chi.
he what thing all like eat
'He likes eating everything.' (∀)

b. [Shenme dongxi]$_j$, ta t_j dou xihuan chi.
what thing he all like eat
'He likes eating everything.' (∀)

Even though the *wh*-phrase *shenme dongxi* 'what thing' is topicalized to the left periphery, the sentence is still grammatical and it seems that the above prediction is not borne out. The scope of the universal quantifier *dou* 'all' is its left side; however, the left boundary of the scope of the *dou*-quantification is not syntactically marked. Therefore, when the relevant *wh*-phrase is topicalized, it is still not clear whether it completely moves out of the scope of *dou* 'all'. In fact, the full form of the so-called *dou*-quantification is *wulun*…*dou* 'no matter…all' and the presence of *wulun* 'no matter' is not obligatory. Lin (1996) discusses in great detail the semantics of *wulun* 'no matter'. In syntax, I suggest that *wulun* 'no matter' should be treated as the marker of the left edge of the scope of *dou* 'all'. One possible account for the grammaticality of (38b) is that even if the *wh*-phrase is topicalized, it still stays on the right side of the implicit *wulun* 'no matter' (cf. 39); therefore, such a *wh*-phrase still remains within the scope of *dou* 'all'. This can then explains the fact that *shenme dongxi* 'what thing' still gets a universal reading.

(39) a. (**Wulun**) [shenme dongxi]$_j$, ta t_j **dou** xihuan chi.
no-matter what thing he all like eat
'He likes eating everything.'



By contrast, if we keep the explicit *wulun* 'no matter' in the original sentence and let the *wh*-phrase topicalize to the left side of *wulun* 'no matter' by forcing this *wh*-word to topicalize completely out of the scope of *dou* 'all', the sentence should be ungrammatical. (40) shows that this prediction is borne out.

(40) *[Shenme dongxi]$_j$, **wulun** t_j' ta t_j **dou** xihuan chi.
what thing no-matter he all like eat

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The observation on *dou*-quantification also confirms the hypothesis that a quantificationally strong licensing context obligatorily requires the presence of a *wh*-variable within the c-command domain of the key element of such a context. This context only permits one possible reading for the *wh*-variable. If this *wh*-phrase is topicalized out of the scope of the key element of the context, the sentence will become ungrammatical due to a vacuous quantification. As for the ambiguous contexts, when the *wh*-phrase stays in-situ in the c-command domain of the key element of the context, the sentence gets either an existential reading or a question reading, both of which need the corresponding prosodic forms, as indicated in the (a) cases in (41-43). When the relevant *wh*-phrase is topicalized out of the c-command domain of the key element of each context, such a *wh*-phrase is not anymore ambiguous and it can only get a Q-reading. This Q-reading is its default reading that does not require any prosodic form, as indicated in the (b) cases.

(41) Negation

a. Ta yi-ge ren **bu** gan qu *shenme difang*
she one-Cl person not dare go what place
'She dare not go anywhere alone.' (∃) with prosody
'For what place x, such that she dare not go to x alone?' (Q) with prosody

b. [Shenme difang]$_j$, ta yi-ge ren **bu** gan qu t_j
what place she one-Cl person not dare go
'There is some place x, such that she dare not go to x alone.' (∃)
'What place is the one that she dare not go to x alone?' (Q) without prosody

(42) Probability adverbs

a. Tamen-lia **kending** hui qu *shenme difang*
they-two certainly will go what place
'(Since you are not at home with them), they will certainly go somewhere together.'
(∃) with prosody
'Where will they certainly go together?' (Q) with prosody

b. [Shenme difang]$_j$, tamen lia **kending** hui qu t_j
what place they two certainly will go
'There is some place x, such that they will certainly go to x.' (∃)
'What place is the one where they will certainly go together?' (Q) without prosody

(43) Non-factive verbs

a. Dajia dou **juede** [Lisi zuotian qu-guo shenme difang]
everyone all think Lisi yesterday go-Exp what place
'Everyone thought that Lisi went somewhere yesterday.' (∃) with prosody
'Where did everyone think that Lisi went yesterday?' (Q) with prosody

b. [Shenme difang]$_j$, dajia dou **juede** [Lisi zuotian qu-guo t_j]
what place everyone all think Lisi yesterday go-Exp.
'There is some place x, such that everyone thought that Lisi went x yesterday.' (∃)
'What place (x) is the one that everyone thought that Lisi went to x yesterday?'
(Q) without prosody

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Note that topicalization of *wh*-phrases can only disambiguate a sentence containing an ambiguous context iff such a movement is not ruled out by locality constraints nor by any other independent restriction; otherwise, the sentence becomes ungrammatical. Here are some examples of the offended cases. In Chinese, a direct object can be fronted to a post-subject position and be marked, at the same time, by the preposition *ba* under certain conditions. For instance,

(44) a. Wo da-sui-le huaping.
I break-Perf vase
'I broke a/the vase.'

b. Wo ba huaping$_i$ da-sui-le t_i.
I BA vase break-Perf
'I broke the vase.'

Ba-sentences also construct ambiguous licensing contexts. For instance, when the fronted *wh*-phrase *shenme dongxi* 'what thing' in (45a) appears under the scope of *ba*, it is interpreted either as 'something' or as a question word 'what'. When the *wh*-object is topicalized further to the left periphery, *ba* is stranded; since Chinese does not permit any preposition stranding, the sentence becomes ungrammatical, as shown in (45b). The sentence can be saved if a resumptive pronoun is inserted as a last resort in the position of the trace left by the topicalized *wh*-phrase, as indicated in (45c). In this case, the *wh*-phrase only gets an interrogative reading without any specific intonation contour. Under my analysis, this is the default Q-reading of the *wh*-phrase itself.

(45) a. Zhangsan **ba** <u>shenme dongxi</u> da-sui-le
Zhansan BA what thing break-Perf
'Zhangsan broke something into pieces.' (∃) with prosody
'What did Zhangsan break into pieces?' (Q) with prosody

b. *[<u>Shenme dongxi</u>]$_j$, Zhangsan **ba** t_j da-sui-le?
what thing Zhansan BA break-Perf

c. [<u>Shenme dongxi</u>]$_j$, Zhangsan **ba** ta$_j$ da-sui-le?
what thing Zhansan BA it break-Perf
*'Zhangsan broke something into pieces.'
'What did Zhangsan break into pieces?' (Q) without prosody

In the previous section, I show that some islands behave similarly as ambiguous contexts. In (46), if we topicalize the *wh*-phrase *shenme ren* 'what person' out of a complement clause of noun, known as complex NP island, the sentence becomes ungrammatical because this movement violates locality constraints.

(46) *Complement clause of noun*
a. [Zhangsan da-si-le shenme ren] de yaoyan shi zhende
Zhangsan beat-die-Perf what person DE rumor is true
'For what person x, the rumor that Zhangsan beat x to death is true ?' (Q) with prosody
'The rumor that Zhangsan beat someone to death is true.' (∃) with prosody

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b. * [Shenme ren]$_j$, [Zhangsan da-si-le t_j] de yaoyan shi zhende
what person Zhangsan beat-die-Perf DE rumor is true

In this section, I use *wh*-topicalization as an argument to support my analysis. There is a close relationship between the distribution of the ∃ and of the Q readings of a *wh*-phrase on the one hand and the c-command domain of the key element of the ambiguous contexts on the other hand.

3. Theoretical consequences

3.1 The cases that prosodic licensing does not look into

Prosody works as a last resort to disambiguate *wh*-nominals in ambiguous licensing contexts. *Wh*-nominals, as such *shenme* 'what', are pure variables that need to be bound by an operator. Instead of directly triggering a specific operator to bind an in-situ *wh*-nominal as variable, a licensing context only activates underspecified features [±Q] of such a *wh*-word. It is the corresponding prosodic form that triggers a specific operator, such as ∃ or Q. As a result, prosody only disambiguates the case as a last resort. I also demonstrated that prosodic licensing of *wh*-in-situ even works for island constructions. Example (47) illustrates a well-known ECP effect: when the *wh*-adjunct *weishenme* 'why' is embedded within a complex-NP island, the relevant sentence is ungrammatical. This example was taken to be as evidence in favor of an LF-movement analysis of *wh*-adjuncts in Huang (1982).

(47) * Ni xihuan [$_{NP}$ [$_{CP}$ [$_{TP}$ Luxun weishenme xie] de] shu]?
you like Luxun why write DE book
(intentioned reading: 'For what reason x, such that you like the book [that Luxun wrote for x]?')

If prosody functions as a last resort, a natural question is why a prosodic contour cannot save the sentence from the violation of locality conditions in (48). In other words, why cannot prosody work for *wh*-adjuncts? As suggested in Tsai (1994), a *wh*-adverb is itself an operator and undergoes LF-movement to the scope position and this movement cannot cross any island boundary. (48) is ungrammatical because the movement of *weishenme* 'why' crosses the complex-NP island boundary. The function of prosodic licensing is to introduce a specific operator to bind a *wh*-variable by providing it with a specific reading. However, being an operator itself, a *wh*-adverb does not need to be bound by any other operator or to get a specific reading from another operator. In my analysis, a *wh*-adverb does not bear underspecified features but bears a single feature with a positive interrogative value [+Q]. In any type of licensing context, ambiguous or unambiguous, it is always the default interrogative reading of a *wh*-adverb that is activated. This Q-reading is either properly interpreted when locality constraints are obeyed or is blocked by islands. Therefore, (48) does not need any prosodic licensing and it represents a case that prosodic licensing cannot look into. This is the reason why prosody cannot save the relevant sentence.

3.2 Last-resort status and interpretation redundancy

Another important point in our analysis is that being a repair mechanism, prosodic licensing is tolerated by the computational system because this mechanism does not create any interpretation redundancy. Each combination of the lexicon with a certain prosodic form constructs a unique set that corresponds to an unambiguous semantic output. In this sense, there are no two different prosodic forms that give the same semantic output. When a certain prosodic form is used, it ensures that one and only one semantic interpretation is obtained at interfaces. Since prosody does not create any interpretation redundancy during the

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numeration, its last resort status is justified and is of course tolerated by the computational system. This study on Chinese confirms the system-repairing hypothesis of Reinhart (2006).

3.3 How is our analysis compatible with the previous ones?

An important question that I must answer is in what way our analysis is compatible with the previous analyses on *wh*-in-situ in Chinese. Let us begin with the Clausal Typing hypothesis of Cheng (1991). This hypothesis requires that the type of each clause should be morpho-syntactically indicated overtly. To type a *wh*-question, either the *wh*-word overtly moves to the scope position at syntax (i.e. languages like English) or a typing particle is inserted at the scope position to bind the in-situ *wh*-word as variable (i.e. languages like Chinese). This hypothesis implies that ambiguity at interfaces is not permitted in that each unique semantic output should be associated with a single syntactic form. This hypothesis provides us with a way to establish a mapping between the interrogative interpretation and a specific syntactic sentence type. What my proposal suggests is that in addition to the morpho-syntactic typing, the prosodic typing should also be taken into consideration with regard to Clausal Typing. If we take the combination of word stress with sentence intonation as a part of the Lexicon before the numeration, then the corresponding prosodic form behaves exactly like sentence typing particles in the original sense of Cheng (1991). Therefore, in an ambiguous licensing context, the sentence containing an in-situ *wh*-nominal can be typed by prosody either as a question or as a normal declarative sentence with an existential reading of such a *wh*-word. The analysis based on a prosodic licensing of *wh*-in-situ is also theoretically supported by the intonation morpheme licensing of French *wh*-in-situ questions proposed in Cheng & Rooryck (2000). However, the morpho-syntactic typing in the sense of Cheng and the prosodic licensing in my analysis do not have the same status in the computational system in that the former does not function as a last resort but the latter does. One should always bear in mind that neither question-typing particles nor a syntactic *wh*-movement deals with the ambiguous cases. What these two typing mechanisms do is only transforming a declarative sentence into a question. Therefore, they are not considered as saving devices in the sense of last resort. By contrast, the prosodic licensing mechanism in my analysis only deals with ambiguous cases in which the same syntactic form gives rise to several possible semantic interpretations. It is also for this specific reason that the prosodic licensing of *wh*-in-situ only works in ambiguous licensing contexts. What a specific prosodic form does is to avoid the undesirable situation in which the potential output of the computational system is still ambiguous at interfaces. Another way to look at Clausal Typing is to treat it as some kind of filter at interfaces. Any sentence that is not typed in this sense will not be interpretable at interfaces. Accordingly, the prosodic licensing of *wh*-in-situ in Chinese can be regarded as a necessary component that is required by the computational system. The computational system activates prosodic licensing as a repairing system in order to ensure that a single interpretation is obtained as the unique output at LF; otherwise, the computational system will filter uninterpretable ambiguous *wh*-sentences.

Let us turn to the unselective Op-binding approach of Tsai (1994), in which in-situ *wh*-nominals are systematically bound by a null Op that is located at the sentential level (i.e. the CP level). This insightful observation on the variable status of *wh*-nominals is also crucial for my prosodic licensing analysis. These two proposals only differ concerning the status of the licensor for the relevant in-situ *wh*-words. Prosodic forms can be treated either as the overt phonetic realization of the relevant operators that bind the *wh*-word as variable or as the trigger that activates the unselective binders, such as the null Op, in the sense of Tsai (1994).

4. Conclusion

Previous studies on Chinese *wh*-in-situ questions agree on the variable status of *wh*-nominals, which is a crucial start point of my analysis. Nevertheless, the variable status of *wh*-nominals is not enough to explain why they are only unambiguous in certain types of contexts but ambiguous in others. A distinction is made between these two types of contexts in this study. In ambiguous licensing contexts, a *wh*-nominal is ambiguous between several possible readings and I discussed in detail the distribution of the ∃-reading and of the Q-reading. The fact that in actual conversational situations, speakers use specific word stress and prosodic forms to disambiguate such sentences leads me to inquire the function of those prosodic forms in the computational system. Following Reinhart's (2006) system-repairing hypothesis, it is possible to treat the prosodic licensing of *wh*-in-situ as a repair strategy at interfaces. The interpretative ambiguity of the relevant sentence could be due to the imperfection of the system; each prosodic contour combined with a syntactic form gives a single interpretation as output at interfaces. I propose that these prosodic elements are generated as phonological features among other features associated with a given lexical item in the Lexical Array. Since these prosodic features have a semantic effect on the output of the computational system at the C-I component, they satisfy Legibility conditions and therefore, they do not violate the Inclusiveness condition. At LF, these prosodic forms are treated either as the overt realization of the relevant operators or as the trigger of those operators that bind the in-situ *wh*-variables by providing them with the corresponding readings. Prosodic licensing of *wh*-in-situ in Chinese also suggests that in addition to morpho-syntax, prosody can also work as a Clausal Typer in the sense of Cheng (1991).

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