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Interface Strategy: Prosodic Licensing of *Wh*-in-situ in Mandarin Chinese

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Chinese *wh*-nominals are ambiguous between an existential reading, an interrogative reading and etc. However, in actual conversational situations, when different combinations of stress with intonation are used, the relevant *wh*-words are not ambiguous anymore. This observation serves as evidence to show that prosodic licensing of *wh*-in-situ is a repair strategy at interfaces in the sense of Reinhart (2006). When the output of the computational system fails to meet an interface need, some repair mechanisms will be activated. The mechanisms are costly; however, the computational system can tolerate them since they do not create any interpretation redundancy.

1. Working hypothesis

Human language is optimally designed but the actual human computational system is not perfect and 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. (Reinhart 2006). Concretely, when the representation at Syntax 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 interpretations. These mechanisms are costly; however, the computational system can tolerate them since they do not create any interpretation redundancy. In this article, I will provide an argument based on *wh*-in-situ questions in Mandarin to support this hypothesis.

2. Previous observation of *wh*-in-situ in Chinese

It has been observed that *wh*-words in Chinese behave like polarity items (Huang 1982, Cheng 1991, Aoun & Li 1993, Tsai 1994), as shown in (1). *Wh*-words can have an existential reading, interrogative reading and universal reading when bound by different operators.

(1) 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 *shenme* dou chi. *Universal quantification*
he what all eat
'He eats everything.' (∀)

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

e. Ni renwei ta mai-le *shenme* *Non-factive verbs*
you think he buy-Perf what
'What do you think he bought?' (Q)
'You think that he bought something.' (∃)

3. Prosodic licensing of *wh*-in-situ

3.1 The nature of *wh*-words in Chinese

It has been argued in Pan (2011b) that without any so-called interrogative particle, a bare *wh*-word can only have an interrogative reading.[1]

(2) Ni xihuan chi shenme?
you like eat what
'What do you like eating?' (Unambiguous interrogative reading)

Example (2) shows that the in-situ *wh*-word does not need to be licensed by any overt interrogative particle to get an interrogative reading nor need it a special prosodic contour. In other words, the *wh*-question in (2) is neither marked by a morpho-syntactic interrogative particle nor by mean of prosody. The question is how (2) is typed as a *wh*-question in the sense of the Clausal Typing hypothesis of Cheng (1991). My assumption is that *shenme* 'what' in (2) inherently bears an interrogative feature, noted as [+Q]. The fact that this [+Q] value is activated in a simple *wh*-question context without any overt licensor suggests that the interrogative reading is a kind of default reading of *wh*-words like *shenme* 'what' in Mandarin.

[1] Particle *ne* in Chinese is not an interrogative particle and it cannot give the interrogative force to the in-situ *wh*-words (Wu 2005, Li 2006, Pan 2011a, b). Its presence is always optional in a *wh*-question and it is analyzed as a discourse particle.

Furthermore, it is also observed that in contexts like, *yes-no* questions, A-not-A question, *if*-conditionals and *dou*-quantification, a *wh*-word receives non-interrogative readings. The relevant examples were given in (1) where *wh*-words take the non-interrogative [-Q] value. Especially, in the contexts with negation or with non-factive verbs (c.f. 1b, c), a *wh*-word is underspecified between two values, [+Q] and [-Q], which means that they can get either an interrogative reading or a non-interrogative reading.

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. However, the positive value [+Q] is their default reading because in a very simple sentence without the presence of any overt interrogative marker, without any special prosodic contour, without any licensing context, a *wh*-word gets an unambiguous interrogative reading (cf. 2). However, the [+Q] value is "weak" in the sense that it can be overruled in certain licensing contexts. More specifically, when a *wh*-word appears in a given context, either it gets an unambiguous non-interrogative reading [-Q], such as in *yes-no* questions (cf. 1a), *if*-conditionals (cf. 1b) or *dou*-quantification (cf. 1c) or it is ambiguous between an interrogative reading and non-interrogative readings, such as in negative contexts (cf. 1d) or in non-factive verb contexts (cf. 1e). In the latter case, only prosody can disambiguate the relevant sentence, as will be detailed immediately below.

3.2 The status of licensing contexts

Sentences in (1) show that *wh*-words do not behave uniformly in different contexts: they are ambiguous in certain contexts but not in other ones. Therefore, licensing contexts do not have the same status when licensing *wh*-in-situ in Chinese. In fact, licensing contexts are more general than those where polarity items appear. Roughly, these contexts can be divided into two different categories: unambiguous licensing contexts and ambiguous licensing contexts. A *wh*-word has only one possible reading in the former ones and has several readings in the latter ones. In ambiguous contexts, every different reading needs a specific intonation contour (combined with/without a stress on certain element). Pan (2011b) examines the existential, interrogative, universal, exclamative, rhetorical question and echo question readings of *wh*-words in these contexts. The following table presents a partial result. The symbol ♬ stands for intonation contours.

	Licensing Contexts	∃	Q	RheQ	∀		♬
I. Unambiguous	*Yes-no* question marker *ma*, *meiyou*, etc.	yes	no	no	no		no
	Adverb *haoxiang* 'seem', Construction *hui…de* (future)	yes	no	no	no		no
	A-not-A question	yes	no	no	no		no
	Universal quantifier *dou* 'all'	no	no	no	yes		no
	Conditional, concessive clauses	yes	no	no	no		no

II. Below TP level (ambiguous)	Negative elements	yes	yes	yes	no		yes
	Progressive aspect	yes	yes	yes	no		yes
	Passive construction	yes	yes	yes	no		yes
	Non-factive verbs	yes	yes	yes	no		yes
	Verb *pa* 'be afraid of'	yes	yes	yes	no		yes
	Modifiers: *yidianr* 'a little', etc.	yes	yes	no	no		yes
	Adverbs of probability	yes	yes	yes	no		yes
III. CP level (ambiguous)	Clauses: temporal, etc.	yes	yes	yes	no		yes
	Relative clause	yes	yes	yes	no		yes
	Sentential subject	yes	yes	yes	no		yes
	Complement clause of noun	yes	yes	yes	no		yes

Table 1

Here is an example to illustrate how prosodic licensing works. Progressive aspect creates an ambiguous context.

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

b. Ta zai **CHI**-zhe shenme.
he Prog eat-Dur what
(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
(Stress on the *wh*-word and 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
(Stress on the subject *he* and the falling/neutral intonation at the end of the sentence)
'What is HE eating?! = He is eating nothing!' (*Rhetorical question*)

The mapping between syntax and semantics in (3) is not tight enough to disambiguate the *wh*-word in an ambiguous licensing context. That is to say, a specific

syntactic form is not sufficient to give a unique output at LF. In actual contexts when different combinations of stress with intonation are put on the sentence, it is no longer ambiguous. The sentence in (3) is only ambiguous on its syntactic representation and when this syntactic form is associated with different specific prosodic contours, it can get an unambiguous output at LF. Crucially, a target reading is only associated with a specific prosodic pattern and a specific prosodic pattern is only associated with a single corresponding reading. In this sense, the mapping between prosody and interpretation is strictly one-to-one. In fact, all of the ambiguous cases presented in (1) can be systematically disambiguated by prosody, as will be detailed in the next section.

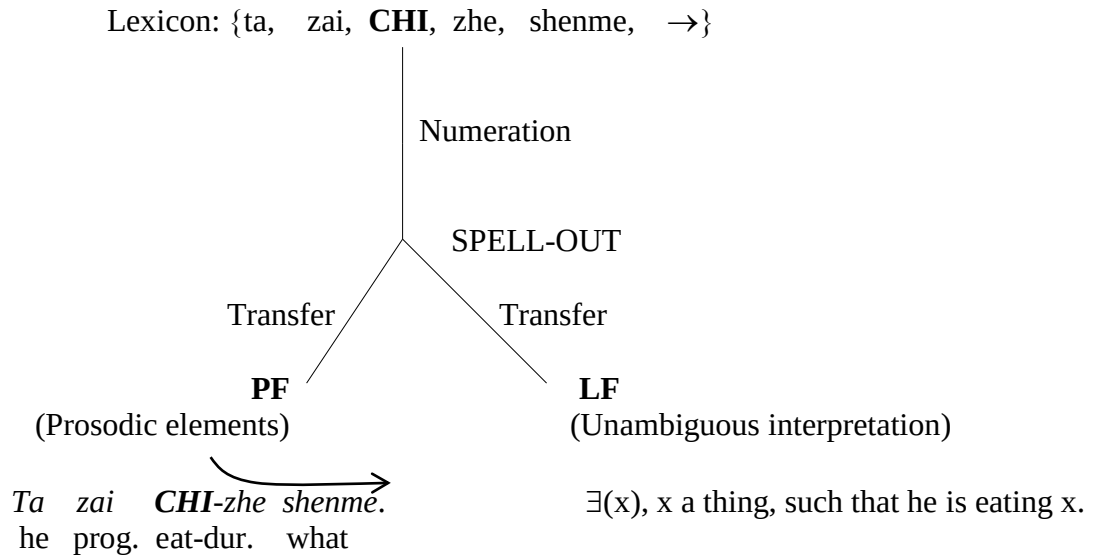
One general consideration behind my analysis is that the illocutionary force of a sentence should be indicated overtly in the case of ambiguity; otherwise, the output of the computational system is still ambiguous for the co-speaker, which is not a desirable situation. This consideration is based on the spirit of the Clausal Typing hypothesis, according to which every clause must be typed and each clause-type is only associated with a single illocutionary force (Cheng 1991). However, an important difference between my proposal and the original Clausal Typing hypothesis is that the clausal typing in Cheng's sense is only realized by means of morpho-syntax. Typologically, the morphological typing and the syntactic typing are two alternative ways to type a *wh*-question. In this sense, they are equal and have the same status. However, prosodic typing of *wh*-in-situ in my analysis does not have the same status as the morpho-syntactical typing in that prosodic elements can only indicate the illocutionary force of an ambiguous sentence when morpho-syntax fails to properly type such a sentence which still remains ambiguous at interfaces. Recall that prosodic licensing is only activated when syntax is not sufficient to generate different interpretations in different contexts. This is the reason why in a simple unambiguous context, such as in (2), no prosodic form is needed. From this point of view, prosodic marking only works as a last resort, which confirms the assumption that the output of the computational system should not be ambiguous and that the illocutionary force must be overtly realized in conversation.

Another technical question is how to treat these prosodic forms in formal mechanisms. One possible way is to treat them either as an overt realization of the related operators that bind *wh*-words as variables (i.e. the QU-operator in the sense of Aoun & Li 1993 or unselective binders in sense of Tsai 1994) or as the triggers that activate these operators. However, this view of things gives another technical difficulty. In the traditional T-model, the PF branch and the LF branch are separated after Spell-Out and prosodic forms are only realized after Spell-Out at PF side. Technically, there is no direct interaction between these two branches after Spell-Out. Thus, one question is that how prosodic elements situated at PF influence the interpretation at LF. A possible solution is to allow different prosodic forms to be generated in the Lexicon before the numeration process begins. During the computation process, even after the operation Transfer, these prosodic elements are still combined with lexical items at LF. Therefore, it is reasonable to treat them as the realization of the relevant operators which bind in-situ *wh*-words as

variables and give them the corresponding readings. Different combinations of the word stress with the intonation construct Referent-sets in the sense of Reinhart (2006) and each referent-set corresponds to one and only one specific semantic interpretation, and this guarantees a single output at interfaces. In this sense, the word stress and sentential intonation enter into the numeration as a part of the Lexicon in the computational system. Let us take (3) for example. The four referent-sets are given below.[2]

(4) a.	{ta, zai, chi, zhe, shenme, ↑}	➔	Q	(3a)
b.	{ta, zai, CHI, zhe, shenme, →}	➔	∃	(3b)
c.	{ta, zai, chi, zhe, SHENME, ↓}	➔	!	(3c)
d.	{TA, zai, chi, zhe, shenme, ↓}	➔	Q!	(3d)

(4a-d) represent four different sets of Lexicon and after Spell-Out, prosodic elements, such as ↑, → or ↓, combined with the phonetic form of the lexicon are transferred to the PF branch. Each LF output corresponds to a single fixed PF output, and this ensures that the output of the computational system is no longer ambiguous at interfaces. The following diagram illustrates the existential reading in (4b).



3.3 Constraints on prosodic licensing

Every ambiguous licensing context has its key element and only when the *wh*-word appears in the c-command domain of this element, is the former considered to be within such a context. From this perspective, *wh*-subjects, *wh*-direct objects and *wh*-

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

adverbials do not behave uniformly. For instance, in an ambiguous context constructed by probability adverbs[3], *wh*-adverbial *shenme difang* 'where' can have an existential reading because it is c-commanded by probability adverbs (cf. 5); whereas the *wh*-subject *shei* 'who' cannot get an ∃-reading because it is located outside the c-command domain of these adverbs (cf. 6).

(5) *probably* > *wh*-element

a. Ta yi-ge ren **dagai** hui qu shenme difang
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 shenme difang ku
she probably would at what place cry
'She is probably crying somewhere.' (∃) with prosody
'Where is she probably crying?' (Q) with prosody

(6) *wh*-subject > *probably*

Shei **kending / yexu / keneng** hui lai?
who certainly/ maybe/ probably will come
'Who will certainly/ maybe/ probably come?' (Q) without prosody
'Someone will certainly/ maybe/ probably come.' (∃)

Similarly, in a passive sentence constructed by *bei*, only *wh*-words appearing inside the c-command domain of *bei* can get an existential reading (cf. 7a vs. 7b).

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

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

Another example is based on non-factive verbs. *Wh*-objects (cf. 8a), *wh*-subjects (cf. 8b) and *wh*-adverbials (cf. 8c) of the embedded clause can get an existential reading because all of them are c-commanded by non-factive verbs of the matrix clause.

[3] More discussion on probability adverbs and *wh*-quantification can be found in Lin (1996).

(8) a. Ta **juede** [wo ma-le shei]
he think I insult-Perf who
'He thought that I had insulted someone.' (∃) with prosody
'Who did he think that I had insulted?' (Q) with prosody

b. 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

c. 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

By contrast, *wh*-subjects (cf. 9a) and *wh*-adverbials (cf. 9b) of the main clause cannot get an existential reading since neither of them appears inside the c-command domain of non-factive verbs of the main clause.

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

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

Let us summarize the distribution of the existential reading and the interrogative reading in an ambiguous licensing context. For the ∃-reading, if the *wh*-element is generated 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 is always obligatorily licensed by a prosodic contour. In this case, the negative value [-Q] of this *wh*-word is taken. By contrast, if the *wh*-word is generated outside the scope of the key-element, it cannot get an existential reading. As for the Q-reading, if the *wh*-element is generated 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 generated outside the scope of the key-element, it can also get an interrogative reading; however, the Q-reading in this case is the inherent default interrogative reading

of the *wh*-word and no special prosodic form is required and the positive value [+Q] of this *wh*-word is taken. In other words, iff the relevant *wh*-word is generated within the scope of the key element of an ambiguous licensing context, it is considered to be within this context and the *wh*-word keeps its underspecified bi-values [±Q]. In this case, both ∃-reading and Q-reading are possible under the prosodic licensing. However, when the relevant *wh*-word is generated outside the scope of the key element, it is thus not within this licensing context; instead, it is considered to be in a simple context. In this case, only the weak default positive value [+Q] is activated. 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 2

It is worthwhile noticing that certain islands, such as the complement clause of noun in (10), the relative clause in (11) and the temporal adverbial clause in (12) behave exactly like ambiguous licensing contexts.

(10) 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

(11) 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

(12) Zhangsan [kandao shei de shihou] jiu hui lian hong
Zhangsan see who DE moment then will face red
'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

Prosodic forms work as a last resort in that they only intervene when it is required by the interpretation (output). Every syntactic representation combined with an

appropriate prosodic form only corresponds to a single interpretation (without any ambiguity). Thus, prosodic intervention does not create any interpretation redundancy. Table 3 gives a global summary of the distribution of the ∃-reading and the Q-reading in three types of contexts that I examined. It is thus not surprising to see that both 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.

		∃	**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 3

3.4 *Wh*-fronting argument

In the previous section, it has been shown that an unambiguous context is quantificationally strong in the sense that, on the one hand, it requires a *wh*-word to be within the scope of its key element; and on the other hand, it does not permit more than one reading of the relevant *wh*-word. By contrast, if a *wh*-phrase is generated in the scope of the key element of an ambiguous context, it can get several possible readings. Pan (2011, 2014) argues that in some cases, a D-linked *wh*-phrase can be fronted to the left periphery in Mandarin and that the nature of this fronting is topicalization. Along this line, 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 to be within the scope of its key element. However, if the relevant *wh*-phrase is topicalized out of an ambiguous context, the prediction is that the relevant *wh*-phrase is no longer ambiguous between an ∃-reading and a Q-reading and that it can only get an interrogative reading. This interrogative reading does not need any specific prosodic licensor since it is the default Q-reading of the *wh*-word itself.

Let us begin by examining unambiguous contexts. (13) and (14) show that when a *wh*-phrase is topicalized to the left periphery, thus out of the scope of the key element (i.e. the *yes-no* question particle *ma* and the A-not-A element) of each sentence, the sentence becomes ungrammatical. In (13b) and (14b), after the topicalization of the relevant *wh*-words, the existential quantifier ∃ binds no variable within its scope and the sentence is ungrammatical due to the vacuous quantification. On the other hand, the topicalized *wh*-phrase cannot get an interrogative reading either because if it does, the sentence will be interpreted both as *wh*-question and as *yes-no* question simultaneously, which is uninterpretable at interfaces in that two different types of illocutionary forces cannot co-exist.

(13) *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?' ($\exists$)

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

(14) 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?' ($\exists$)

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 (15b), the *wh*-phrase *zai shenme difang* 'at what place' is topicalized out of the scope of *haoxiang* 'seem', the sentence becomes ungrammatical.

(15) a. [$_{TP}$ Ta [$_{T'}$ haoxiang $\exists_x$ [zai shenme difang]$_x$ xue-guo fayu]] .
she seem at what place study-Exp French
'Il seems that he had already studied French somewhere.' ($\exists$)

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

Let us turn to the *dou*-quantification. *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. However, the grammaticality of (16b) seems to suggest that our prediction is wrong.

(16) a. Ta shenme dongxi dou xihuan chi.
he what thing all like eat
'He likes eating everything.' ($\forall$)

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

In (16b), even if the *wh*-phrase *shenme dongxi* 'what thing' is topicalized to the left periphery, the sentence is still correct and it seems that our prediction is not borne out. In fact, since the scope of the universal quantifier *dou* 'all' is its left side, even if the relevant *wh*-phrase is topicalized, we still do not know if it moves completely out of the scope of *dou* 'all'. In other words, we do not know the left boundary of the scope of the *dou*-quantification. In Chinese, 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 semantic function of *wulun* 'no matter'. In syntax, we can treat *wulun* 'no matter' as the marker of the left edge of the scope of *dou* 'all'. One possible account for the grammaticality of (16b) is that even if the *wh*-phrase is topicalized, it is still on the right side of the implicit *wulun* 'no matter', therefore, such a *wh*-phrase still remains within the scope of *dou* 'all', which explains the fact that *shenme dongxi* 'what thing' can receive the universal reading, as shown in (17).

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

$\forall$

b. [(**Wulun**) [shenmedongxi]$_i$ [$_{TP}$ t_i **dou**]

By contrast, if we try to keep the explicit *wulun* 'no matter' in the original sentence and let the *wh*-phrase be topicalized to the left side of *wulun* 'no matter', in other words, if we force the *wh*-word to topicalize completely out of the scope of *dou* 'all', the sentence should be ungrammatical. (18) shows that our prediction is correct.

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

The observation in *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 the *wh*-phrase is topicalized out of the scope of the key element of the context, the sentence will be ungrammatical due to the vacuous quantification.

As for ambiguous contexts, when the *wh*-phrase stays in-situ in the c-command domain of the key element in these contexts, the sentence gets either an existential reading or a question reading. Both readings need the corresponding prosodic forms, as indicated in the (a) cases in (19)-(21). When the relevant *wh*-phrase is topicalized out of the c-command domain of the key element of each context, the *wh*-phrase is no longer ambiguous and it can only get an interrogative reading. This Q-reading is its default reading and no prosody is necessary, as indicated in the (b) cases.

(19) 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

(20) 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

(21) 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

In the previous section, we observed that some islands behave similarly as ambiguous contexts. In (22), 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.

(22) *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

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

4. Theoretical consequences

4.1 Cases that prosodic licensing does not look into

I demonstrated that prosody works as a last resort to disambiguate *wh*-nominals in ambiguous licensing contexts and that the prosodic licensing even works for island constructions. *Wh*-nominals are pure variables (cf. Tsai 1994) that need to be bound by an operator. (23) 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 the LF-movement analysis of *wh*-adjuncts for Huang (1982). If prosody functions as a last resort, a natural question is how come prosody cannot save the case in (23). In other words, why cannot prosody function as a last resort to save the *wh*-adjunct cases in general?

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

As suggested by Tsai (1994), a *wh*-adverb is itself an operator and undergoes LF-movement to the scope position and this movement cannot cross island boundaries. (23) is ungrammatical because the movement of *weishenme* 'why' crosses the complex-NP island boundary at LF. One should notice that the function of the prosodic licensing is to introduce a specific operator to bind a *wh*-variable by giving it a specific reading. Nevertheless, being an operator itself, a *wh*-adverb does not need to be bound by any other operator and it does not need 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 the *wh*-adverb that is activated. This Q-reading is either interpreted correctly when the locality constraint is obeyed or is blocked when islands intervene. The operator status of a *wh*-adverb never changes, thus, it cannot be bound by another potential operator. Therefore, (23) does not need the prosodic licensing at all. In other words, (23) is a case that the prosodic licensing cannot look into and that is why prosody cannot "save" it.

4.2 The last-resort status and the interpretation redundancy

As the reader will notice, prosodic licensing is costly in terms of Economy Principle in the Minimalist Program. How come can the computational system tolerate such a mechanism? My answer to this question is inspired by the notion of "repair system" proposed by Reinhart (2006). Her main idea is that when a syntactic form is not sufficient to generate different semantic interpretations at LF, some other mechanisms will be activated to disambiguate the sentence and these mechanisms are treated as repair system. For instance, Main Stress Shift is an operation that creates different stress patterns that construct Reference-sets. Each pattern corresponds to one and only one specific focus structure, and each focus structure corresponds to one and only one specific semantic reading. These repair mechanisms are costly in the sense of Economy Principle; however, the computational system still tolerates 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 can trigger the relevant operators, such as the interrogative operator, the existential quantifier and etc. to bind in-situ *wh*-variables by giving them the corresponding readings. The mapping between a prosodic pattern and a semantic interpretation is strictly "one-to-one". 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. During this process, no interpretive redundancy is created, and the economy principle is not violated. Therefore, such a repair mechanism is tolerated by the computational system.

4.3 How is our analysis compatible with the previous ones?

One question that we 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) which requires that the type of each clause should be morpho-syntactically indicated overtly. This hypothesis implies that the ambiguity at interfaces is not permitted in that each unique semantic output should be associated with a single syntactic form. Therefore, it 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 the word stress with the sentence intonation contour as a part of the Lexicon before the numeration, then the corresponding prosodic form behaves exactly like sentence typer in the original sense of Cheng (1991). Therefore, in an ambiguous licensing context, a 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 the prosodic licensing of *wh*-in-situ in Chinese is also theoretically supported by the intonation morpheme licensing of *wh*-in-situ questions in French 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. We should always bear in mind that neither the question-typing particle nor the syntactic *wh*-movement deals with ambiguous cases. What these two typing mechanisms do is only transforming a declarative sentence into a question. Therefore, they are not considered as saving device 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 corresponds 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 save the undesirable situation in which the potential output of the computational system is still ambiguous at interfaces. Another way to look at the Clausal Typing is to treat it as some kind of filter at interfaces. Any sentence that is not "typed" is not going to be properly interpreted at interfaces. Thus, 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 will activate prosody as a repairing system in order to ensure that only one possible interpretation is obtained as the unique output at LF; otherwise, the computational system will filter the uninterpretable ambiguous *wh*-sentences.

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

5. Conclusion

Previous studies on Chinese *wh*-in-situ more or less 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 remain ambiguous in others. A distinction was made between these two types of contexts in this study. In ambiguous licensing contexts, a *wh*-nominal is ambiguous among several possible readings and I discussed in detail the generation of the ∃-reading and the Q-reading. The fact that in actual conversational situations speakers use specific word stress and prosodic forms to disambiguate the relevant sentences leads me to inquire the function of these prosodic forms in the computational system. Following Reinhart (2006)'s system-repairing hypothesis, the prosodic licensing of *wh*-in-situ is treated as a repair strategy at interfaces. The ambiguity of *wh*-words is due to the imperfection of the system; each prosodic form combined with a syntactic form gives a single output as interpretation at interfaces. I propose that these prosodic elements are

generated as part of Lexicon before the numeration. During the computational process, they are sent to PF at the point of Transfer. At LF, these prosodic forms are treated either as an overt realization of the relevant operators or as the triggers of these operators which bind in-situ *wh*-variables and give them the corresponding readings. The prosodic licensing of *wh*-in-situ in Chinese also suggests that in addition to morpho-syntactic tools, prosody can also work as a Clausal Typer in the sense of Cheng (1991).

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