

Focus intervention effects in Mandarin multiple *wh*-questions

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Abstract In this paper, we investigate focus intervention effects in Mandarin multiple *wh*-questions, showing that such effects arise only if a focus particle and its focus associate intervene between the interrogative complementizer $C_{[Q]}$ and one or more in-situ *wh*-phrases. We further show that focus intervention effects are not observed when a focus particle takes all the in-situ *wh*-phrases in its c-command domain as its focus associates. Adopting Pesetsky and Torrego's (in: Karimi et al. (eds.) *Phrasal and clausal architecture: Syntactic derivation and interpretation, in honor of Joseph E. Emonds, 2007*) feature-sharing view of Agree, we propose that the dependency between $C_{[Q]}$ and an in-situ *wh*-phrase can be reduced to an Agree relation. In addition, adopting Rizzi's (in: Belletti (ed.), *Structures and beyond: The cartography of syntactic structures, 2004*) refined version of Relativized Minimality, we propose that focus intervention effects are induced by the presence of a Focus Phrase that prohibits $C_{[Q]}$ from establishing proper dependencies with the in-situ *wh*-phrases.

Keywords Focus intervention effects · Association with focus · Feature-sharing view of Agree · Relativized Minimality · Multiple *wh*-questions · Mandarin

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1 Introduction

In Mandarin, an in-situ interrogative *wh*-phrase cannot be preceded by a focus element, a phenomenon termed the *focus intervention effect*. In previous studies, the term *focus interveners* may refer to a focused phrase (Soh 2005; Kim 2006; Yang 2008, 2012), as shown in (1a–b). In (1a–b), the focused phrase is *Zhangsan*.^{1,2}

- (1) a. **Shi* *Zhangsan* *chi-le* *shenme?*
 SHI *Zhangsan* eat-Asp what
 ‘What was the thing *x* such that it is *Zhangsan* who ate *x*?’ (Yang 2008, p. 65)
- b. **Zhiyou* *Zhangsan* *chi-le* *shenme?*
 only *Zhangsan* eat-Asp what
 ‘What was the thing *x* such that only *Zhangsan* ate *x*?’ (Yang 2008, p. 65)

Different syntactic analyses have been proposed for focus intervention effects. On the one hand, both Soh (2005) and Kim (2006) treat focus intervention effects as blocking effects. In particular, Soh proposes that focus interveners block covert movement of an in-situ *wh*-phrase to the interrogative complementizer ($C_{[Q]}$, henceforth), while Kim proposes that focus interveners block the Agree relation between $C_{[Q]}$ and an in-situ *wh*-phrase. In other words, these studies essentially attribute focus intervention effects to the presence of focus interveners intervening between a *wh*-phrase and $C_{[Q]}$. On the other hand, Yang (2008, 2012) proposes that focus intervention effects should be attributed to competition effects instead of blocking effects. Specifically, the focus interveners in (1a–b) introduce a focus operator (Foc-Op, henceforth) into the CP edge, and hence the Foc-Op competes with a question operator (Q-Op, henceforth) for the same position.

On the basis of a more comprehensive investigation, Li (2011) and Li and Cheung (2012) argue that the previous analyses fail to correctly predict the (un)availability of focus intervention effects in Mandarin. As originally observed by Huang (1982a, b) and illustrated in (2a), the focus particle *shi* can be associated with an in-situ *wh*-phrase in Mandarin. In light of Huang’s observation, Li (2011) and Li and Cheung (2012) show that Huang’s observation can be extended to other focus particles such as *zhi* and *zhiyou* ‘only’, as shown in (2b–c). In contrast, they observe that when the focus particles are associated with a non-*wh* focused phrase preceding an in-situ *wh*-phrase, the sentences become ill-formed, as shown in (3). (Here and throughout, focus particles are boldfaced and their focus associates are underlined.)

¹ The abbreviations used in this paper are as follows: Asp: aspectual marker, $C_{[Q]}$: interrogative complementizer, Foc-Op: focus operator, FocP: Focus Phrase, Q: question particle, and Q-Op: question operator.

² Previous studies show that intervention effects can be triggered by quantifiers as well as focus elements (Kim 2002; Beck 2006; Yang 2008, 2012). As discussed in Yang (2008, 2012), different accounts are needed for the two types of intervention effects (cf. Kim 2002; Beck 2006). In this study, we concentrate on focus intervention effects induced by the focus particles *shi*, *zhi* ‘only’ and *zhiyou* ‘only’.

- (2) a. **Shi** shei zai jia hui he jiu ne?
 SHI who at home will drink wine Q
 ‘Who is the person x such that it is x who will drink wine at home?’
- b. Libai zai jia **zhi** hui he shenme ne?
 Libai at home only will drink what Q
 ‘What is the thing x such that Libai will drink only x at home?’
- c. Libai **zhiyou** zai nali cai hui he jiu ne?
 Libai only at where just will drink wine Q
 ‘What is the place x such that Libai will drink wine only at x?’
- (3) a. ***Shi** zai jia shei hui he jiu ne?
 SHI at home who will drink wine Q
 ‘Who is the person x such that it is at home that x will drink wine?’
- b. *Libai **zhi** zai jia hui he shenme ne?
 Libai only at home will drink what Q
 ‘What is the thing x such that Libai will drink x only at home?’
- c. *Libai **zhiyou** jiu cai zai nali hui he ne?
 Libai only wine just at where will drink Q
 ‘What is the place x such that Libai will drink only wine at x?’

It is well-known that a focus particle must be associated with a focused phrase. This phenomenon is called *association with focus* (Jackendoff 1972; Tancredi 1990). According to Huang (1982a, b, 1988), Aoun and Li (1993), Zhang (1997, 2000), Zhu (1997), Xu (2002, 2004), Tsai (2004), Cheung (2008, 2014), and Li (2013), the Mandarin focus particles *shi*, *zhi* and *zhiyou* occur only in preverbal positions and must be associated with a focused phrase they c-command. Following Xu (2002) and Tsai (2004), we assume that the focused phrase associated with *shi*, *zhi* or *zhiyou* functions as a contrastive focus. In (2a–c), the focus particles are associated with the *wh*-phrases, and no focus intervention effects arise. By contrast, in (3a–c), the focus particles are associated with a non-*wh* focused phrase preceding an in-situ *wh*-phrase, and focus intervention effects are observed.

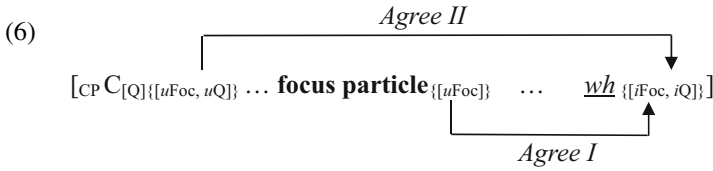
Building on the contrast illustrated in (2) and (3), Li (2011) and Li and Cheung (2012) provide the following generalization for focus intervention effects:

- (4) Focus intervention effects arise in Mandarin only if a focus particle and its associated non-*wh* focused phrase intervene between $C_{[Q]}$ and an in-situ *wh*-phrase.

Furthermore, adopting Chomsky’s (2000) locality condition on Agree, they suggest another Agree-based analysis for focus intervention effects in Mandarin. Assuming that a *wh*-phrase functions as the focus of a *wh*-question, they posit the feature system in (5a–d).

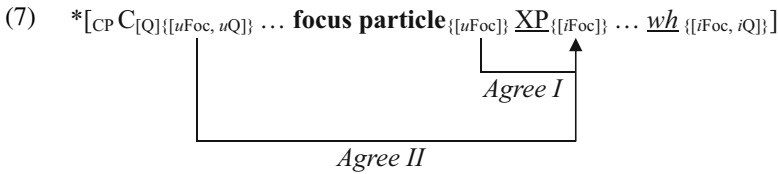
- (5) a. *wh*-phrase: {[iFoc, iQ]}
 b. $C_{[Q]}$: {[uFoc, uQ]}
 c. Focus particle: {[uFoc]}
 d. Non-*wh* focused phrase: {[iFoc]}

In light of this feature system, let us consider how Li’s and Li and Cheung’s analysis can account for the absence of focus intervention effects in the configuration in which a focus particle takes a *wh*-phrase as its focus associate, as schematized in (6).



In (6), there are two Agree operations. Since both $C_{[Q]}$ and the focus particle have uninterpretable focus features, they probe the *wh*-phrase as a goal. After the two Agree operations have taken place, all the uninterpretable features are deleted. Hence, the derivation converges as desired.

We now turn to Li’s and Li and Cheung’s analysis of the presence of focus intervention effects. Consider the configuration in (7).



In (7), there are two Agree operations, one between the focus particle and the focused phrase XP, and the other between $C_{[Q]}$ and the focused phrase XP. Specifically, following Chomsky’s (2000) locality condition on Agree, the uninterpretable focus feature on the focus particle forces it to participate in an Agree relation with the focused phrase XP, which is the closest goal bearing an interpretable focus feature. However, the other Agree operation fails: since the focused phrase XP does not have an interpretable question feature, the uninterpretable question feature on $C_{[Q]}$ cannot be checked off. As a result, the derivation crashes.

In sum, the previous studies have established a full picture of focus intervention effects in single *wh*-questions. However, such effects in multiple *wh*-questions are left unexplored. In this paper, we mainly examine focus intervention effects in Mandarin multiple *wh*-questions, showing that the previous analyses fail to correctly predict the (un)availability of such effects. We argue that what triggers focus intervention effects is not competition between the focus and question operators (Yang 2008, 2012) or the locality condition on Agree (Li 2011; Li and Cheung 2012), but the failure of $C_{[Q]}$ to establish a dependency with an in-situ *wh*-phrase, and hence the *wh*-question’s failure to receive a proper interpretation at the semantic interface. Following Takita and Yang (forthcoming), we adopt Pesetsky and Torrego’s (2007) feature-sharing version of Agree and offer a syntactic account for focus intervention effects in multiple *wh*-questions.

This paper is organized as follows. Section 2 investigates the presence and absence of focus intervention effects in multiple *wh*-questions, aiming to provide a

new descriptive generalization regarding focus intervention effects in Mandarin and to show that previous Agree-based analyses cannot fully accommodate the (un)availability of focus intervention effects in multiple *wh*-questions. Section 3 discusses how Pesetsky and Torrego's (2007) feature-sharing version of Agree can capture the association between focus particles and focused phrases and the dependencies between $C_{[Q]}$ and *wh*-phrases, the latter of which have been explored by Takita and Yang (forthcoming) to account for anti-superiority effects in Japanese and Mandarin. It further offers syntactic accounts for the presence and absence of focus intervention effects in Mandarin multiple *wh*-questions. Section 4 concludes the paper.

2 Focus intervention effects in multiple *wh*-questions

In this section, we explore the availability of focus intervention effects in multiple *wh*-questions, ultimately revising Li's (2011) and Li and Cheung's (2012) generalization in (4). Furthermore, we show that focus intervention effects in multiple *wh*-questions challenge previous Agree-based accounts for focus intervention effects.

2.1 Data

As shown in (8) and (9), when a focus particle and its focus associate precede one or more in-situ *wh*-phrases, focus intervention effects arise.

- (8) a. ***Shi** zuotian shei chi-le shenme ne?
 SHI yesterday who eat-Asp what Q
 'Who was the person x and what was the thing y such that it was yesterday that x ate y?'
 b. *Libai **zhi** zai zuotian gen shei chi-le shenme ne?
 Libai only at yesterday with who eat-Asp what Q
 'Who was the person x and what was the thing y such that Libai ate y with x only yesterday?'
 c. ***Zhiyou** zuotian shei zenme(-yang) chi-le yifen ne?
 only yesterday who how-manner eat-Asp spaghetti Q
 'Who was the person x and what was the manner y such that x ate spaghetti in y only yesterday?'
- (9) a. *Shei **shi** zuotian chi-le shenme ne?
 who SHI yesterday eat-Asp what Q
 'Who was the person x and what was the thing y such that it was yesterday that x ate y?'
 b. *Shei **zhi** zai zuotian gen Libai chi-le shenme ne?
 who only at yesterday with Libai eat-Asp what Q
 'Who was the person x and what was the thing y such that x ate y with Libai only yesterday?'

- c. *Shei **zhiyou** zuotian zenme(-yang) chi-le yifen ne?
 who only yesterday how-manner eat-Asp spaghetti Q
 ‘Who was the person x and what was the manner y such that x ate spaghetti in y only yesterday?’

The sentences in (8) and (9) can be schematized as in (10a–b), respectively.

- (10) a. *_{[CP C_[Q] ...} **focus particle** XP ... *wh* ... *wh* ...]
 b. *_{[CP C_[Q] ...} *wh* ... **focus particle** XP ... *wh* ...]

In Mandarin, *shi* and *zhi* can be associated with more than one focused phrase within their *c*-command domains, as shown in (11a–b). In these examples, the focus associate of *shi* or *zhi* is not *books* or *Gaoshi* alone; rather, it is the pair <*Gaoshi*, *books*>. Hence, in each of (11a–b) the pair <*Gaoshi*, *books*> in the second sentence can be felicitously contrasted with the pair <*Dufu*, *pens*> in the first sentence.

- (11) a. Libai mei song Dufu bi. Ta **shi** song Gaoshi shu.
 Libai not send Dufu pen he SHI send Gaoshi book
 ‘Libai didn’t send Dufu pens. It is sending Gaoshi books that Libai did.’
 b. Libai mei song Dufu bi. Ta **zhi** song Gaoshi shu.
 Libai not send Dufu pen he only send Gaoshi book
 ‘Libai didn’t send Dufu pens. He only sent Gaoshi books.’

In multiple *wh*-questions, the focus particle can be associated with multiple *wh*-phrases, as shown in (12a–b). In this case, no focus intervention effects are observed.

- (12) a. Zuotian **shi** [shei chi-le shenme] ne?
 yesterday SHI who eat-Asp what Q
 ‘Who was the person x and what was the thing y such that it was the pair <x,y> that x ate y yesterday?’
 b. Libai zuotian **zhi** [gen shei chi-le shenme] ne?
 Libai yesterday only with who eat-Asp what Q
 ‘Who was the person x and what was the thing y such that Libai only ate y with x yesterday?’

Interestingly, if the focus particles in (12a–b) are replaced by *zhiyou*, the sentences become ill-formed, as shown in (13a–b).³

³ We thank the two anonymous reviewers for pointing out the contrast among *shi*, *zhi* and *zhiyou* in multiple *wh*-questions.

- (13) a. *Zuotian [**zhiyou shei**] chi-le shenme ne?
 yesterday only who eat-Asp what Q
 ‘Who was the person x and what was the thing y
 such that only x ate y yesterday?’
- b. *Libai zuotian [**zhiyou gen shei**] chi-le shenme ne?
 Libai yesterday only with who eat-Asp what Q
 ‘Who was the person x and what was the thing y such that Libai
 ate y only with x yesterday?’

The ill-formedness of (13) is due to the fact that *zhiyou* can only take the phrase adjacent to it as its focus associate, as demonstrated in (14a). Here, *bi* ‘pens’ is contrasted with *shu* ‘books’. That *zhiyou* cannot take a pair as its focus associate, as *shi* and *zhi* can, is shown by the contrast between (11a–b) and (14b): the sentence with *zhiyou* in (14b) is not a felicitous continuation (“#” marks infelicity), since *Gaoshi* and *shu* are forced to serve as foci that contrast with the preceding pair <*Dufu, pens*>.

- (14) a. Libai mei song Dufu bi. Ta **zhiyou shu** cai song Dufu.
 Libai not send Dufu pen he only book just send Dufu
 ‘Libai didn’t send Dufu pens. He sent Dufu only books.’
- b. Libai mei song Dufu bi. #Ta **zhiyou shu** cai song Gaoshi
 Libai not send Dufu pen he only book just send Gaoshi
 ‘Libai didn’t send Dufu pens. He sent Gaoshi only books.’

We suspect that the difference between *shi/zhi* and *zhiyou* has to do with their different syntactic properties. Previous studies analyze *shi* as being located in I and taking an IP or a VP as its complement (Huang 1988), and they analyze *zhi* as an adjunct to VP (Tsai 2004; Shu 2011). In principle, *shi* and *zhi* are able to associate with two foci (indicated by “XP” below) so long as the latter are within their c-command domains, as shown in (15a–b).

- (15) a. [IP ... *shi* [IP/VP ... XP ... XP ...]]
 b. [IP ... [VP *zhi* [VP ... XP ... XP ...]]]

By contrast, *zhiyou* is analyzed as a particle adjoined to its focus associate, and it does not c-command an IP or a VP (Zhang 1997, 2000; Shu 2011), as shown in (16). Hence, it cannot be associated with multiple foci.

- (16) [IP ... [*zhiyou* [XP]] ... (*XP) ...]

Therefore, it is not surprising that *zhiyou* can only take a single *wh*-phrase that is adjacent to it as its focus associate in (13a–b), unlike *shi* and *zhi*, which can take multiple *wh*-phrases within their c-command domains as their focus associates.

As a consequence, the sentences in (12) and (13) can be represented schematically as in (17a) and (17b), respectively.

- (17) a. $[_{CP} C_{[Q]} \dots \textit{shi/zhi} [\dots \textit{wh} \dots \textit{wh} \dots]]$
 b. $*[_{CP} C_{[Q]} \dots [\textit{zhìyou wh}] \dots \textit{wh} \dots]$

Comparing the schemata in (10a–b) and (17a–b) reveals that focus intervention effects are induced so long as $C_{[Q]}$ and one or more in-situ *wh*-phrases are separated by a focus particle and its focus associate, regardless of whether the focus associate is a non-*wh* focused phrase (10a–b) or an in-situ *wh*-phrase (17b). Given these observations, we offer a new descriptive generalization regarding focus intervention effects in (18), which can be schematized as in (19).

- (18) Generalization regarding focus intervention effects in Mandarin
 Focus intervention effects arise in Mandarin only if a focus particle and its focus associate intervene between $C_{[Q]}$ and one or more in-situ *wh*-phrases.
- (19) $*[_{CP} C_{[Q]} \dots (\textit{wh}) \dots \textbf{focus particle } \underline{\textit{wh}} / \underline{\textit{XP}} \dots \textit{wh} \dots (\textit{wh}) \dots]$

In contrast, the configurations without focus intervention effects do not contain an intervening focus associate between $C_{[Q]}$ and the *wh*-phrases. The lack of an intervening focus associate is due to the fact that the focus particle takes all the *wh*-phrases within its c-command domain as its focus associates, as shown in the general schema in (20).

- (20) $[_{CP} C_{[Q]} \dots \textbf{focus particle } \underline{\textit{wh}} \dots (\underline{\textit{wh}}) \dots]$

2.2 Challenges for previous analyses

These data pose challenges for two previous Agree-based analyses: those proposed by Li (2011) and Li and Cheung (2012) and by Kim (2006).

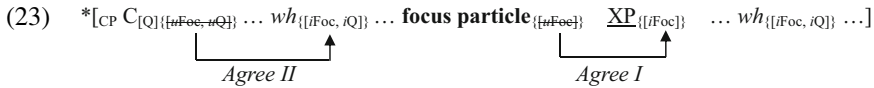
Although Li's (2011) and Li and Cheung's (2012) syntactic analysis can cover more empirical data than analyses proposed in previous studies, such as Soh (2005), Kim (2006) and Yang (2008, 2012), it cannot account for focus intervention effects observed in multiple *wh*-questions. Recall the focus intervention effect observed in the configuration in (10b), repeated here as (21).

- (21) $*[_{CP} C_{[Q]} \dots \textit{wh} \dots \textbf{focus particle } \underline{\textit{XP}} \dots \textit{wh} \dots]$

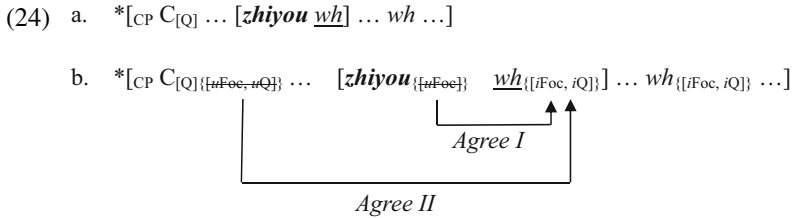
And recall the feature system in (5), repeated here as (22).

- (22) a. *wh*-phrase: $\{[i\text{Foc}, iQ]\}$
 b. $C_{[Q]}$: $\{[u\text{Foc}, uQ]\}$
 c. Focus particle: $\{[u\text{Foc}]\}$
 d. Non-*wh* focused phrase: $\{[i\text{Foc}]\}$

Annotated with this feature system, the Agree operations involved in (21) are illustrated in (23). Obviously, every uninterpretable feature is checked off. As a result, this configuration is wrongly ruled in.



Moreover, the ill-formedness of the configuration in (17b), repeated here as (24a), is not predicted. (24b) shows the two Agree operations expected under this analysis, and it is evident that all the uninterpretable features are deleted after these operations. Thus, (24a) is wrongly ruled in.



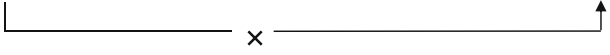
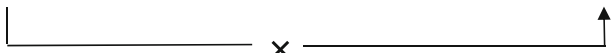
Consider these data in light of the Agree-based analysis proposed by Kim (2006). Following Chomsky’s (2000, 2001) version of Agree, Kim argues that focus intervention effects appear because Agree between $C_{[Q]}$ and an in-situ *wh*-phrase is blocked by a Foc-Op introduced by an intervening focused phrase. In her analysis, $C_{[Q]}$ has an interpretable question feature $[iQ]$ and an interpretable focus feature $[iFoc]$, while a *wh*-phrase has an uninterpretable question feature $[uQ]$ and an uninterpretable focus feature $[uFoc]$. The uninterpretable features of *wh*-phrases must be checked off by the matching interpretable features of $C_{[Q]}$ through Agree. Following Chomsky (2001), Kim proposes that Agree complies with Maximize Matching Effects, as stated in (25). Consequently, $C_{[Q]}$ is the only matching probe that can check off the uninterpretable features of an in-situ *wh*-phrase.

(25) Maximize Matching Effects

The probe must have a complete set of features matching those of the goal in order to delete its uninterpretable features.

(Kim 2006, p. 529)

In addition, Kim assumes that the Foc-Op introduced by a focused phrase also has an interpretable focus feature. Given these assumptions, let us consider how her account can correctly rule out (21) and (24a), as shown in (26a) and (26b), respectively.

- (26) a. $*[{}_{CP} C_{[Q]\{[iFoc, iQ]\}} \textit{wh}_{\{[uFoc, uQ]\}} \dots \textit{Foc-Op}_{\{[iFoc]\}} [\textit{focus particle } \underline{XP} \dots \textit{wh}_{\{[uFoc, uQ]\}}]]$

- b. $*[{}_{CP} C_{[Q]\{[iFoc, iQ]\}} \textit{Foc-Op}_{\{[iFoc]\}} [\textit{zhiyou } \textit{wh}_{\{[uFoc, uQ]\}}] \dots \underline{\textit{wh}}_{\{[uFoc, uQ]\}}]$


In each construction, the focus particle and its focus associate intervene between $C_{[Q]}$ and the second in-situ *wh*-phrase. The *Foc-Op* introduced by the focus associate blocks the Agree relation between $C_{[Q]}$ and the second *wh*-phrase. Following the locality condition on Agree, since the *Foc-Op* is closer to the second *wh*-phrase than $C_{[Q]}$, the *Foc-Op* should check off the uninterpretable focus feature on the *wh*-phrase. However, since the feature matrix of the *Foc-Op* does not match that of the *wh*-phrase, the *Foc-Op* and the *wh*-phrase cannot undergo Agree, as this operation will violate Maximize Matching Effects. Consequently, the uninterpretable features of the *wh*-phrase cannot be checked off, and the derivation crashes.

While Kim's analysis can correctly rule out the multiple *wh*-questions with focus intervention effects, it fails to account for the fact that an intervening focus particle associated with multiple *wh*-phrases does not trigger focus intervention effects, as we have shown in (12a–b), with the corresponding schema in (17a) (repeated here as (27a)). Since the *wh*-phrases serve as foci associated with *shi* or *zhi*, a *Foc-Op* could be introduced into the configuration, as in (27b).

- (27) a. $[{}_{CP} C_{[Q]} \dots \textit{shi/zhi} [\underline{\textit{wh}} \dots \underline{\textit{wh}} \dots]]$
 b. $[{}_{CP} C_{[Q]\{[iFoc, iQ]\}} \dots \textit{Foc-Op}_{\{[iFoc]\}} \textit{shi/zhi} [\underline{\textit{wh}}_{\{[uFoc, uQ]\}} \dots \underline{\textit{wh}}_{\{[uFoc, uQ]\}} \dots]]$

Following Kim's analysis, the *Foc-Op* should block the Agree relation between $C_{[Q]}$ and the *wh*-phrases. At the same time, the interpretable focus feature on the *Foc-Op* is unable to check off the uninterpretable features of the *wh*-phrases owing to the mismatch of their feature matrices. Therefore, (27a) is wrongly ruled out. A more general problem with Kim's analysis lies in her assumptions that a focus particle can always introduce a *Foc-Op* that bears an interpretable focus feature and that Agree must comply with Maximize Matching Effects. Given these two assumptions, any configurations that contain a *Foc-Op* between $C_{[Q]}$ and in-situ *wh*-phrases are bound to be ruled out.

Both Agree-based analyses follow Chomsky's (2000, 2001) version of Agree. Apart from the fact that both analyses fail to accommodate the presence or absence of focus intervention effects, a key problem is that Chomsky's version of Agree is purely a valuation process that applies to two distinct instances of a feature. Once the two instances of a feature, F_1 and F_2 , have undergone Agree, the syntax cannot inspect them and see that the valuation of F_2 is due to Agree with F_1 or vice versa. In other

words, once valuation has taken place, no link is established between F_1 and F_2 . On this view, no analysis that adopts Chomsky's version of Agree will be able to attribute the presence or absence of focus intervention effects to the (im)possibility of establishing a dependency between $C_{[Q]}$ and an in-situ *wh*-phrase; this is because the syntax cannot inspect whether the features borne by $C_{[Q]}$ and an in-situ *wh*-phrase are checked against each other once their features are valued, and because the features cannot be linked to each other. As the generalization in (18) clearly indicates that there must be a dependency between $C_{[Q]}$ and in-situ *wh*-phrases that can be blocked by a focus particle and its focus associate (be it an in-situ *wh*-phrase or a focused phrase XP), an alternative version of Agree that can take into account whether a dependency can be established between $C_{[Q]}$ and an in-situ *wh*-phrase must be adopted. As we will show in the following section, Pesetsky and Torrego's (2007) version of Agree offers a way to check whether a dependency can be established between $C_{[Q]}$ and an in-situ *wh*-phrase, through the notion of feature sharing.

3 Syntactic analyses of the (un)availability of focus intervention effects

In this section, we offer a syntactic analysis of focus intervention effects in Mandarin. In Sect. 3.1, we briefly introduce the feature-sharing view of Agree proposed by Pesetsky and Torrego (2007). In Sect. 3.2, we discuss how the feature-sharing view of Agree can account for the association between a focus particle and one or more focused phrases and the dependencies between $C_{[Q]}$ and in-situ *wh*-phrases in single and multiple *wh*-questions. In Sects. 3.3 and 3.4, we offer syntactic accounts for the presence and absence of focus intervention effects in multiple *wh*-questions. Adopting Rizzi's (2004) refined version of Relativized Minimality, we show that focus intervention effects are triggered by an intervening Focus Phrase that inhibits $C_{[Q]}$ from entering into an Agree relation with the *wh*-phrases.

3.1 Agree and feature sharing

Pesetsky and Torrego (2007) argue for a revised version of Chomsky's (2000, 2001) Agree operation. Crucially, whereas Chomsky hypothesizes that there is a biconditional relation between uninterpretable and unvalued features (i.e., a feature F is uninterpretable if and only if it is unvalued), Pesetsky and Torrego abandon the interpretability/valuation biconditional and take features to come in four varieties according to whether they are interpretable/uninterpretable or valued/unvalued, as shown in (28). (Below, we indicate interpretability and uninterpretable by writing i and u , respectively, to the left of the feature F ; and we indicate valuation and lack of valuation by writing or not writing F to the right of the colon in the square brackets.)

(28)

	Interpretable	Uninterpretable
Valued	[iF : F]	[uF : F]
Unvalued	[iF :]	[uF :]

It follows that, contrary to the interpretability/valuation biconditional advocated by Chomsky, which bars a lexical item from bearing an uninterpretable and valued feature (i.e., [*u*F: F] in (28)) or an interpretable and unvalued feature (i.e., [*i*F:] in (28)), Pesetsky and Torrego's revised version of Agree allows both.

Assuming that an unvalued feature always acts as a probe, Pesetsky and Torrego further propose the feature-sharing version of Agree, as stated in (29).

- (29) Agree (feature-sharing version) (Pesetsky and Torrego 2007, p. 268)
- (i) An unvalued feature F (a probe) on a head H at syntactic location α (F_α) scans its c-command domain for another instance of F (a goal) at location β (F_β) with which to agree.
 - (ii) Replace F_α with F_β , so that the same feature is present in both locations.

Under the feature-sharing version of Agree, when Agree applies between a probe feature F at a syntactic location α and a goal feature F at a syntactic location β , the output is a single feature F shared by two locations, giving rise to a feature-sharing chain. This version of Agree differs significantly from Chomsky's version, since the latter assumes that Agree applies to two distinct instances of a feature and that no link is established between the two once Agree has taken place.

Assuming the typology of features postulated by Pesetsky and Torrego together with their feature-sharing version of Agree, we expect that occurrences of two types of unvalued features can serve as probes: occurrences of interpretable unvalued features and occurrences of uninterpretable unvalued features. To see how an interpretable unvalued occurrence of a feature F can participate in an Agree relation with an uninterpretable valued occurrence of F, consider (30). By virtue of having an unvalued feature, the interpretable unvalued occurrence of F can act as a probe and undergo Agree with the uninterpretable valued occurrence of F, that is, the goal within its c-command domain. When the two undergo Agree, the valued occurrence of F on the goal replaces the unvalued occurrence of F on the probe, giving rise to two instances of the same valued feature F, which form a feature-sharing chain. For clarity, the instance of the valued feature F received by the probe through Agree is indicated in boldface in (30) and throughout.

(30) ... [*i*F:] ... [*u*F: F] ... \implies Agree \implies ... [*i*F: **F**] ... [*u*F: F] ...

In brief, the two salient features of Pesetsky and Torrego's revised version of Agree are the independence of feature valuation and feature interpretability and the view that Agree gives rise to a feature-sharing chain. The former opens up the possibility for interpretable unvalued features and uninterpretable unvalued features to act as probes. The latter allows a single feature to give rise to multiple instances of the same feature in different locations and form a feature-sharing chain through Agree. As we will show, both the fact that occurrences of interpretable unvalued features can serve as probes and the feature-sharing view of Agree will play an important role in our analysis of the (un)availability of focus intervention effects in Mandarin.

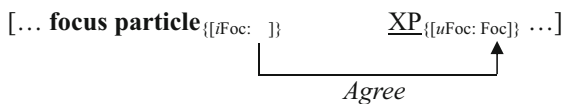
3.2 Focus features and Agree

Adopting Pesetsky and Torrego's revised version of Agree, we show that association between focus particles and focused phrases and the dependency between $C_{[Q]}$ and *wh*-phrases can be reduced to Agree relations.

3.2.1 Association between a focus particle and one or more focused phrases

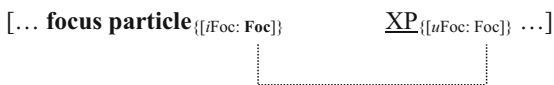
Recall that in Sect. 2.1, we showed that a focus particle must be associated with a focused phrase in its *c*-command domain. According to Rooth (1985, 1992), Kratzer (1991) and Wold (1996), a focused phrase has a focus semantic value, which introduces alternatives into semantic interpretations, while a focus particle functions as a focus-sensitive operator, which must take the alternatives as its quantificational domain. The semantics of focus is derived by evaluating a focus particle on the alternatives. In a nutshell, a focused constituent has the focus value, but a focus particle is the locus of focus semantic interpretations. In line with previous studies of the semantics of focus, we posit that the focus feature of a focus particle is interpretable but unvalued, while that of a focused phrase is uninterpretable but valued. Following Pesetsky and Torrego's revised version of Agree, the interpretable unvalued occurrence of the focus feature on the focus particle will probe the uninterpretable valued occurrence of the focus feature on the focused phrase XP in its *c*-command domain in order to allow the former to enter into an Agree relation with the latter, as depicted in (31).

(31) Agree between a focus particle and a focused constituent XP



Agree between the focus particle and the focused phrase XP results in the formation of a feature-sharing chain. Specifically, the valued focus feature on the focused phrase XP replaces the unvalued one on the focus particle, giving rise to two instances of the valued focus feature that form a feature-sharing chain, as depicted in (32).

(32) Feature sharing



Following the standard assumption in the Minimalist Program that only features that are both interpretable and valued are legible at the interface, the interpretable valued focus feature on the focus particle will be legible at the interface. By contrast, the uninterpretable valued focus feature on the focused phrase XP will not be legible at the interface, and thus it must be deleted, as shown in (33).

(33) Deletion of the uninterpretable valued focus feature

[... **focus particle**_{[iFoc: Foc]} XP_{[uFoc: Foc]} ...]

Moreover, the focus particles *zhi* and *shi* can associate with multiple foci (see Sect. 2.1). Adopting Hiraiwa’s (2001) proposal of multiple Agree, which allows a probe to undergo Agree with multiple goals simultaneously (see also Chomsky 2004), the unvalued focus feature on the focus particle will undergo multiple Agree with the valued focus features on the two focused phrases simultaneously, as shown in (34).

(34) [... *shi/zhi*_{[iFoc: Foc]} [... XP_{[uFoc: Foc]} ... XP_{[uFoc: Foc]} ...]]

In sum, we have demonstrated that the association between a focus particle and the focused phrase can be reduced to an Agree relation.

Next, we turn to *wh*-questions and show that the dependency between C_[Q] and a *wh*-phrase can also be reduced to an Agree relation.

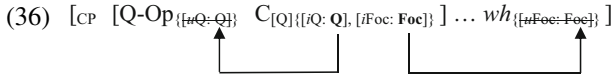
3.2.2 Dependency between C_[Q] and *wh*-phrases

In *wh*-questions, it is generally assumed that there is a dependency between C_[Q] and a *wh*-phrase, which together make up an interrogative *wh*-question. According to Pesetsky and Torrego’s (2007) proposal regarding *wh*-questions, the dependency can be reduced to Agree between C_[Q] and a *wh*-phrase. Specifically, Pesetsky and Torrego propose that C_[Q] in *wh*-questions bears an interpretable unvalued question feature, while the *wh*-phrase bears an uninterpretable valued question feature. In order to form a *wh*-question, the two must undergo Agree in narrow syntax, as shown in (35). The interpretable unvalued question feature on C_[Q] acts as a probe and obtains its value by entering into an Agree relation with the uninterpretable valued question feature on the *wh*-phrase. After the two have undergone Agree, the uninterpretable valued question feature on the *wh*-phrase is deleted.

(35) [CP C_[Q]_{[iQ: Q]} ... *wh*_{[uQ: Q]}]

Takita and Yang (forthcoming) adopt Pesetsky and Torrego’s feature-sharing view of Agree to account for the anti-superiority effect in Mandarin and Japanese (see also Takita and Yang 2014). In Takita and Yang’s proposed feature system for Mandarin, C_[Q] bears an interpretable unvalued question feature and an interpretable unvalued focus feature, whereas a *wh*-phrase bears an uninterpretable valued focus feature. Additionally, Takita and Yang posit that a question operator Q-Op with an uninterpretable valued question feature is merged into C_[Q]. According to their proposal, the question feature on C_[Q] is valued by the corresponding feature on the

question operator and the focus feature on $C_{[Q]}$ is valued by the corresponding feature on the *wh*-phrase, as shown in (36).

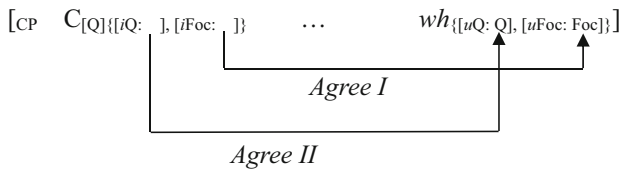


Taking a similar route, we propose that $C_{[Q]}$ and *wh*-phrases bear focus features. Adopting Hamblin’s (1973) semantics of questions, Rooth (1985, 1992) reveals a property shared by questions and focus constructions: namely, both invoke a set of alternative propositions. Along this line, Beck (2006) further proposes that, like a focused constituent, a *wh*-phrase denotes a set of alternative individuals, and correspondingly, that $C_{[Q]}$ is a focus-sensitive operator. Following this view, we propose that $C_{[Q]}$ and *wh*-phrases also have a focus feature and that the specifications of the focus feature in terms of valuation and interpretability are similar to those of focus particles and focused phrases. More specifically, we propose that $C_{[Q]}$ bears an interpretable unvalued focus feature, while a *wh*-phrase bears an uninterpretable valued focus feature.

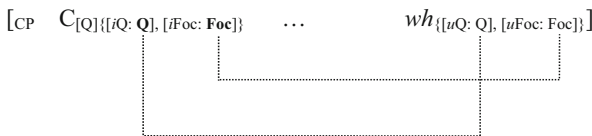
Moreover, differing from Takita and Yang (forthcoming), we do not assume a question operator in our system. We simply adopt Pesetsky and Torrego’s (2007) proposal that $C_{[Q]}$ and *wh*-phrases bear question features. In particular, $C_{[Q]}$ bears an interpretable but unvalued question feature that functions as a probe, while a *wh*-phrase bears an uninterpretable but valued question feature that functions as a goal. Following Miyagawa’s (2010) proposal, Agree establishes a functional relation between $C_{[Q]}$ and a *wh*-phrase, which in turn allows the question feature on $C_{[Q]}$ to establish an operator-variable relation with the *wh*-phrase. In this sense, it is not necessary to assume a question operator.

As a result, two Agree operations—one between the two occurrences of the focus feature and one between the two occurrences of the question feature—are needed to establish the dependency between $C_{[Q]}$ and a *wh*-phrase, as depicted in (37a–c).

- (37) a. Step 1: Agree I of focus features and Agree II of question features



- b. Step 2: Feature sharing



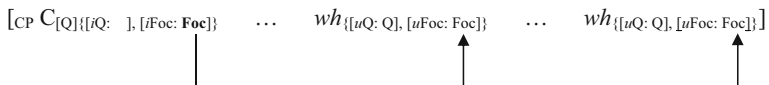
- c. Step 3: Deletion of the uninterpretable question and focus features



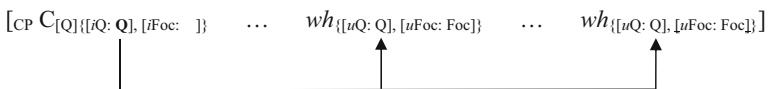
Note that we adopt Larson’s (2014) view that individual matching features, rather than a complete set of matching features, can participate in an Agree relation. Larson independently argues for this view by showing that theta-role assignment can be reanalyzed as Agree between individual matching features of the verb and its arguments (see also Cheung and Larson 2015).

Now let us turn to multiple *wh*-questions. Following Hiraiwa’s (2001) proposal of multiple Agree, the unvalued focus feature on $C_{[Q]}$ will undergo multiple Agree with the valued focus features on the two *wh*-phrases simultaneously, as shown in (38a). The unvalued question feature on $C_{[Q]}$ will also undergo multiple Agree with the valued question features on the two *wh*-phrases simultaneously, as shown in (38b).

(38) a. Multiple Agree of focus features



b. Multiple Agree of question features



The two multiple Agree operations establish the dependencies between $C_{[Q]}$ and multiple *wh*-phrases. Thus, multiple *wh*-questions are legible at the interface.

3.3 A syntactic account for focus intervention effects

Having established how the association between a focus particle and its focus associate and the dependency between $C_{[Q]}$ and a *wh*-phrase can be captured under the feature-sharing version of Agree, we are now in a position to account for focus intervention effects in Mandarin. The generalization regarding focus intervention effects and the relevant configuration are repeated in (39) and (40).

(39) Generalization regarding focus intervention effects in Mandarin

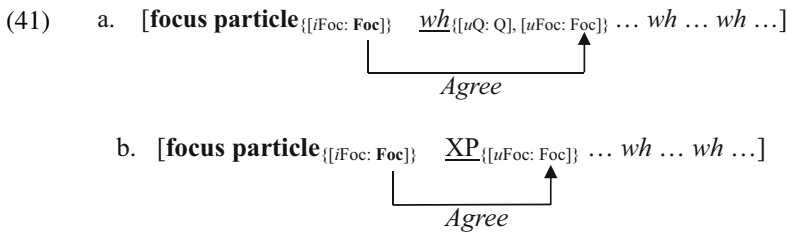
Focus intervention effects arise in Mandarin only if a focus particle and its focus associate intervene between $C_{[Q]}$ and one or more in-situ *wh*-phrases.

(40) $*[_{CP}\ C_{[Q]}\ \dots (wh)\ \dots \text{focus particle } \underline{wh} / \underline{XP}\ \dots wh\ \dots (wh)\ \dots]$

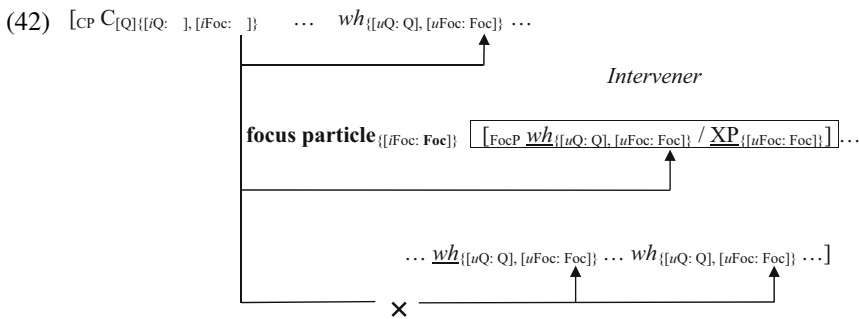
We propose that focus intervention effects should be construed as resulting from violations of the refined version of Relativized Minimality proposed by Rizzi (2004), which are induced by elements belonging to the same structural type. According to Rizzi (2004), a *wh*-phrase belongs to the same structural type as a focus that is housed in a Focus Phrase (FocP). Following this view, we propose that after a focus particle enters into an Agree relation with the focus associate (i.e., a *wh*-phrase or a focused phrase XP), the focus associate is licensed as a focus that is housed in a FocP. Since the focus inside the FocP is of the same structural type as a

wh-phrase, it blocks $C_{[Q]}$ from entering into an Agree relation with the *wh*-phrases following the FocP.

Let us consider how this proposal correctly rules out (40). Derivationally, the focus particle must be merged earlier than $C_{[Q]}$. The unvalued focus feature on the focus particle probes and finds as its goal the valued focus feature on the focus associate (i.e., a *wh*-phrase or a focused phrase XP). Agree takes place, establishing a feature-sharing chain between the focus particle and the *wh*-phrase or between the focus particle and the focused phrase XP. As a result, the focus particle shares the same focus feature with either the *wh*-phrase or the focused phrase XP, as shown in (41a) and (41b).



When $C_{[Q]}$ is merged to the structure, its unvalued focus feature probes and looks for a valued focus feature in its c-command domain. Since there is more than one matching goal due to the presence of multiple *wh*-phrases, the unvalued focus feature on $C_{[Q]}$ undergoes multiple Agree with the valued focus features on the *wh*-phrases simultaneously. However, multiple Agree between $C_{[Q]}$ and the *wh*-phrases following the FocP is prohibited; were it to take place, it would violate Rizzi’s refined version of Relativized Minimality, since the focus inside the FocP is of the same structural type as *wh*-phrases. In other words, the FocP serves as an “intervener” that blocks $C_{[Q]}$ from entering into an Agree relation with the *wh*-phrases following the FocP. This is depicted in (42).⁴



⁴ While we follow Rizzi’s (2004) proposal that a focus occupies Spec-FocP (see also Rizzi 1997), we have abstracted away from the precise position of the FocP and the internal structure of the FocP in (42) and (44) for simplicity. We leave open the possibility that a focus particle together with its focus associate may occupy Spec-FocP (see Badan and Del Gobbo, to appear).

Thus, $C_{[Q]}$ does not share its focus feature with the *wh*-phrases following the FocP. As a result, dependencies cannot be established between $C_{[Q]}$ and the *wh*-phrases, and the output is illegible at the semantic interface.⁵

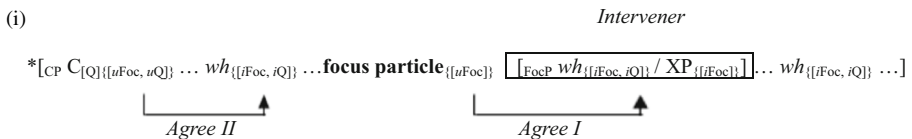
3.4 A syntactic account for the unavailability of focus intervention effects

In this section, we will account for the general configuration without focus intervention effects, which is repeated here.

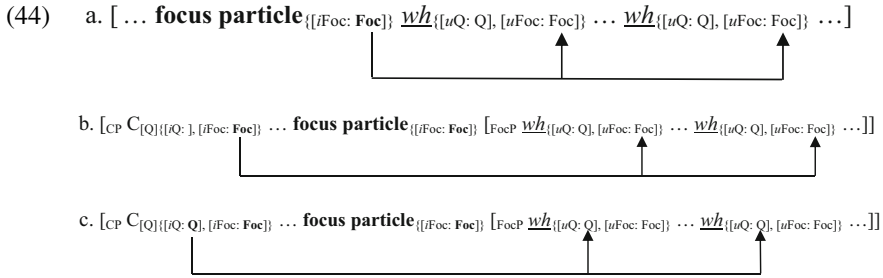
(43) $[_{CP} C_{[Q]} \dots$ **focus particle** *wh* ... (*wh*) ...]

Crucially, in (43), the focus particle is associated with *all* the *wh*-phrases in its c-command domain, and it differs from (42), which has *wh*-phrases following the FocP. Recall that the fundamental reason for analyzing the FocP as an intervener in (42) is that the focus inside the FocP is of the same structural type as a *wh*-phrase; hence, Agree between $C_{[Q]}$ and the *wh*-phrases following the FocP is blocked because it would violate Rizzi’s (2004) refined version of Relativized Minimality. In contrast, there is no intervening FocP between $C_{[Q]}$ and the *wh*-phrases in (43). Hence, our analysis correctly predicts the absence of focus intervention effects in (43). Under Pesetsky and Torrego’s (2007) Agree mechanism, an unvalued feature acts as a probe and finds a valued counterpart as its goal (see Sect. 3.1). Following Hiraiwa’s (2001) proposal of multiple Agree, the derivation of (43) is as depicted in (44a–c).

⁵ An anonymous reviewer asks whether Li’s (2011) and Li and Cheung’s (2012) analysis can successfully accommodate the presence of focus intervention effects in (40) if these authors also adopt Rizzi’s (2004) refined version of Relativized Minimality. Recall that in Sect. 2.2, we have reviewed their analysis and shown that it fails to accommodate configurations similar to (40), repeated here as (i) with the feature specifications following Li’s and Li and Cheung’s analysis:



Suppose the uninterpretable focus feature on the focus particle undergoes Agree I with the interpretable focus feature on the *wh*-phrase or the one on the focused phrase XP, rendering the FocP an intervener. Note that since Li (2011) and Li and Cheung (2012) assume that $C_{[Q]}$ bears uninterpretable focus and question features and that a *wh*-phrase bears interpretable focus and question features, so long as there is a *wh*-phrase that is closer to $C_{[Q]}$ than the FocP, the uninterpretable focus and question features on $C_{[Q]}$ can undergo Agree with their interpretable counterparts on the *wh*-phrase (see Agree II), leading to deletion of the uninterpretable features on $C_{[Q]}$. After the two Agree operations, the configuration no longer contains any uninterpretable features and hence (i) is wrongly predicted to be well-formed.

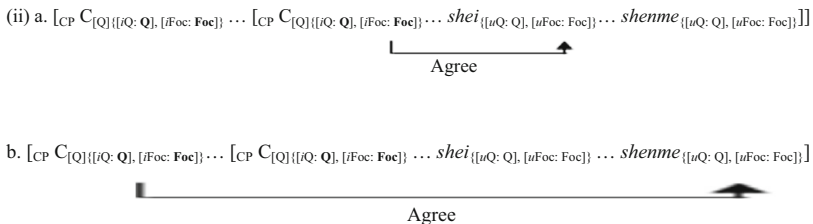


In (44a), the unvalued focus feature on the focus particle undergoes multiple Agree with the valued focus features on the *wh*-phrases. In (44b), C_[Q] is merged to the structure and its unvalued focus feature undergoes multiple Agree with the valued focus features on the *wh*-phrases. In (44c), the unvalued question feature on C_[Q] undergoes multiple Agree with the valued question features on the *wh*-phrases. As a result, proper dependencies are successfully established between C_[Q] and the *wh*-phrases.⁶

⁶ An anonymous reviewer asks whether the proposed analysis can be extended to account for sentences like (i), which according to Huang (1982a, b) has the readings shown in (ia–b).

- (i) Ni xiang-zhidao shei mai-le shenme?
- you wonder who buy-Perf what
- a. ‘What is the thing x such that you wonder who bought x?’
- b. ‘Who is the person x such that you wonder what x bought?’

According to Hiraiwa (2001, p. 70), a probe undergoes multiple Agree if its feature is [+multiple]. Since the two readings in (ia–b) do not involve a single probe with multiple matching goals, we assume that the unvalued features on the C_[Q] in the matrix and embedded clauses are not [+multiple]. To derive the reading in (ia), the unvalued features on C_[Q] in the embedded clause probe the corresponding valued features on *shei* ‘who’ as in (iia), and the unvalued features on C_[Q] in the matrix clause probe the corresponding valued features on *shenme* ‘what’, as shown in (iib).



In contrast, to derive the reading in (ib), the unvalued features on C_[Q] in the embedded clause probe the corresponding valued features on *shenme* ‘what’, and the unvalued features on C_[Q] in the matrix clause probe the corresponding valued features on *shei* ‘who’.

Under this analysis, we can correctly capture the absence of focus intervention effects.⁷

4 Conclusion

In this paper, we have investigated focus intervention effects in multiple *wh*-questions, revealing that focus intervention effects arise in Mandarin only if $C_{[Q]}$ and one or more in-situ *wh*-phrases are separated by a focus particle and its focus associate, which can be a focused phrase XP or an in-situ *wh*-phrase. We have further shown that focus intervention effects are not observed when a focus particle is associated with all the in-situ *wh*-phrases in its c-command domain. Taking a route similar to Takita and Yang (forthcoming), we have adopted Pesetsky and Torrego's (2007) feature-sharing view of Agree and proposed that the dependency between $C_{[Q]}$ and a *wh*-phrase can be reduced to an Agree relation. Specifically, a dependency can be successfully established between $C_{[Q]}$ and a *wh*-phrase only if they share the same focus and question features. Adopting Rizzi's (2004) refined version of Relativized Minimality, which analyzes a focus as belonging to the same structural type as a *wh*-phrase, we have proposed that focus intervention effects are induced by the intervening FocP, which inhibits $C_{[Q]}$ from entering into an Agree relation with the *wh*-phrases. It follows that the underlying cause of focus intervention effects is the failure of $C_{[Q]}$ to establish dependencies with *all* the *wh*-phrases in its c-command domain. Our analysis, if correct, not only sheds new light on focus intervention effects, but also provides additional empirical support for Pesetsky and Torrego's feature-sharing view of Agree.

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⁷ An anonymous reviewer asks whether Kim's (2006) analysis can accommodate the absence of focus intervention effects in configurations like (43). As discussed in Sect. 2.2, Kim adopts Maximize Matching Effects, which requires the probe to have a complete set of features matching those of the goal in order to undergo Agree. Consider (i), a configuration identical to (43) with the feature specifications following Kim's analysis.

(i) [C_P $C_{[Q]}$ $\{[iFoc, iQ]\}$... Foc-Op $\{[iFoc]\}$ **focus particle** [*wh* $\{[uFoc, uQ]\}$... *wh* $\{[uFoc, uQ]\}$...]]

Since the uninterpretable focus and question features on the two *wh*-phrases do not match the interpretable focus feature on the Foc-Op, the *wh*-phrases cannot undergo Agree with the Foc-Op due to Maximize Matching Effects. Furthermore, following Kim's proposal, the Foc-Op will block Agree between $C_{[Q]}$ and the two *wh*-phrases. Hence, (43) will be wrongly ruled out.

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