Focus intervention: a quantificational domain approach *

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1. Introduction

This paper attempts to revise the empirical generalization of focus intervention and proffer a new theory for the revised empirical generalization. The revision is motivated by patterns of focus association and focus intervention in Mandarin, the object language of this study.

Focus intervention typically manifests in a *wh*-question when an in-situ *wh*-phrase linearly follows a focus element consisting of a focus-sensitive operator and its associate (Beck 1996, 2006 and Kim 2006), as exemplified by the Mandarin sentence in (1a). If the *wh*-phrase is fronted past the focus element, as in (1b), focus intervention does not arise. [1]

(1) a. ?? **Zhiyou** Zhangsan$_F$ mei chi na dao cai?
only Zhangsan not eat which CL dish

b. Na dao cai, **zhiyou** Zhangsan$_F$ mei chi?
which CL dish only Zhangsan not eat
'Which dish did only Zhangsan not eat?'

As suggested by the naming of the phenomenon, the intervention approach is the most influential account for focus intervention , which goes back to Beck (1996, 2006) (see also Pesetsky 2000, Miyagawa 2010, Mayr 2013). This approach takes focus-sensitive operators to break the syntactic or semantic dependencies between the question operator (Q-operator) and an in-situ *wh*-phrase. Its theoretical consequence entails that (2) is the focus intervention configuration.

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[1] Throughout this paper: ASP stands for aspect marker and CL for classifier. Focus-sensitive operators are set in boldface. A subscript F indicates the presence of a focus feature, in the sense of Rooth (1985, 1992) and Kratzer (1991).

(2) ?*[Q ... **focus-sensitive operator** ... WH ...]

Although often cited in favor of the intervention approach (e.g., Kim 2006, Beck 2006), Mandarin does not support (2) as the focus intervention configuration. Specifically, sentences resembling (2) do not exhibit focus intervention. Instead, they allow association between focus-sensitive operators and in-situ *wh*-phrases (F-WH association, henceforth), as first pointed out by Aoun & Li (1993).

F-WH association, as shown in (3a), is comparable to canonical association with focus, an example of which is shown in (3b). In both cases, the focus-sensitive operator *zhi* 'only' incorporates exhaustivity into the sentence by associating with a constituent in its c-command domain, i.e., the focused object in (3b) and the *wh*-phrase in (3a).

(3) a. Libai **zhi** chuxi-le shenme huodong?
Libai only attend-ASP what activity
'What is the activity x such that Libai attended nothing other than x?'

b. Libai **zhi** chuxi-le wanyan$_F$.
Libai only attend-ASP dinner
'Libai attended nothing other than the dinner.'

The fact that F-WH association is grammatical casts doubts on different variants of this approach. For reasons of space, we cannot discuss the different theories in the intervention approach, but would like to refer interested readers to Beck (1996, 2006), Pesetsky (2000), Miyagawa (2010), Mayr (2013), and other studies cited there.

Based on the contrast between focus intervention and F-WH association, we defend a more restrictive focus intervention configuration. Specifically, we argue that **both** a focused phrase and a *wh*-phrase have to appear in the scope of a focus-sensitive operator to trigger focus intervention in a *wh*-question. The generalization is stated in (4a), and the corresponding configuration is given in (4b). F-WH association as shown in (3a) with the configuration in (2) does not trigger focus intervention since there is no focused phrase in addition to the *wh*-phrase in the scope of the focus-sensitive operator.

(4) a. Focus intervention arises in *wh*-questions iff a focus-sensitive operator scopes over a *wh*-phrase and a focused phrase.

b. ?*[Q **focus-sensitive operator** [XP$_F$ ... WH ...]]

Although (4b) differs from (2) only in the addition of the focused phrase, it leads to an entirely different theory of focus intervention. Like Beck (2006), our explanation is framed within Hamblin's (1973) semantics of questions. However, unlike Beck (2006) and other studies in the intervention approach, we argue that focus-sensitive operators do not cause trouble by virtue of intervening between the Q-operator and a *wh*-phrase. Instead, they cause trouble only when they have two different types of alternative-inducing elements in their scope, for this gives the focus-sensitive operator an illicit quantificational domain.

The rest of the paper explicates how this quantificational domain approach to focus intervention works. Section 2 discusses the interpretive properties of F-WH association, arguing that it is reducible to association with focus (Rooth 1985). With F-WH association

in picture, we reformulate the empirical generalization of focus intervention. Section 3 implements the quantificational domain approach and lays out the composition of focus intervention and F-WH association. Section 4 explores the novel empirical predictions of this approach. Section 5 concludes the paper.

2. From F-WH association to focus intervention

Association with focus establishes an interpretive dependency between a focus-sensitive operator and the constituent with which it associates (Jackendoff 1972, Rooth 1985, 1992, Beaver & Clark 2008, a.o.). The focus-sensitive operators in Mandarin discussed in this study are *zhi*, *zhiyou* and *shi*. *Zhi* and *zhiyou* are counterparts of English *only*. Both of them bring exhaustivity into the asserted content of a sentence (Zhang 1997, Tsai 2004, Lee 2005), as shown in (5a-b) (note that in this set of examples, only those assertions and/or presuppositions relevant to association with focus are given). These two operators have distinct distributions as well as syntactic behaviors, but for the current purpose it suffices to know that *zhiyou* may associate with the subject while *zhi* may not. A *shi*-construction is treated as the counterpart of the English cleft construction. It has an existential presupposition (Huang 1988, Cheng 2008, von Prince 2012), as shown in (5c).

(5) a. Libai **zhi** chuxi-le wanyan$_F$.
Libai only attend-ASP dinner
Assertion: Libai attended nothing other than the dinner.

b. **Zhiyou** Libai$_F$ chuxi-le wanyan.
only Libai attend-ASP dinner
Assertion: Nobody other than Libai attended the dinner.

c. **Shi** Libai$_F$ chuxi-le wanyan.
SHI Libai attend-ASP dinner
Assertion: Libai attended the dinner.
Presupposition: There was someone who attended the dinner.

Aoun & Li (1993) observed that in addition to associating with focused phrases, focus-sensitive operators in Mandarin may also associate with *wh*-phrases, as shown in (6a-c). More recently, Yang (2008) connected this observation with focus intervention (see also Eilam 2011).

(6) a. Libai **zhi** chuxi-le shenme huodong?
Libai only attend-ASP what activity
'What was the activity x such that Libai attended nothing other than x?'

b. **Zhiyou** shei chuxi-le wanyan?
only who attend-ASP dinner
'Who was the person x such that nobody other than x attended the dinner?'

c. **Shi** shei chuxi-le wanyan?
SHI who attend-ASP dinner
'Who was the person x such that it was x who attended the dinner?'

The evidence for the association between *zhi/zhiyou* and the in-situ *wh*-phrases in (6a-b) comes from the obligatory exhaustive interpretation of the *wh*-phrases. Beck & Rullmann (1999) argue that the semantics of *wh*-questions does not always incorporate exhaustivity (contra Groenendijk & Stokhof 1984). For example, to felicitously answer the *wh*-questions in (7a-b), one needs not provide complete lists of modes of transport (for (7a)) and places (for (7b)), but only some of these modes and places.

(7) a. Women keyi zuo shenme che dao huoche zhan?
we can take what transport go.to train station
'What mode of transport can I use to get to the train station?'

b. Women zai nali neng maidao baozhi?
we at where can buy newspaper
'Where can we buy newspaper?'

After the addition of the focus-sensitive operators, as in (8a-b), the mention-some interpretations are no longer available. Thus, only by providing complete lists of modes of transport and places can one felicitously answer these questions. This is because the non-exhaustive mention-some interpretation is incompatible with the exhaustivity enforced by F-WH association.

(8) a. Women **zhi** keyi zuo shenme che dao huoche zhan?
we only can take what transport go.to train station
'What is the mode of transport x such that we can use nothing other than x to get to the train station?'

b. Women **zhiyou** zai nali neng maidao baozhi?
we only at where can buy newspaper
'What is the place x such that we can buy newspaper nowhere other than at x?'

Differing from *zhi/zhiyou*, the semantic contribution of *shi* in (6c) is subtler; that is, the difference between (6c) and the corresponding *wh*-question without *shi*, as in (9), is harder to perceive.

(9) Shei chuxi-le wanyan?
who attend-ASP dinner
'Who attended the dinner?'

This may be due to the fact that both *shi*-constructions and *wh*-questions have existential presuppositions. That *wh*-questions have an existential presupposition has been defended by many scholars, including Karttunen (1977) and Dayal (1996). The same existential presupposition has also been attributed to *shi* (von Prince 2012). It is thus not surprising that the interpretive effects of F-WH association with *shi* is not as strongly perceived as other cases of F-WH association discussed earlier. Nevertheless, a contrast between (6c) and (9) can still be observed: the existential presupposition of (9) can be denied in a conversation like (10) (see Dayal 1996), but that of (6c) cannot, as shown in (11) (see also Wu 1999, p. 84, fn. 49). This indicates that the association between *shi* and the *wh*-phrase strengthens the existential presupposition of the *wh*-question.

(10) a. Q: Shei chuxi-le wanyan?
who attend-ASP dinner
'Who attended the dinner?'

b. A: Mei ren chuxi wanyan.
No person attend dinner
'Nobody attended the dinner.'

(11) a. Q: **Shi** shei chuxi-le wanyan?
SHI who attend-ASP dinner
'Who was the person x such that it was x who attended the dinner?'

b. A:# Mei ren chuxi wanyan.
No person attend dinner
'Nobody attended the dinner.'

Another piece of evidence for the reality of F-WH association is that the association is constrained by the Principle of Lexical Association (PLA) (Aoun & Li 1993, see also Tancredi 1990); that is, the focus-sensitive operators cannot associate with the traces left by movement. For example, F-WH association cannot be maintained in (12a-c) when the in-situ *wh*-phrases undergo fronting across the focus-sensitive operator.

(12) a. * Shenme huodong$_1$, Libai **zhi** chuxi-le t_1 ?
what activity Libai only attend-ASP
Intended 'What was the activity x such that Libai attended nothing other than x?'

b. * Shei$_1$, **zhiyou** t_1 chuxi-le wanyan?
who only attend-ASP dinner
Intended 'Who was the person x such that nobody other than x attended the dinner?'

c. * Shei$_1$, **shi** t_1 chuxi-le wanyan?
who SHI attend-ASP dinner
Intended 'Who was the person x such that it was x who attended the dinner?'

So far, we have established semantic and syntactic evidence for the existence of F-WH association in Mandarin, showing that a focus-sensitive operator can contribute to the interpretation of *wh*-questions through associating with in-situ *wh*-phrases without causing focus intervention. This fact is incompatible with the view that focus-sensitive operators are true interveners, as conceived by the intervention approach (Beck 2006, Kim 2006, Cable 2012, a.o.). Therefore, we must reconsider focus intervention in light of the well-formedness of F-WH association.

The structural contrast between F-WH association and focus intervention is not hard to tease apart. Compare focus intervention as in (13a-b) and F-WH association as in (6a-c).

(13) a. ?* Ta **zhi** yaoqing-le Libai$_F$ chuxi shenme huodong?
he only invite-ASP Libai attend what activity
Intended 'What was the activity x such that he only invited Libai$_F$ to attend x?'

b. ?* **Shi** Libai$_F$ yaoqing-le ta chuxi shenme huodong?
SHI Libai invite-ASP he attend what activity
Intended 'What was the activity x such that it was Libai$_F$ who invited him to attend x?'

In the cases of focus intervention, a focus-sensitive operator c-commands both a focused phrase and a *wh*-phrase; however, in the cases of F-WH association, a focus-sensitive operator only c-commands a *wh*-phrase. Based on this contrast, we defend the following more restrictive configuration of focus intervention (repeated from (4b)):

(14) ?*[Q ... **focus-sensitive operator** [XP$_F$ ... WH ...]]

We maintain that having both a focused phrase and a *wh*-phrase in the scope of a focus-sensitive operator is necessary to trigger focus intervention in *wh*-questions. In the next section, we provide an account for this generalization.

3. Proposal: the quantificational domain approach

This section lays out the quantificational domain approach to focus intervention. The first two subsections are devoted to the introduction of Kratzer's (1991) theory of focus interpretation and Hamblin's (1973) semantics for question interpretation. These two theories together form the backbone of the quantificational domain approach. The last two subsections demonstrate how focus intervention and F-WH association are analyzed in this approach.

3.1 Semantics of focus interpretation

Rooth (1985, 1992) divides the semantic contribution of a focus into its ordinary semantics and focus semantics. An ordinary semantic value is the usual denotation of a given constituent, which is derived by applying the interpretation function "$[\![\cdot]\!]^g$" without taking the focus feature into account. As for the focus semantic value, we follow Krazter's (1991) amendment of Rooth's theory and derive it via a secondary semantic value"$[\![\cdot]\!]^{g,h}$," in which h is a designated assignment function. Kratzer proposes that the focus feature borne by a focused phrase is indexed and functions as a distinguished variable subject to the interpretation by h. The assignment function h is applied only to the index on a focus. If there is no focus feature on α, h is not applied, i.e.,"$[\![\alpha]\!]^{g,h}$" is identical to"$[\![\alpha]\!]^g$." The focus semantic value of α corresponds to the set of $[\![\alpha]\!]^{g,h}$ by quantifying over designated assignments h, with H being the set of designated assignments, i.e., $\{[\![\alpha]\!]^{g,h} \mid h \in \mathrm{H}\}$. (15) is an example illustrating how this works.

(15) a. [$_{IP}$ Peter [$_{VP2}$ only [$_{VP1}$ attended the dinner$_{F1}$]]]
b. $[\![the\ dinner_{F1}]\!]^g$ = the dinner
c. $[\![the\ dinner_{F1}]\!]^{g,h} = h(1)$
d. $[\![\mathrm{VP1}]\!]^g = \lambda y.\lambda w.\ \mathrm{attend}_w(y, \text{the dinner})$
e. $[\![\mathrm{VP1}]\!]^{g,h} = \lambda y.\lambda w.\ \mathrm{attend}_w(y, h(1))$
f. $[\![\mathrm{VP1}]\!]^f = \{\lambda y.\lambda w.\ \mathrm{attend}_w(y, h(1)) \mid h \in \mathrm{H}\}$

Now, let us proceed to the assumption regarding the composition of association with focus. The core idea of association with focus is that the semantic contribution of a focus-sensitive operator must depend on the focus-semantic value of its sister. The meaning of *only* is given in (16). Note that the focus-semantic value of its sister provides the quantificational domain for the focus-sensitive operator. Putting things together, we can derive the meaning of (15a) as in (17).

(16) $[\![\textit{only}\ \text{VP}]\!]^g = \lambda y.\lambda \text{w}.\forall \text{P} \in [\![\text{VP}]\!]^f\ [P_w(y) \rightarrow [\![\text{VP}]\!]^g(y) \subseteq P(y)]$

(17) a. $[\![\text{VP2}]\!]^g = [\![\textit{only}\ \text{VP1}]\!]^g$
$= \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^f\ [P_w(y) \rightarrow \lambda w'.\ \text{attend}_{w'}(y, \text{the dinner}) \subseteq P(y)]$

b. $[\![\text{IP}]\!]^g$
$= \lambda w.\forall P \in [\![\text{VP1}]\!]^f\ [P_w(\text{Peter}) \rightarrow \lambda w'.\ \text{attend}_{w'}(\text{Peter}, \text{the dinner}) \subseteq P(\text{Peter})]$

3.2 Semantics of *wh*-questions

Based on Hamblin's (1973) original semantics, we propose that an in-situ *wh*-phrase does not bear any focus index. It merely denotes a set of alternatives as its ordinary semantic value (see also Eckardt 2007, contra Beck 2006). On this view, the denotation of the in-situ *wh*-phrase in (18) is a set of activities, whose domain is restricted by the context, as in (19a). Since the *wh*-phrase bears no focus index, the designated assignment function *h* is not applied. The secondary semantic value of the *wh*-phrase is identical to its ordinary semantic value, as shown in (19b).

(18) [$_{\text{CP}}$ Q [$_{\text{IP}}$ Libai [$_{\text{VP}}$ chuxi-le shenme huodong]]]
Libai attend-ASP what activity
'Which activity did Libai attend?'

(19) a. $[\![\textit{shenme huodong}]\!]^g = \{x \in D_e \mid \text{activity}_w(x)\}$

b. $[\![\textit{shenme huodong}]\!]^{g,h} = [\![\textit{shenme huodong}]\!]^g$

To avoid the confusion of *wh*-phrases and one-place predicates, we follow Yatsushiro (2009) in treating *wh*-phrases as having the type α/t, as shown in (20) (see also Eckardt 2007). Therefore, the *wh*-phrase *shenme shihou* has the type *e/t* rather than $< e,t >$. The semantic value of a *wh*-question is compositionally derived via pointwise functional application. The original idea is due to Hamblin (1973) and is later polished by Hagstrom (1998). The mode of pointwise functional application following Yatsushiro (2009) is given in (21):

(20) Semantic type for alternative sets (Yatsushiro 2009: 152)
For any type α ; α/t is the type of sets of entities of type α, $\text{D}_{\alpha/t} = \text{POW}(D_\alpha)$

(21) Pointwise functional application (based on Yatsushiro 2009: 153)
If X is a phrase with two immediate subconstituents Y and Z, then $[\![\text{X}]\!]^g$ is defined as follows:

a. if $[\![\text{Y}]\!]^g$ is of type α; $[\![\text{Z}]\!]^g$ is of type $< \alpha, \beta >$, then $[\![\text{X}]\!]^g = [\![\text{Z}]\!]^g([\![\text{Y}]\!]^g) \in D_\beta$;

b. if $[\![\text{Y}]\!]^g$ is of type α/t; $[\![\text{Z}]\!]^g$ is of type $< \alpha, \beta >$, then $[\![\text{X}]\!]^g = \{[\![\text{Z}]\!]^g(y) \mid y \in [\![\text{Y}]\!]^g\} \in D_{\beta/t}$;

c. if $[\![\text{Y}]\!]^g$ is of type α; $[\![\text{Z}]\!]^g$ is of type $< \alpha, \beta >/t$, then $[\![\text{X}]\!]^g = \{z([\![\text{Y}]\!]^g) \mid z \in [\![\text{Z}]\!]^g\} \in D_{\beta/t}$;

d. if $[\![\text{Y}]\!]^g$ is of type α/t; $[\![\text{Z}]\!]^g$ is of type $< \alpha, \beta >/t$, then $[\![\text{X}]\!]^g = \{z(y) \mid z \in [\![\text{Z}]\!]^g$ and $y \in [\![\text{Y}]\!]^g\} \in D_{\beta/t}$;

Using pointwise functional application, the ordinary semantic value of the *wh*-question in (18) is computed in (22a-d). We follow Kratzer & Shimoyama's (2002) definition of the Q operator, taking it to receive a set of propositional alternatives as an argument and return the same propositional alternatives, as in (22c). Notice that no focus index is invoked in the *wh*-question, so the secondary semantic value of the *wh*-question is simply equivalent to its ordinary semantic value, as shown in (22d).

(22) a. $[\![\text{VP}]\!]^g = \{[\![\textit{chuxi}]\!]^g(x) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$
$= \{\lambda y.\ \lambda w'.\ \text{attend}_{w'}(y, x) \mid \text{activity}_w(x)\}$

b. $[\![\text{IP}]\!]^g = \{f([\![\textit{Libai}]\!]^g) \mid f \in [\![\text{VP}]\!]^g\}$
$= \{\lambda w'.\ \text{attend}_{w'}(\text{Libai}, x) \mid \text{activity}_w(x)\}$

c. $[\![\text{CP}]\!]^g = [\![\text{Q IP}]\!]^g = [\![\text{IP}]\!]^g$

d. $[\![\text{CP}]\!]^{g,h} = [\![\text{CP}]\!]^g$

If *the dinner*, *the ball* and *the concert* are all the activities in the context, (22b) denotes the set $\{\lambda w.$ *Libai attend*$_w$ *the dinner,* $\lambda w.$ *Libai attend*$_w$ *the ball,* $\lambda w.$ *Libai attend*$_w$ *the concert*$\}$. Note that this original Hamblin denotation of (18) also serves as the ordinary semantic value of the *wh*-question.

3.3 Deriving focus intervention

We are now in a position to account for focus intervention. This section will show that focus intervention falls out automatically from the proposed interpretive mechanism at no additional cost. Consider the *wh*-question in (23), which manifests focus intervention.

(23) ?*[$_{\text{CP}}$ Q [$_{\text{IP}}$ Ta [$_{\text{VP2}}$ **zhi** [$_{\text{VP1}}$ yaoqing-le Libai$_{F1}$ chuxi shenme huodong]]]]?
he only invite-ASP Libai attend what activity
Intended 'what was the activity x such that he only invited Libai$_F$ to attend x?'

In VP1, the focused phrase *Libai* bears a focus index. Hence, the focused phrase is translated as a distinguished variable for the secondary semantic value of VP1, as shown in (24a-b). The focus semantic value of VP1 can be derived by quantifying over the designated assignment function *h*, as in (24c). Clearly, the use of *h* gives rise to a set of sets of alternative properties. Assume that the activities only include *the dinner*, *the ball* and *the concert* and the alternatives to *Libai* are *Peter* and *Lisa*, the focus semantic value of VP1 can be represented as (25).

(24) a. $[\![\text{VP1}]\!]^g = \{\lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai}, x) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$

b. $[\![\text{VP1}]\!]^{g,h} = \{\lambda y.\lambda w.\ \text{invite-to-attend}_w(y, h(1), x) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$

c. $[\![\text{VP1}]\!]^f = \{[\![\text{VP1}]\!]^{g,h} \mid h \in \text{H}\}$
$= \{\{\lambda y.\lambda w.\ \text{invite-to-attend}_w(y, h(1), x) \mid x \in [\![\textit{shenme huodong}]\!]^g\} \mid h \in \text{H}\}$

(25)
$$[\![\text{VP1}]\!]^f = \left\{ \begin{array}{l} \left\{ \begin{array}{l} \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the dinner}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the ball}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the concert}) \end{array} \right\} \\ \left\{ \begin{array}{l} \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Peter, the dinner}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Peter, the ball}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Peter, the concert}) \end{array} \right\} \\ \left\{ \begin{array}{l} \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Lisa, the dinner}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Lisa, the ball}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Lisa, the concert}) \end{array} \right\} \end{array} \right\}$$

Upon computing VP2, the focus-sensitive operator is applied. According to (16), it must take the focus semantic value of VP1 as its domain of quantification, and compose with the ordinary-semantic value of VP1 through pointwise functional application. (26) is the resulting derivation.

(26) $[\![\text{VP2}]\!]^g = [\![\textit{zhi}]\!]^g\ ([\![\text{VP1}]\!]^f)\ ([\![\text{VP1}]\!]^g)$

$$= [\![\textit{zhi}]\!]^g\ ([\![\text{VP1}]\!]^f) \left(\left\{ \begin{array}{l} \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the dinner}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the ball}) \\ \lambda y.\lambda w.\ \text{invite-to-attend}_w(y, \text{Libai, the concert}) \end{array} \right\} \right)$$

$$= \left\{ \begin{array}{l} \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^f\ [P_w(y) \rightarrow \lambda w'.\ \text{invite-to-attend}_{w'}(y, \text{Libai, the dinner}) \subseteq P(y)] \\ \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^f\ [P_w(y) \rightarrow \lambda w'.\ \text{invite-to-attend}_{w'}(y, \text{Libai, the ball}) \subseteq P(y)] \\ \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^f\ [P_w(y) \rightarrow \lambda w'.\ \text{invite-to-attend}_{w'}(y, \text{Libai, the concert}) \subseteq P(y)] \end{array} \right\}$$

Note that *zhi* quantifies over properties (i.e., of the type $< e, st >$), however, its domain of quantification, $[\![\text{VP1}]\!]^f$, is a set of sets of properties (i.e., of the type $< e, st >/t/t$), according to (25). This results in an illicit quantificational structure, hence focus intervention.

3.4 Deriving F-WH association

F-WH association, unlike focus intervention, does not cause problem to the quantificational domain of a focus-sensitive operator. Take (27) as an example.

(27) [$_{\text{CP}}$ Q [$_{\text{IP}}$ Libai [$_{\text{VP2}}$ **zhi** [$_{\text{VP1}}$ chuxi-le shenme huodong]]]]
Libai only attend-ASP what activity
'What was the activity x such that Libai attended nothing other than x?'

We argue that a *wh*-phrase does not bear any focus index, hence the ordinary semantic value and the secondary semantic value of VP1 are the same, as in (28a). When *zhi* is computed, we stipulate that it takes the secondary semantic value of VP1 as its quantificational domain and composes pointwisely with the ordinary semantic value of VP1, as in (28b). IP and CP are derived by composing the subject *Libai* with the set denoted by VP2, as in (28c).

(28) a. $[\![\text{VP1}]\!]^g = [\![\text{VP1}]\!]^{g,h}$
$= \{\lambda y.\ \lambda w.\ \text{attend}_w(y, x) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$

$$= \left\{ \begin{array}{l} \lambda y.\lambda w.\ \text{attend}_w(y, \text{the dinner}) \\ \lambda y.\lambda w.\ \text{attend}_w(y, \text{the ball}) \\ \lambda y.\lambda w.\ \text{attend}_w(y, \text{the concert}) \end{array} \right\}$$

b. $[\![\text{VP2}]\!]^g = [\![\textit{zhi}]\!]^g\ ([\![\text{VP1}]\!]^{g,h})\ ([\![\text{VP1}]\!]^g)$

$$= \left\{ \begin{array}{l} \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\ \text{attend}_{w'}(y, \text{the dinner}) \subseteq P(y)] \\ \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\ \text{attend}_{w'}(y, \text{the ball}) \subseteq P(y)] \\ \lambda y.\lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\ \text{attend}_{w'}(y, \text{the concert}) \subseteq P(y)] \end{array} \right\}$$

c. $[\![\text{CP}]\!]^g = [\![\text{Q IP}]\!]^g$

$$= \left\{ \begin{array}{l} \lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(\text{Libai}) \rightarrow \lambda w'.\ \text{attend}_{w'}(\text{Libai, the dinner}) \subseteq P(\text{Libai})] \\ \lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(\text{Libai}) \rightarrow \lambda w'.\ \text{attend}_{w'}(\text{Libai, the ball}) \subseteq P(\text{Libai})] \\ \lambda w.\ \forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(\text{Libai}) \rightarrow \lambda w'.\ \text{attend}_{w'}(\text{Libai, the concert}) \subseteq P(\text{Libai})] \end{array} \right\}$$

Here, the secondary semantic value of VP1, i.e., $[\![\text{VP1}]\!]^{g,h}$, denotes a set of properties rather than a set of sets of properties. Hence, it is an appropriate quantificational domain.

4. Predictions

The quantificational domain approach to focus intervention makes novel predictions about when focus intervention appears. This section discusses two predictions, one regarding the asymmetry between *wh*-induced alternatives and focus-induced alternatives, the other regarding the absence of focus intervention in multiple *wh*-questions.

4.1 The asymmetry between *wh*-induced and focus-induced alternatives

A key assumption in the quantificational domain approach is that the set of alternatives induced by a *wh*-phrase and that induced by a focus index-bearing phrase are different with respect to the composition with a focus-sensitive operator. While the focus-sensitive operator reads off the focus index of its non-*wh* associate and closes the expansion of the set of focus alternatives, it does not close the expansion of the set denoted by a *wh*-phrase. This asymmetry predicts the following contrast in sentences with multiple focus-sensitive operators associating with *wh*-phrases and focused phrases:

(29) a. [Q ... **focus-sensitive op.** [$_\gamma$ ...WH... [$_\beta$ **focus-sensitive op.** [$_\alpha$ ... XP_F ...]]]]
b. *[Q ... **focus-sensitive op.** [$_\gamma$ ... XP_F ... [$_\beta$ **focus-sensitive op.** [$_\alpha$ ...WH...]]]]

In (29a), the designated assignment function h is activated to derive the focus semantic value of α, which is evaluated by the inner focus-sensitive operator and reset to the ordinary semantic value. Since there is no unevaluated focused phrase in γ, the application of

the designated assignment function h is no longer available beyond β. The constituent γ does not provide the outer focus-sensitive operator with a set of sets of alternatives as its quantificational domain, but rather a set of alternatives derived from the *wh*-phrase. As a consequence, focus intervention does not arise in (29a). This prediction is borne out, as in (30a).

On the contrary, in (29b), since the *wh*-phrase does not contain any focus index, the assignment function h is not used. The inner focus-sensitive operator composes pointwisely with the set of alternatives denoted by α. The expansion continues to β and γ. When the focus-sensitive operator computes the focus semantic value of γ using the assignment function h, a set of sets of alternatives is resulted. Hence, focus intervention emerges, as evidenced by (30b).

(30) a. **Shi** shei **zhi** chuxi-le wanyan$_F$?
SHI who only attend-ASP dinner
'Who was the person x such that it is x who only attended the dinner?'

b. ?* **Shi** Libai$_F$ **zhi** chuxi-le shenme huodong?
SHI Libai only attend-ASP what activity
Intended 'What was the activity x such that it is Libai who only attended x?'

4.2 Multiple foci and multiple *wh*-questions

It is well known that a focus-sensitive operator can associate with multiple foci (Rooth 1985, Krifka 1991). Consider (31a), in which each focused phrase bears a focus index. The ordinary-semantic value of VP is given in (31b). The designated assignment function h interprets each focus index in (31a) as a focus variable, inducing the secondary semantic value of VP, as in (31c). As a result, the focus-semantic value of VP is derived as a set of properties, as shown in (31d). Then, *zhi* is applied and takes as its quantificational domain the focus semantic value of VP, as in (31e).

(31) a. Ta **zhi** [$_{\text{VP}}$ yaoqing-le Libai$_{F1}$ chuxi wanyan$_{F2}$].
he only invite-ASP Libai attend dinner
'He only invited Libai$_{F1}$ to attend the dinner$_{F2}$.'

b. $[\![\text{VP}]\!]^g = \lambda y.\lambda w.$ invite-to-attend$_w(y,$ Libai, the dinner)

c. $[\![\text{VP}]\!]^{g,h} = \lambda y.\lambda w.$ invite-to-attend$_w(y, h(1), h(2))$

d. $[\![\text{VP}]\!]^f = \{\lambda y.\lambda w.$ invite-to-attend$_w(y, h(1), h(2)) \mid h \in \text{H}\}$

e. $[\![zhi\ \text{VP}]\!]^g = \lambda \text{y}.\lambda \text{w}.\forall P \in [\![\text{VP}]\!]^f\ [P_w(y) \rightarrow [\![\text{VP}]\!]^g(y) \subseteq P(y)]$

The quantificational domain is appropriate: a property P belongs to a set of properties. As a result, no focus intervention arises, conforming to the generalization in (4).

Now, let's suppose that a focus-sensitive operator is applied to a VP which contains multiple *wh*-phrases, as in the following examples:

(32) a. Ta **zhi** [$_{\text{VP}}$ yaoqing-le shei chuxi shenme huodong]?
he only invite-ASP who attend what activity

'What was the person y and what was the activity x such that he only invited y to attend x?'

b. **Shi** [$_{IP}$ shei mai-le shenme]?
SHI who buy-ASP what
'What was the person y and what was the thing x such that it was the pair $< x, y >$ that y bought x?'

Let's take (32a) as an example. Since there is no focus index invoked, the ordinary semantic value and the secondary semantic value of VP are identical, as shown in (33a). When *zhi* is applied, it takes the secondary semantic value of VP as its quantificational domain and composes pointwisely with the ordinary semantic value of VP. The result is shown in (33b).

(33) a. $[\![\text{VP}]\!]^g = [\![\text{VP}]\!]^{g,h}$
$= \{\lambda z.\lambda w.\ \text{invite-to-attend}_w(z, y, x) \mid x \in [\![\textit{shenme huodong}]\!]^g \text{ and } y \in [\![\textit{shei}]\!]^g\}$

b. $[\![\textit{zhi}\ \text{VP}]\!]^g = [\![\textit{zhi}]\!]^g\ ([\![\text{VP}]\!]^{g,h})\ ([\![\text{VP}]\!]^g)$

$$= \left\{ \begin{array}{l} \lambda z.\lambda w.\ \forall P \in [\![\text{VP}]\!]^{g,h}\ [P(w)(z) \rightarrow \lambda w.\ \text{invite-to-attend}_{w'}(z, y, x) \subseteq P(z)] \\ \mid x \in [\![\textit{shenme huodong}]\!]^g \text{ and } y \in [\![\textit{shei}]\!]^g \end{array} \right\}$$

Since the secondary semantic value of VP does not denote a set of sets of alternatives, focus intervention does not arise. [2]

5. Conclusion

This paper has motivated a quantificational domain approach to focus intervention in light of the contrast between focus intervention and F-WH association, and explored some of its predictions. As concluding remarks, we would like to address an apparent limitation of this approach and suggest a direction for future research.

It is well known that in addition to focus-sensitive operators, certain quantified NPs (e.g., those introduced by counterparts of *no*, *most*, and *few*) and adverbial quantifiers (e.g., counterparts of *always*, *often* and *never*) also trigger intervention in *wh*-questions in some languages (see Beck 2006:3-10). While previous studies in the intervention approach subject focus intervention and quantifier intervention to the same account (e.g., Beck 2006 and Mayr 2013), the quantificational domain approach defended here does not. It is because the latter crucially relies on Rooth's (1985, 1992) assumption that a focus-sensitive operator makes use of both the ordinary semantic value and the focus semantic value of its sister, but it is not clear how this special semantics can be extended to other quantificational elements without additional stipulations (but see Beck 2006). We would also like to point out that

[2]One thing worth pointing out is that the multiple *wh*-questions in (32) only have single-pair readings, as suggested by the semantics in (33b). We do not have a sound analysis for the unavailability of pair-list readings in multiple *wh*-questions. However, we would like to offer the following conjectures. First, if LF movement of at least one *wh*-phrase is needed to derive the pair-list reading, as assumed by most studies (e.g., Dayal 1996; Kitagawa et al. 2004; a.o.), then associating a focus-sensitive operator with multiple *wh*-phrases could render it impossible for any *wh*-phrase to undergo LF movement (due to the PLA). This derives the lack of the pair-list reading. Secondly, if no LF movement is needed to derive the pair-list reading and the pair-list denotes a set of sets of alternatives, then focus intervention arises to rule out the pair-list reading.

the lack of a uniform account actually better accords with the empirical facts: as noted by Beck (2006), focus-sensitive operators are stable interveners cross-linguistically, but other quantificational elements exhibit greater variation. It is thus possible that focus intervention and quantifier intervention are subject to different explanations. In this regard, the fact that the quantificational domain approach does not unify different types of intervention effects may turn out to be a virtue rather than an inadequacy.

The quantificational domain approach is a very general hypothesis for focus intervention. It predicts that the interaction of any sets of alternatives induced by a Hamblin set and a focus gives rise to focus intervention. Since disjunctive sentences, alternative questions and sentences with negative polarity items and indefinites have been argued to involve Hamblin sets, it would be worthwhile to investigate focus intervention in these constructions to verify the merits of the quantificational domain approach (see Li & Law to appear).

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