Alternatives in different dimensions: a case study of focus intervention

Haoze Li Jess Law

Abstract

In Beck (2006), focus intervention is used as an argument for reducing Hamblin's (1973) semantics for questions to Rooth's (1985) focus semantics. Drawing on novel empirical evidence from Mandarin and English, we argue that this reduction is unwarranted. Maintaining both Hamblin's original semantics and Rooth's focus semantics not only allows for a more adequate account for focus intervention in questions, but also correctly predicts that focus intervention is a very general phenomenon caused by interaction of alternatives in different dimensions.

Keywords: focus intervention, alternative semantics, questions, focus

1 Introduction

Alternative semantics as originally conceived by Hamblin (1973) has proven to be an impactful framework for studying natural language meaning. Hamblin's core idea is that question words like *who* and *what* denote sets of alternative individuals and things respectively. A set of alternatives can compose with other appropriate elements in a pointwise manner to form higher types of sets of alternatives. These ideas have inspired two major lines of alternative semantics that have been actively researched in recent years—neo-Hamblin semantics (Kratzer and Shimoyama 2002, Kratzer 2005), and focus semantics (Rooth 1985, 1992).

Neo-Hamblin semantics takes up Hamblin's insight that there are expressions denoting sets of alternatives. One of the major contributions of neo-Hamblin semanticists is the discovery that there are expressions other than question words that denote sets of alternatives. These expressions include non-interrogative *wh*-phrases (Kratzer and Shimoyama 2002; Shimoyama 2006; Rawlins 2008, 2013) and disjunction (Aloni 2003; Simons 2005; Alonso-Ovalle 2008).

Focus semantics, which was developed by Rooth (1985) more than a decade earlier than neo-Hamblin semantics, assumes that there are two dimensions of meaning: the ordinary dimension and the focus dimension. A focused phrase has an ordinary semantic value, which is its usual denotation; in addition, it gives rise to a set of alternatives as its denotation in the focus dimension, i.e. the focus semantic

value. A focus-sensitive operator, such as the $\sim$ operator, evaluates all foci in its scope unselectively and neutralizes their contribution by resetting the focus semantic value to the ordinary semantic value.

Little was known about the consequence of bringing together these two branches of alternative semantics before Beck (2006). In an attempt to explain focus intervention effects (referred to simply as 'focus intervention' in this paper), Beck suggests reducing sets of alternatives at the ordinary dimension to sets of alternatives at the focus dimension. Focus intervention arises when a focus-sensitive operator c-commands an interrogative in-situ *wh*-phrase, as schematized in (1). This phenomenon is widely attested in *wh*-in-situ languages, including Mandarin, Hindi, Japanese, and Korean, as well as in certain *wh*-in-situ environments in English and German (Huang 1982a,b; Beck 1996, 2006; Beck and Kim 1997; Pesetsky 2000; Kim 2006; Grohmann 2006; Tomioka 2007; Yang 2008, 2012; Miyagawa 2010; Mayr 2013; Xie 2013; a.o.).

(1) Classic configuration of focus intervention
?*[Q ... [focus-sensitive operator [$_{YP}$ ... WH ...]]]

Following Rooth's focus semantics, Beck develops a multi-dimensional semantics for *wh*-questions. In particular, a *wh*-phrase like focus denotes a set of alternatives as its focus semantic value, but lacks an ordinary semantic value. To obtain a well-formed ordinary denotation, the *wh*-phrase has to be rescued by a special, appropriate focus-sensitive operator, i.e., the question operator (Q operator). The Q operator elevates the focus semantic value of its complement to its ordinary semantic value. However, such an evaluation is unsuccessful in (1). Firstly, due to minimality, the focus-sensitive operator evaluates all the foci in its scope, and hence blocks the association between the focus-sensitive Q operator and the *wh*-phrase. Secondly, the focus-sensitive operator is not an appropriate evaluator for the *wh*-phrases. When the focus-sensitive operator is applied to the *wh*-containing constituent YP, it requires both the focus semantic value and the ordinary semantic value of YP. However, since the *wh*-phrase does not have an ordinary semantic value, and neither does YP, the application fails and focus intervention is triggered.

This 'reductionist' framework has been very influential. In fact, a significant fraction of the growing body of research on questions and focus is done in this framework. Some telling examples include Dong (2009), Cable (2010), Trukenbrodt (2013), Constant (2014), Erlewine (2014) and Kotek and Erlewine (to appear).

This paper represents a second attempt to bring together Rooth's focus semantics and Hamblin semantics to account for focus intervention. However, instead of following the reductionist framework, we believe having sets of alternatives in different dimensions would give us more explanatory power, an insight that goes back to Eckardt (2007). So, we depart from Beck in maintaining Hamblin's original

semantics that there are defined sets of alternatives in the ordinary dimension. With sets of alternatives in different dimensions at our disposal, we show that focus intervention turns out to be more revealing than it was thought to be. In particular, we demonstrate that focus intervention is a consequence of focus-sensitive operator having an inappropriate quantificational domain. This inappropriate quantificational domain is resulted when the focus-sensitive operator scopes over sets of alternatives in different dimensions. In other words, our proposal attributes focus intervention to the illicit quantificational structure induced by a focus-sensitive operator, rather than to minimality effects. For this reason, we refer to the proposal put forward here as the 'quantificational domain approach' to focus intervention. This paper lays out the quantificational domain approach and examines its empirical and theoretical consequences.

This paper is organized as follows. Section 2 draws on novel empirical evidence to motivate a revision of the empirical generalization on focus intervention. Section 3 introduces the quantificational domain approach and demonstrates how it fares with the revised generalization. Section 4 extends the proposed analysis to account for novel data, namely, focus intervention with non-interrogative *wh*-phrases and disjunctive phrases. Section 5 points out two remaining issues for future research, and compares the proposed analysis with other recent approaches to focus intervention. Section 6 concludes the paper.

2 Revising the generalization on focus intervention

Focus intervention is the motivation behind Beck's (2006) framework that the semantics of questions is reduced to Rooth's focus semantics. However, this section describes a relevant phenomenon in Mandarin which calls into question the empirical generalization of focus intervention and challenges the reductionist framework.

We begin by introducing the properties of focus-sensitive operators in Mandarin. Three focus-sensitive operators in Mandarin are relevant in this study, namely, *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 (2a-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 in (2c).

(2) 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.

Focus intervention is observed when these focus-sensitive operators precede *wh*-phrases, as shown in (3). In contrast, if the *wh*-phrases are fronted across the focus-sensitive operators, focus intervention disappears, as in (4). The contrast illustrated here follows from the extant generalization of focus intervention stated in (1).

(3) 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. ?* **Zhiyou** [Libai]$_F$ yaoqing-le ta chuxi *shenme huodong*?
only Libai invite-Asp he attend what activity
Intended 'What was the activity x such that only [Libai]$_F$ invited him to attend x?'

c. ?* **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?'

(4) a. *Shenme huodong*, ta **zhi** yaoqing-le [Libai]$_F$ chuxi?
what activity he only invite-Asp Libai attend
'What was the activity x such that he only invited [Libai]$_F$ to attend x?'

b. *Shenme huodong*, **zhiyou** [Libai]$_F$ yaoqing-le ta chuxi?
what activity only Libai invite-Asp he attend
'What was the activity x such that only [Libai]$_F$ invited him to attend x?'

c. *Shenme huodong*, **shi** [Libai]$_F$ yaoqing-le ta chuxi ?
what activity SHI Libai invite-Asp he attend what activity
'What was the activity x such that it was [Libai]$_F$ who invited him to attend x?'

However, this generalization of focus intervention becomes unwarranted if we take into consideration Aoun & Li's (1993) observation that focus-sensitive operators in Mandarin may associate with *wh*-phrases, as shown in (5a-c). If focus-sensitive operators were genuine interveners between Q and *wh*-phrases, none of these sentences should be well-formed. We refer to this phenomenon as 'F-WH association.' To our knowledge, Huang (1982b) is the first to notice the contrast between (3) and (5), and Yang's (2008) dissertation explicitly connects F-WH association with focus intervention (see also Eilam 2011; Li 2013).

(5) 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 (5a-b) comes from the obligatory exhaustive interpretation of the *wh*-phrases. Beck and Rullmann (1999) argue that the semantics of *wh*-questions does not always incorporate exhaustivity (contra Groenendijk and Stokhof 1984). For example, to felicitously answer the *wh*-questions in (6a-b), one needs not provide complete lists of forms of transport (for 6a) and places (for 6b), but only some of these forms and places.

(6) a. Women keyi zuo *shenme che* dao huoche zhan?
we can take what transport go.to train station
'What kind 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 (7a-b), the mention-some interpretations are no longer available. In other words, only by providing complete lists of forms 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.

(7) 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* cai neng maidao baozhi?
we only at where just 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 (5c) is subtler; that is, the difference between (5c) and the corresponding *wh*-question without *shi*, as in (8), is harder to perceive.

(8) *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 (5c) and (8) can still be observed: the existential presupposition of (8) can be denied in a conversation like (9) (see Dayal 1996), but that of (5c) cannot, as shown in (10) (cf. 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.

(9) 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.'

(10) 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 and 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 (11a-c) when the in-situ *wh*-phrases undergo fronting across the focus-sensitive operator.

(11) 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. It reveals 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 extant generalization that focus-sensitive operators are true interveners. Furthermore, F-WH association poses another problem for Beck's (2006) 'reductionist' framework. In this account, a *wh*-phrase only has a focus semantic value. Hence, it cannot be taken by a focus-sensitive operator as an appropriate associate, because the semantics of focus-sensitive operator not only requires a focus semantic value but also an ordinary semantic value (see section 1). As a consequence, F-WH association should be impossible, contrary to fact. Thus, we must reconsider focus intervention in light of the well-formedness of F-WH association.

In fact, the structural contrast between F-WH association and focus intervention is not hard to tease apart. Compare focus intervention as in (3a-c) and F-WH association as in (5a-c). 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:

(12) Revised configuration for focus intervention (first approximation)
?*[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, which is based on the assumption that focused phrases and *wh*-phrases introduce alternatives in different dimensions. Specifically, we maintain the key assumptions of Rooth's focus semantics and neo-Hamblin semantics: a focused phrase evokes alternatives in the focus dimension, whereas *wh*-phrases evoke alternatives in the ordinary dimension. There is no need to reduce one to another. Focus intervention results from the interaction of the alternatives in two different dimensions, which induces an illicit quantificational domain for focus-sensitive operators. The first two subsections are devoted to the introduction of Kratzer's (1991) implementation of Rooth's (1985) theory of focus interpretation and a neo-Hamblin 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 follow from the quantificational domain approach.

3.1 The 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 '$[\![.]\!]^g$.' 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 $[\![\alpha]\!]^{g,h}$, obtained by quantifying over designated assignments h, with "H" being the set of designated assignments, i.e., $\{[\![\alpha]\!]^{g,h} \mid h \in \mathrm{H}\}$. (13b-f) demonstrate how the denotation of the VP containing the focus *dinner* in (13a) is derived.

(13) a. [$_{\mathrm{IP}}$ Peter [$_{\mathrm{VP2}}$ **only** [$_{\mathrm{VP1}}$ attended [the dinner]$_{F1}$]]]

b. $[\![[\textit{the dinner}]_{F1}]\!]^g$ = the dinner

c. $[\![[\textit{the dinner}]_{F1}]\!]^{g,h} = h(1)$

d. $[\![\text{VP1}]\!]^g = \lambda y.\lambda w.\text{attend}_w(y, \text{the dinner})$

e. $[\![\text{VP1}]\!]^{g,h} = \lambda y.\lambda w.\text{attend}_w(y, h(1))$

f. $[\![\text{VP1}]\!]^f = \{\lambda y.\lambda w.\text{attend}_w(y, h(1)) \mid h \in H\}$

The next step is to carry out 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 (14). 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 (13a) as in (15) (ONLY is an abbreviation for the denotation of *only*).[1]

(14) $[\![\textit{only}\ \text{VP1}]\!]^g = \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^f\ [P_w(y) \rightarrow [\![\text{VP1}]\!]^g(y) \subseteq P(y)]$

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

b. $[\![\text{IP}]\!]^g = \lambda w.\text{ONLY}(\text{attend}_w(\text{Peter}, \text{the dinner}))$

3.2 Semantics of *wh*-questions

Based on Hamblin's (1973) original semantics and neo-Hamblin semantics (Kratzer and Shimoyama 2002, Kratzer 2005), 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 (16) is a set of activities in the evaluation world w_0 and its

1 This paper adopts a simplified version of Rooth's (1985; 1992) mechanism of association with focus (see also Kratzer 1991, Wold 1996, Cable 2010). In Rooth's (1992) original work, a focus-sensitive operator does not make use of the focus semantic value directly. The contribution of focus is evaluated by the $\sim$ operator, as defined in (i). The $\sim$ operator introduces a contextual variable C. A focus-sensitive operator, such as *only*, is assumed to lexically encode a contextual variable C as its domain of quantification. It associates with a focus through sharing the value of C with the $\sim$ operator, as shown in (ii).

(i) If X = [$\sim$ C Y], then (a) $[\![\text{X}]\!]^g = [\![\text{Y}]\!]^g$ if $g(\text{C}) \subseteq [\![\text{Y}]\!]^f$, otherwise undefined; (b) $[\![\text{X}]\!]^f = [\![\text{X}]\!]^g$.

(ii) [$_{\text{IP}}$ Peter [$_{\text{VP}}$ **only**(C_1) $\sim\text{C}_1$ [$_{\text{VP1}}$ attended [the dinner]$_{F1}$]]]

The contextual variable C is important for formalizing the pragmatic information of focus (von Fintel 1994; Roberts 2012; Martí 2003; a.o.). Since pragmatic information has little role in this paper, we leave out the $\sim$ operator to simplify the semantic composition.

domain is restricted by the context, as in (17a). 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 (17b).[2]

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

(17) a. $[\![\textit{shenme huodong}]\!]^g = \{x \mid x \in D_e \wedge \text{activity}_{w_0}(x)\}$
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 (18) (see also Eckardt 2007). Therefore, the *wh*-phrase *shenme huodong* has the type *e/t* rather than $<et>$. 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 (19):

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

(19) Pointwise functional application (a notational variant of Yatsushiro 2009: 153)
If X is a phrase with two immediate subconstituents Y and Z, then $[\![X]\!]^g$ is defined as follows:
a. if $[\![Y]\!]^g$ is of type α; $[\![Z]\!]^g$ is of type $< \alpha, \beta >$, then $[\![X]\!]^g = [\![Z]\!]^g([\![Y]\!]^g) \in D_\beta$;

2 We would like to thank Clemens Mayr for drawing our attention to the compositional issues of *wh*-phrases. Obviously, the meaning of the *wh*-phrase given in (17a) can be further decomposed. Technically, we have two possible solutions. Firstly, adopting Rullmann and Beck (1998) and Novel and Romero (2010), we can treat the *wh*-word *wh* as a set of alternative definite determiners, as defined in (i). When it pointwisely combines with the property denoted by the common noun, a set of alternative $<e>$-type definite expressions is returned. Secondly, we can assume that the *wh*-word denotes a set of choice functions, each of which takes a property as an argument and returns an individual, as shown in (ii). As a result, we can derive a set of alternative individuals. Since the composition of *wh*-phrases is not the focus of this paper, we treat complex *wh*-phrase as a non-compositional chunk for simplicity.

(i) $[\![\textit{shenme}]\!]^g = \{\lambda P.\iota x.P_{w_0}(x) \wedge x{=}y \mid y \in D_e\}$

(ii) $[\![\textit{shenme}]\!]^g = \{\lambda P.f(P_{w_0}) \mid f \in D_{<<e,st>,e>}\}$

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 (16) is composed as in (20a-d). We follow Kratzer and 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 (20c). Note 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 (20d).

(20) a. $[\![\text{VP}]\!]^g = \{[\![\textit{chuxi-le}]\!]^g(x) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$
$= \{\lambda y.\lambda w.\text{attend}_w(y, x) \mid x \in D_e \wedge \text{activity}_{w_0}(x)\}$

b. $[\![\text{IP}]\!]^g = \{f([\![\textit{Libai}]\!]^g) \mid f \in [\![\text{VP}]\!]^g\}$
$= \{\lambda w.\text{attend}_w(\text{Libai}, x) \mid x \in D_e \wedge \text{activity}_{w_0}(x)\}$

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, (20b) denotes a set of propositions like {'Libai attend the dinner', 'Libai attend the ball', 'Libai attend the concert'}. Note that this original Hamblin denotation of also serves as the ordinary semantic value of the *wh*-question in (16).

3.3 Deriving focus intervention

This section shows that focus intervention falls out automatically from the proposed interpretive mechanism. Consider the *wh*-question in (21), which manifests focus intervention.

(21) ?*[Q [$_{\text{IP}}$ Ta [$_{\text{VP2}}$ **zhi** [$_{\text{VP1}}$ yaoqing-le [Libai]$_{F1}$ chuxi *shenme*
he only invite-Asp Libai attend what
huodong]]]]?
activity
'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 when computing the secondary semantic

value of VP1, as shown in (22a-b). The focus semantic value of VP1 can be derived by quantifying over the designated assignment function h, as in (22c). Clearly, the use of the designated assignment function h gives rise to a set of sets of alternative properties. Assuming 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 (23).

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

(23)
$$[\![\text{VP1}]\!]^f = \left\{ \begin{array}{l} \left\{ \begin{array}{l} \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Libai, the dinner}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Libai, the ball}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Libai, the concert}) \end{array} \right\} \\ \left\{ \begin{array}{l} \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Peter, the dinner}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Peter, the ball}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Peter, the concert}) \end{array} \right\} \\ \left\{ \begin{array}{l} \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Lisa, the dinner}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Lisa, the ball}) \\ \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Lisa, the concert}) \end{array} \right\} \end{array} \right\}$$

Upon computing VP2, the focus-sensitive operator is applied. According to (14), 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. (24) is the resulting derivation.

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

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

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

Note that *zhi* quantifies over properties (of the type $< e, st >$), however, its domain of quantification, $[\![\text{VP1}]\!]^f$, is a set of sets of properties (of the type $< e, st >/t/t$), according to (23). This results in an illicit quantificational structure, which we take to be the underlying reason for focus intervention.

Since other focus-sensitive operators, such as *zhiyou* 'only' and *shi*, also take the focus semantic values of their sisters as the quantificational domain, this analysis can be easily extended to focus intervention involving different focus-sensitive operators. We do not demonstrate the compositional details here for reasons of space.

Additionally, the current analysis predicts that focus intervention disappears when *wh*-phrases are fronted past focus-sensitive operators, as in (25).

(25) [Q [$_{IP2}$ [*Shenme huodong*]$_2$ [$_{IP1}$ ta **zhi** [$_{VP1}$ yaoqing-le [Libai]$_{F1}$ chuxi
what activity he only invite-Asp Libai attend
t_2]]]]

'What was the activity x such that he only invited [Libai]$_F$ to attend x?'

It is shown in (25) that the focus-sensitive operator scopes only over the focused phrase. Assuming that the fronting of the *wh*-phrase in Mandarin leaves a trace interpreted as a variable (Hoh and Chiang 1990; see also Beck 2006), the ordinary and focus semantic values of VP1 are computed as in (26a-c). Notice that the focus semantic value of VP1 is a set of properties with the type $< et >/t$. When the focus-sensitive operator *zhi* takes it as the domain of quantification, a licit quantificational structure is induced, as visualized in (26d). Therefore, no focus intervention arises.

(26) a. $[\![\text{VP1}]\!]^g = \lambda y.\lambda w.\text{invite-to-attend}_w(y, \text{Libai}, g(2))$
b. $[\![\text{VP1}]\!]^{g,h} = \lambda y.\lambda w.\text{invite-to-attend}_w(y, h(1), g(2))$
c. $[\![\text{VP1}]\!]^f = \{\lambda y.\lambda w.\text{invite-to-attend}_w(y, h(1), g(2)) \mid h \in H\}$
d. $[\![\textit{zhi}\ \text{VP1}]\!]^g = \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^f$
$[P_w(y) \rightarrow \lambda w'.\text{invite-to-attend}_{w'}(y, \text{Libai}, g(2)) \subseteq P(y)]$

The rest of the compositional steps goes smoothly, deriving to the meaning of the *wh*-question, as illustrated below.

(27) a. $[\![\text{IP1}]\!]^g = \lambda w.\text{ONLY}(\text{attend}_w(\text{he}, \text{Libai}, g(2)))$
b. $\lambda x.[\![\text{IP1}]\!]^{g[2/x]} = \lambda x.\lambda w.\text{ONLY}(\text{attend}_w(\text{he}, \text{Libai}, x))$
c. $[\![\text{Q IP2}]\!]^g = [\![\text{IP2}]\!]^g = \{\lambda w.\text{ONLY}(\text{attend}_w(\text{he}, \text{Libai}, x)) \mid x \in [\![\textit{shenme huodong}]\!]^g\}$

According to the current account, focus intervention results from inappropriate quantificational domains received by focus-sensitive operators. Hence, we propose the following condition on focus intervention:

(28) Condition on focus intervention
Focus intervention arises iff what a focus-sensitive operator quantifies is not a member of its quantificational domain.

Under the quantificational approach, focus-sensitive operators are not inherent interveners in *wh*-questions. It is the quantificational structure of the focus-sensitive operators that triggers focus intervention. In the next section, we show that the quantificational domain approach teases apart F-WH association from focus intervention.

3.4 Deriving F-WH association

F-WH association, unlike focus intervention, does not trigger an inappropriate quantificational domain for the focus-sensitive operator. Take (29) as an example.

(29) [Q [$_{IP}$ Libai [$_{VP2}$ **zhi** [$_{VP1}$ 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 (30a). 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 (30b). IP and CP are derived by composing the subject *Libai* with the set denoted by VP2, as in (30c).

(30) 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. $[\![\text{VP2}]\!]^g = [\![\textit{zhi}]\!]^g\ ([\![\text{VP1}]\!]^{g,h})\ ([\![\text{VP1}]\!]^g)$
$= \left\{ \begin{array}{l} \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\text{attend}_{w'}(y, \text{the dinner}) \subseteq P(y)], \\ \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\text{attend}_{w'}(y, \text{the ball}) \subseteq P(y)], \\ \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^{g,h}\ [P_w(y) \rightarrow \lambda w'.\text{attend}_{w'}(y, \text{the concert}) \subseteq P(y)] \end{array} \right\}$
$= \left\{ \begin{array}{l} \lambda y.\lambda w.\text{ONLY}(\text{attend}_w(y, \text{the dinner})), \\ \lambda y.\lambda w.\text{ONLY}(\text{attend}_w(y, \text{the ball})), \\ \lambda y.\lambda w.\text{ONLY}(\text{attend}_w(y, \text{the concert})) \end{array} \right\}$

c. $[\![\text{Q IP}]\!]^g = [\![\text{IP}]\!]^g = \left\{ \begin{array}{l} \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai}, \text{the dinner})), \\ \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai}, \text{the ball})), \\ \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai}, \text{the concert})) \end{array} \right\}$

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. Moreover, exhaustivity is incorporated into each proposition in the set

in (30c). When one of them is chosen as the true answer to the *wh*-question, others cannot be simultaneously true. In other words, the *wh*-question is obligatorily interpreted as exhaustive, correctly describing the interpretation of F-WH association pointed out in section 2.

Furthemore, the proposed analysis can correctly predict that a focus-sensitive operator is able to associate with multiple *wh*-phrases, as illustrated in (31).

(31) a. Ta **zhi** [$_{VP}$ yaoqing-le *shei* chuxi *shenme huodong*]?
he only invite-ASP who attend what activity
'Who was the person y and what was the activity x such that he only invited y to attend x?'

b. Ta **zhiyou** [$_{IP}$ yaoqing *shei* chuxi *shenme huoding*] cai neng rang
he only invite who attend what activity just can make
dajia manyi?
people satisfied
'Who is the person y and what is the activity x such that he makes people satisfied only when he invites y to attend x?'

c. **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 $< x, y >$ such that that y bought x?'

In these sentences, the focus-sensitive operator does not scope over any focused phrase. Therefore, focus intervention is not expected. Compositionally, the focus-sensitive operator in these examples does not receive an inappropriate quantificational domain. Let's take (31a) 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 (32a). 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 (32b).

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

Since the secondary semantic value of VP does not denote a set of sets of alternatives, focus intervention does not arise. [3]

3 One thing worth pointing out is that the multiple *wh*-questions in (31) only have single-pair readings, as suggested by the semantics in (32b). We do not have a sound analysis for the unavailability of

4 Generalized focus intervention

According to the quantificational domain approach, focus intervention is the manifestation of the inappropriate quantificational domain of focus-sensitive operators. Configurationally, focus intervention is observed in *wh*-questions when a focus-sensitive operator scopes over a focused phrase and a *wh*-phrase, as illustrated by (12), repeated below.

(33) Revised configuration for focus intervention (first approximation)
?*[Q ... **focus-sensitive operator** [XP_F ... WH ...]]

The *wh*-phrase denotes a set of alternatives as its *ordinary semantic value*, and the focused phrase denotes a set of alternatives as its *focus semantic value*. Compositionally, the ordinary alternatives and the focus alternatives interact and give rise to a focus semantic value that denotes a set of sets of alternatives. This focus semantic value cannot serve as the quantificational domain of the focus-sensitive operator, resulting in composition failure and hence focus intervention. If this intuition is on the right track, the configuration of focus intervention can be represented in a more general way, as exemplified in (34).

(34) Generailized configuration for focus intervention (final version)
*[...**focus-sensitive operator** [focus alternatives ... ordinary alternatives ...]]

This configuration reveals a major merit of the quantificational domain approach: generality. Note that there is no mention of interrogative *wh*-phrases in (34). All that matters is for ordinary alternatives to co-occur with focus alternatives in the scope of a focus-sensitive operator. What gives rise to ordinary alternatives and focus alternatives is independent of the theory of focus intervention.

Luckily, there are independent studies that we can draw on to decide what expressions give rise to what alternatives. In particular, focus alternatives are triggered by focused phrases, as first argued by Rooth (1985, 1992). Ordinary alternatives can be introduced by a host of expressions, among which are interrogative *wh*-phrases (Hamblin 1973), non-interrogative *wh*-phrases (Kratzer and Shimoyama 2002, Shimoyama 2006) and disjunctive phrases (Aloni 2003, Simons 2005, Alonso-Ovalle 2006). If the quantificational domain approach to focus intervention is on the right

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, Roehrs, and Tomioka 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.

track, the configuration in (34) should apply not only to sentences with interrogative *wh*-phrases, but also to sentences with non-interrogative *wh*-phrases or disjunctive phrases. The goal of this section is to show that this prediction is indeed correct.

4.1 Focus intervention with non-interrogative *wh*-phrases

According to Kratzer and Shimoyama (2002) and Shimoyama (2006), Hamblin's semantics can be extended to non-interrogative *wh*-phrases. They assume that a *wh*-phrase uniformly denotes a set of alternatives as its ordinary semantic value and undergoes set expansion with the help of pointwise functional application (see 19). Whether it gives rise to an interrogative or a non-interrogative reading depends on the operator that closes the set expansion.

There are two non-interrogative uses of *wh*-phrases in Mandarin. One can be found in the restrictor of *(wunlun)...dou*, where the *wh*-phrase is interpreted universally (Cheng 1991, Lin 1996); another can be found in non-veridical contexts, such as in the scope of epistemic modals, where the *wh*-phrase is interpreted as an existential indefinite (Li 1992; Lin 998b, Liao 2011). We take up these two uses one by one.

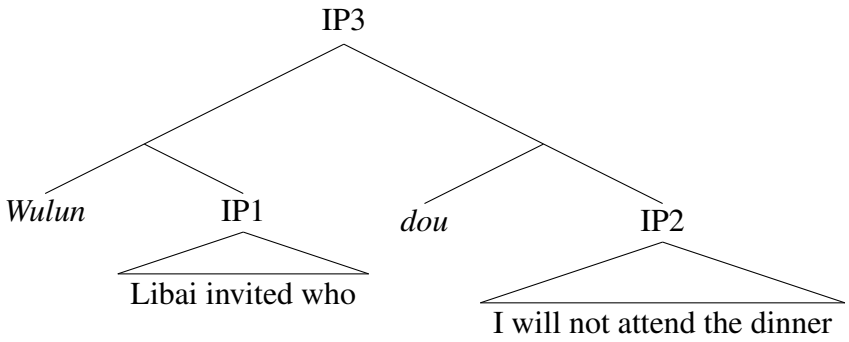
4.1.1 *Wh*-unconditionals

An instance of a *wh*-phrase in the restrictor of *(wunlun)...dou* can be seen in (35), which is a *wh*-unconditional. The sentence expresses that the resolution of the issue described by the *wulun*-adjunct is independent of the truth of the main clause (see also Rawlins 2008, 2013).

(35) [$_{IP3}$ Wulun [$_{IP1}$ Libai yaoqing *shei*], [$_{IP2}$ wo dou bu hui chuxi
no.matter Libai invite who, I DOU not will attend
wanyan]].
dinner
'No matter who Libai invites, I will not attend the dinner.'

The LF structure of (35) is given in (37) and the semantic composition is given in (37).

(36)



(37) a. $[\![shei]\!]^g$ = {John, Mary}

b. $[\![\text{IP1}]\!]^g = \{\lambda w.\ \text{invites}_w(\text{Libai}, x) \mid x \in [\![shei]\!]^g\}$

c. $[\![wulun\ \alpha\ dou\ \beta]\!]^g = \lambda w.\ \forall p \in [\![\alpha]\!]^g\ [p(w) \rightarrow [\![\beta]\!]^g(w)]$

d. $[\![\text{IP2}]\!]^g = \lambda w.\ \forall p \in [\![\text{IP1}]\!]^g\ [p(w) \rightarrow \neg\ \text{will-attend}_w(\text{I, the dinner})]$

Clearly, the computation of the *wh*-clause is similar to that of *wh*-questions. The *wh*-phrase denotes a set of individuals, which keeps expanding with the help of pointwise functional application until it is selected by the operator *(wulun) ... dou* as its domain restriction.[4] After this point, the alternatives introduced by the *wh*-phrase is no longer available.

Accordingly, the quantificational domain approach expects focus intervention in the *wh*-clause of a *wh*-unconditional if the right configuration is resulted, i.e., if a focus-sensitive operator scopes over a focused phrase and a *wh*-phrase before the set expansion of the *wh*-phrase is closed by *wulun...dou*. The expectation is borne out by the Mandarin sentences in (38).

(38) a. ?* Wulun ta **zhi** yaoqing-le [Libai]$_F$ chuxi *shenme huodong*, wo
no.matter he only invite-Asp Libai attend what activity I
dou hui daochang.
DOU will go
'No matter which activity he only invited [Libai]$_F$ to attend, I will go.'

4 We assume, for the sake of simplicity, that (*wulun*.)..*dou* is a complex, discontinuous operator. Following Lin's (998a) assumption that *dou* is a distributive operator, we can decompose *wulun...dou* in the following way: the function of *wulun* is to close the set expansion of a *wh*-phrase, while *dou* brings in the universal quantificational force and takes the *wulun*-clause, which denotes a set of propositions, as its quantificational domain. The semantics for *dou* is assumed to be (i):

(i) $[\![dou]\!]^g = \lambda C.\lambda q.\lambda w\ \forall p \in C\ [p(w) \rightarrow q(w)]$

Certainly, the meaning of *wulun* can be more complicated. It may be responsible for expressing relational indifference or speaker ignorance (see Rawlins (2008, 2013)). However, we must refrain from delving into the semantics of *wulun* here. We believe this simplification does no harm to the argument that focus intervention surfaces in *wh*-unconditionals in Mandarin.

b. ?* Wulun **zhiyou** [Libai]$_F$ yaoqing-le *shei* chuxi wanyan, wo dou hui daochang.
no.matter only Libai invite-Asp who attend dinner I DOU will go
'No matter who only [Libai]$_F$ invites to attend the dinner, I will go.'

c. ?* Wulun **shi** [Libai]$_F$ yaoqing-le *shei* chuxi wanyan, wo dou hui daochang.
no.matter SHI Libai invite-Asp who attend dinner I DOU will go
'No matter who it is [Libai]$_F$ who invites him/her to attend the dinner, I will go.'

Moreover, the quantificational domain approach correctly predicts that the *wh*-phrase in a *wh*-unconditional can associate with a focus-sensitive operator without giving rise to focus intervention:

(39) a. Wulun Libai **zhi** yaoqing-le *shei* chuxi wanyan, wo dou hui daochang.
no.matter Libai only invite-Asp who attend dinner I DOU will go
'No matter who is the person *x* such that Libai invites nobody other than *x*, I will go.'

b. Wulun zuizhong **zhiyou** *shei* neng chuxi wanyan, wo dou hui daochang.
no.matter at.last only who can attend dinner I DOU will go
'No matter who is the person *x* such that nobody other than *x* can attend the dinner at last, I will go.'

c. Wulun zuizhong **shi** *shei* chuxi wanyan, wo dou hui daochang.
no.matter at.last SHI who attend dinner I DOU will go
'No matter who is the person *x* such that it is *x* who attends the dinner at last, I will go.'

In addition, when a focus-sensitive operator is outside a *wulun*-adjunct, it should not give rise to focus intervention, hence the well-formedness of (40); nor should it be able to associate with the *wh*-phrase, whose alternatives have been used up by *wulun...dou*, hence the ill-formedness of (41).

(40) a. **Zhiyou** [Libai]$_F$ wulun chuxi *shenme huodong* dou hui chuan xizhuang.
only Libai no.matter attend what activity DOU will wear suit

'Libai is the only person who will wear a suit, no matter which activity he attends.'

b. **Shi** [Libai]$_F$ wulun chuxi *shenme huodong* dou hui chuan
SHI Libai no.matter attend what activity DOU will wear
xizhuang.
suit
'It is [Libai]$_F$ who will wear a suit, no matter which activity he attends.'

(41) a. * Libai **zhiyou** wulun chuxi *shenme huodong* dou hui chuan
Libai only no.matter attend what activity DOU will wear
xizhuang.
suit

b. * Libai **shi** wulun chuxi *shenme huodong* dou hui chuan
Libai SHI no.matter attend what activity DOU will wear
xizhuang.
suit

4.1.2 Existential *wh*-indefinites

Next, we turn to non-interrogative *wh*-phrases interpreted as existential indefinites. Li (1992) and Lin (998b) have reported a series of licensing conditions for this type of *wh*-phrases, including negation, conditionals, epistemic modals and so on. Liao (2011) further generalizes them to non-veridical contexts. The following example shows the existential reading of a *wh*-indefinite in the scope of an epistemic modal.

(42) Keneng Libai chi-le *shenme dongxi*.
possibly Libai eat-Asp what thing
'It is possible that Libai ate something.'

According to Kratzer and Shimoyama (2002), the modal is combined with an existential closure, which closes the set expansion of a *wh*-phrase, allowing the *wh*-phrase to receive an existential interpretation. Following Reinhart (2006) and Dong (2009), moreover, we assume that the existential closure can freely apply to VP or IP (see also Chierchia 2001; Lin 2004). The definitions of the existential closure (adapted from Kratzer and Shimoyama 2002: 7) at the VP (predicate) level and that at the IP (proposition) level are given below:

(43) a. Predicate-level existential closure
For $[\![\alpha]\!]^g \subseteq D_{<e,st>}$, $[\![\exists\ \alpha]\!]^g = \lambda y.\lambda w.\ \exists P\ [P \in [\![\alpha]\!]^g \wedge P_w(y)]$

b. Proposition-level existential closure
For $[\![\alpha]\!]^g \subseteq D_{<st>}$, $[\![\exists\ \alpha]\!]^g = \lambda w.\ \exists p\ [p \in [\![\alpha]\!]^g \wedge p(w)]$

We assume that the proposition-level existential closure is used in (42), whose LF structure and semantic composition are (44) and (45).

(44) [$_{IP3}$ keneng [$_{IP2}$ ∃ [$_{IP1}$ Libai chi-le *shenme dongxi*]]]
possibly Libai eat-Asp what thing

(45) a. $[\![\text{IP1}]\!]^g = \{\lambda w.\ \text{ate}_w(\text{Libai}, x) \mid x \in [\![\textit{shenme dongxi}]\!]^g\}$

b. $[\![\text{IP2}]\!]^g = \lambda w.\ \exists p\ [p \in [\![\text{IP1}]\!]^g \wedge p(w)]$

c. $[\![\text{IP3}]\!]^g = \lambda w.\ \exists w'\ [w' \in \xi_w \wedge \exists p\ [p \in [\![\text{IP1}]\!]^g \wedge p(w')]]$,
where ξ is the set of worlds epistemically accessible from w

Lin (2004) points out that an existential *wh*-indefinite may interact with other scope-bearing elements. For example, in (46a), the existential *wh*-phrase can take narrow or wide scope relative to negation, giving rise to the readings in (46b) and (46c), respectively. The second reading is not as easily perceived, but it can be made more salient when the domain of the *wh*-phrase is specified in a context, as exemplified in (47).

(46) a. Keneng Libai mei zuodui *shenme ti* ba.
possibly Libai not answer.correctly what problem SFP

b. 'It is possible that Libai didn't solve any significant problem.'

c. 'It is possible that there is some problem that Libai didn't solve.'

(47) Keneng Libai mei zuodui *shenme ti* ba. Wo kan bu shi
possibly Libai not answer.correctly what problem SFP I think not SHI
daishu ti jiu shi jihe ti.
algebra problem just SHI geometry problem
'It is possible that there is some problem that Libai didn't solve. I think it's either algebra or geometry.'

The two readings can be obtained by applying the existential closure below or above negation, as shown in the two representations in (48) and (49).

(48) a. [$_{IP}$ possibly Libai not [∃ [$_{VP}$ correctly answer what problem]]]

b. $[\![\text{VP}]\!]^g = \{\lambda y.\lambda w.\text{correctly.answer}_w(y, x) \mid x \in [\![\textit{what question}]\!]^g\}$

c. $[\![\text{IP}]\!]^g = \lambda w.\ \exists w'\ [w' \in \xi_w \wedge \neg\ \exists P\ [P \in [\![\text{VP}]\!]^g \wedge P_{w'}(\text{Libai})]]$

(49) a. [$_{IP2}$ possibly [∃ [$_{IP1}$ Libai not correctly answer what problem]]]

b. $[\![\text{IP1}]\!]^g = \{\lambda w.\ \neg\ \text{correctly.answer}_w(\text{Libai}, x) \mid x \in [\![\textit{what question}]\!]^g\}$

c. $[\![\text{IP2}]\!]^g = \lambda w.\ \exists w'\ [w' \in \xi_w \wedge \exists p \in [\![\text{IP1}]\!]^g \wedge p(w')]$

Interestingly, when the subject associates with a focus-sensitive operator, as in (50a), only the narrow scope reading of the existential *wh*-phrase (50b) is available. The wide-scope reading (50c) is blocked, as evidenced by the infelicity of specifying the domain of the *wh*-phrase in (51).

(50) a. Keneng **zhiyou** [Libai]$_F$ mei zuo-dui *shenme ti* ba.
possibly only Libai not answer.correctly what problem SFP

b. [possibly **only** [Libai]$_F$ [∃ [not answer.correctly what problem]]]
≈ It is possible that only [Libai]$_F$ didn't solve any problem.

c. ?* [possibly [∃ [**only** [Libai]$_F$ not answer.correctly what problem]]]
≈ It is possible that there is some problem that only [Libai]$_F$ didn't solve.

(51) Keneng **zhiyou** [Libai]$_F$ mei zuo-dui *shenme ti* ba. # Wo
possibly only Libai not answer.correctly what problem SFP I
kan bu shi daishu ti jiu shi jihe ti.
think not SHI algebra problem just SHI geometry problem
'It is possible that there is some problem that only [Libai]$_F$ didn't solve. I think it's either algebra or geometry.'

The unavailability of the wide scope reading falls under the prediction of the quantificational domain approach: in (50c), the focus-sensitive operator scopes over the focus alternatives evoked by the focused phrase and the ordinary alternatives evoked by the *wh*-phrase. The interaction of these two types of alternatives gives rise to an inappropriate quantificational domain for the focus-sensitive operator, resulting in focus intervention. By contrast, in (50b), the set expansion of the *wh*-phrase has been closed by ∃ before the focus-sensitive operator is composed. There is no interaction of the ordinary alternatives and the focus alternatives. As a consequence, focus intervention does not arise.

The same contrast also surfaces in the restrictor of a conditional. The existential *wh*-phrase in (52a) can take narrow or wide scope relative to the negation.

(52) a. Yaoshi ni bu xiang chi *shenme* de-hua, qing tiqian rang wo
if you not want eat what if please beforehand let me
zhidao.
know

b. [[if you not ∃ [want to eat what]] ...]
≈ If you don't want to eat anything, please let me know in advance.

c. [[if ∃ [you not want to eat what]] ...]
≈ If there is something that you don't want to eat, please let me know in advance.

However, replacing the subject with a focused phrase associated with a focus-sensitive operator blocks the wide scope reading. Hence, (53a) can only mean (53b), but not (53c).

(53) a. Yaoshi **zhiyou** [Libai]$_F$ bu xiang chi shenme de-hua, qing
if only Libai not want eat what if please
tiqian rang wo zhidao.
beforehand let me know

b. 'If only [Libai]$_F$ doesn't want to eat anything, please let me know in advance.' (*if* > *not* > *wh*)

c. ?* 'If there is something that only [Libai]$_F$ doesn't want to eat, please let me know in advance.'(*if* > *wh* > *not*)

Interrogative and non-interrogative *wh*-phrases appear in different linguistic contexts and are licensed by different operators. The fact that they pattern uniformly with respect to focus intervention reveals that focus intervention does not pertain to the type of operators that license these *wh*-phrases. What matters is the types of sets of alternatives in the scope of focus-sensitive operators. To further strengthen this claim, we show in the next section that focus intervention is not a specialty of *wh*-phrases—disjunctive phrases are subject to focus intervention in exactly the same environments.

4.2 Focus intervention with disjunctive phrases

Recent studies have also extended Hamblin's semantics to disjunction (Aloni 2003, Simons 2005, Alonso-Ovalle 2006). According to this approach, a disjunctive phrase has the following denotation:

(54) $[\![\text{A or B}]\!]^g = \{\text{A}, \text{B}\}$

If this view is correct, a disjunctive phrase is just like a *wh*-phrase, denoting a set of (two or more) alternatives as its ordinary semantic value. Consequently, the quantificational domain approach predicts that focus intervention should surface in sentences with disjunctive phrases in the same environments that trigger focus intervention in *wh*-questions. In the following subsections, we show that the prediction is borne out by disjunctive phrases in declarative sentences and those in questions.

4.2.1 Declarative disjunctive sentences

Partee and Rooth (1983) have argued that disjunctions may participate in scope interactions (see also Larson 1985, Simons 2005, a.o.). For example, (55a) has two

de dicto readings, (55b) and (55c), depending on the relative scope of the disjunction and the intensional verb *look for*. The disjunction is said to take narrow scope in (55b) and wide scope in (55c). The wide scope reading of the disjunction can be made to stand out by a continuation like *But I'm not sure which*. [5]

(55) a. Mary is looking for [$_{\text{DisjP}}$ *a maid or a cook*].

b. Mary is looking for *x*, *x* is a maid or *x* is a cook

c. Mary is looking for a maid or Mary is looking for a cook.

Interestingly, the wide scope reading of disjunction becomes unavailable when a focus-sensitive operator and its associate precede a disjunction. Consider the examples in (56). (56a) has no focus-sensitive operator or focus associate. In this case the disjunction can take wide scope, as evidenced by the felicity of the continuation. However, no continuation is possible in (56b-c), suggesting that the presence of the focus-sensitive operator and its associate blocks the wide scope reading of the disjunction.

(56) a. Peter introduced John to [$_{\text{DisjP}}$ *Mary or Sue*]. But I'm not sure which.

b. Perter **only** introduced [John]$_F$ to [$_{\text{DisjP}}$ *Mary or Sue*]. ?*But I'm not sure which.

c. **Only** [Peter]$_F$ introduced John to [$_{\text{DisjP}}$ *Mary or Sue*]. ?*But I'm not sure which.

The same phenomenon is also found in Mandarin, only in a more remarkable way. To begin with, Crain (2012: 240) has reported that disjunction in Mandarin necessarily takes wide scope relative to negation.

(57) Yuehan meiyou chi [$_{\text{DisjP}}$ *pingguo huozhe li*].
John not eat apple or pear
'John didn't eat apples or he didn't eat pears.'

However, when a focus-sensitive operator and its associate precede the disjunctive phrase, as in (58a),the disjunction can only take narrow scope, i.e., (58b), but not wide scope, i.e., (58c) (Crain 2012: 242-243).

(58) a. **Zhiyou** [Yuehan]$_F$ chi-le [$_{\text{DisjP}}$ *pingguo huozhe li*].
only John eat-Asp apple or pear

5 The sentence also has a *de re* reading, which asserts the existence of a particular maid and a particular cook. It seems to us that such a reading requires both the disjunction and the disjuncts (i.e., the indefinite noun phrases) to take wide scope. How indefinite noun phrases behave in focus intervention contexts is an intriguing issue. However, we must leave it for another occasion.

b. ‘John is the only person who ate apples or pears.’ (*only*-XP$_F$ > *or*)

c. ?* ‘Only John ate apples or only John ate pears.’ (*or* > *only*-XP$_F$)

According to the quantificational domain approach, the unavailability of the wide scope reading is a result of focus intervention. Following Aloni (2003), Simons (2005) and Alonso-Ovalle (2006), a disjunctive phrase denotes a set of alternatives as its ordinary semantic value, just like an in-situ *wh*-phrase. Therefore, the wide scope reading of disjunction can be derived along the same lines as *wh*-in-situ questions (section 3.2) and existential-*wh* phrases (section 4.1.2). Like existential-*wh*-phrases, a disjunctive phrase requires an existential closure (Kratzer and Shimoyama 2002), as defined in (43a-b), to close the set expansion.

We illustrate the derivation of (56a) in (59) to familiarize our reader with the compositional semantics of a sentence with a disjunctive phrase:

(59) a. [$_{\text{IP2}}$ $\exists$ [$_{\text{IP1}}$ Peter introduced John to [$_{\text{DisjP}}$ *Mary or Sue*]]]

b. $[\![\text{DisjP}]\!]^g = \{\text{Mary, Sue}\}$

c. $[\![\text{IP1}]\!]^g = \{\lambda w.\text{introduce}_w(\text{Peter, John, } x) \mid x \in [\![\text{DisjP}]\!]^g\}$

d. $[\![\text{IP2}]\!]^g = \lambda w.\exists p\ [p \in [\![\text{IP1}]\!]^g \wedge p(w)]$

With this in mind, let’s turn to the examples in which the wide scope reading of disjunction is blocked. Consider (60), which represents the LF of the wide scope disjunction reading of (56b). It is a typical focus intervention configuration: the focus-sensitive operator scopes over the focus alternatives evoked by *John* and ordinary alternatives evokes by the disjunctive phrase. Consequently, focus intervention rules out the wide scope reading. We leave the compositional details for the reader to verify.

(60) [$\exists$ [Peter [$_{\text{VP2}}$ **only** [$_{\text{VP1}}$ introduced [John]$_{F1}$ to [$_{\text{DisjP}}$ *Mary or Sue*]]]]]

Although the wide scope reading of disjunction is blocked, the narrow scope reading is still available in (56b). The relevant reading is represented by the LF structure in (61).

(61) [$_{\text{IP}}$ Peter [$_{\text{VP3}}$ **only** [$_{\text{VP2}}$ $\exists$ [$_{\text{VP1}}$ introduced [John]$_{F1}$ to [$_{\text{DisjP}}$ *Mary or Sue*]]]]]

In the above LF, the set of ordinary alternatives denoted by the disjunctive phrase is selected by the predicate-level $\exists$ and hence the set expansion is closed upon VP2, prior to the activation of the designated assignment function h . Therefore, there is no interaction between the ordinary alternatives evoked by the disjunctive phrase and the focus alternatives evoked by the focused phrase. The sentence is well-formed as predicted by the quantificational domain approach. The composition proceeds as follows:

(62) a. $[\![\text{VP1}]\!]^g = \{\lambda y.\lambda w.\text{introduce}_w(y, \text{John}, x) \mid x \in [\![\text{DisjP}]\!]^g\}$

b. $[\![\text{VP2}]\!]^g = \lambda y.\lambda w.\exists P \in [\![\text{VP1}]\!]^g \wedge P_w(y)$
$= \lambda y.\lambda w[\text{introduce}_w(y, \text{John}, \text{Mary}) \vee \text{introduce}_w(y, \text{John}, \text{Sue})]$

c. $[\![\text{VP2}]\!]^{g,h} = \lambda y.\lambda w[\text{introduce}_w(y, h(1), \text{Mary}) \vee \text{introduce}_w(y, h(1), \text{Sue})]$

d. $[\![\text{VP2}]\!]^f = \{[\![\text{VP2}]\!]^{g,h} \mid h \in \text{H}\}$
$= \{\lambda y.\lambda w[\text{introduce}_w(y, h(1), \text{Mary}) \vee \text{introduce}_w(y, h(1), \text{Sue})] \mid h \in \text{H}\}$

e. $[\![\text{VP3}]\!]^g = \lambda y.\lambda w.\forall P \in [\![\text{VP2}]\!]^f\ [P_w(y) \rightarrow [\![\text{VP2}]\!]^g(y) \subseteq P(y)]$

Note that $[\![\text{VP2}]\!]^f$ is not a set of sets of propositions but rather a set of propositions, as shown in (62d) . As a consequence, $[\![\text{VP2}]\!]^f$ is an appropriate quantificational domain for *only*. (62e) is a successful composition with no focus intervention.

For the sake of argument, let us point out that the quantificational domain approach is not the only conceivable account that can explain the contrast between a wide scope and a narrow scope disjunction in the presence of a focus-sensitive operator. An account that treats a focus-sensitive operator as an inherent 'intervener' has the same effect. For example, a minimality account, like the one developed by Beck and Kim (2006), can force the existential closure to apply before a focus-sensitive operator to prevent the minimality effect triggered by the focus-sensitive operator; a LF movement account of disjunction, like the one in Han and Romero (2004a,b) and Larson (1985), when considered in conjunction with the assumption that a focus-sensitive marker is a LF barrier (Beck 1996), would offer similar explanatory power. Without going into details of these alternative analyses, it suffices to know that these accounts have difficulty in explaining why the wide scope reading returns when a focus-sensitive operator takes the disjunction as its associate. Consider the examples in (63a-d). The felicity of the continuations indicates that the wide scope reading of the disjunction is available in these sentences.

(63) a. Peter **only** introduced John to $[_{\text{DisjP}}$ *Mary or Sue*$]_F$. But I'm not sure which one.

b. Peter **only** introduced $[_{\text{DisjP}}$ *John or Paul*$]_F$ to Mary. But I'm not sure which one.

The same pattern is also observed in Mandarin. In (64), the focus-sensitive operator is associated with the disjunctive phrase. Here, the disjunction can have a wide scope reading.

(64) Yuehan **zhi** chi-le $[_{\text{DisjP}}$ *pingguo huozhe li*$]_F$.
John only eat-Asp apple or pear
'John ate nothing other than an apple or John ate nothing other than a pear.'

If the focus-sensitive operators in the above examples are indeed 'interveners' or 'barriers' at LF, the wide scope reading of the disjunctions remains mysterious.

The mystery is resolved by the quantificational domain approach in a principled way. Take (63a) as an example. The LF structure in (65), in which the existential closure is introduced above *only*, represents the wide scope reading of the disjunction. We assume that the disjunctive phrase bears a focus index, as in (65). Hence, the designated assignment function h is activated, giving rise to focus alternatives. The focus alternatives may include not only the disjuncts but also additional contextual salient individuals (cf. Fox 2007; Alexatib 2014), as shown in (66) (the assignment of the focus index will be taken up again in section 5.1).[6]

(65) $[_{\text{IP2}}\ \exists\ [_{\text{IP1}}$ Peter $[_{\text{VP2}}$ **only** $[_{\text{VP1}}$ introduced John to $[_{\text{DisjP}}$ *Mary or Sue*$]_{F1}]]]]$

(66) a. $[\![\text{DisP}]\!]^{g,h} = h(1)$

b. $[\![\text{DisjP}]\!]^{f} = \{\text{Mary, Sue, Lisa}\}$

Based on this assumption, we can compute the LF structure in (65) following the steps shown in (67). The result is a wide scope reading for the disjunction.

(67) a. $[\![\text{VP1}]\!]^{g} = \{\lambda y.\lambda w.\ \text{introduce}_w(y, \text{John}, x) \mid x \in [\![\text{DisjP}]\!]^{g}\}$

b. $[\![\text{VP1}]\!]^{g,h} = \lambda y.\lambda w.\text{introduce}_w(y, \text{John}, h(1))$

c. $[\![\text{VP1}]\!]^{f} = \{\lambda y.\lambda w.\text{introduce}_w(y, \text{John}, h(1)) \mid h \in \text{H}\}$

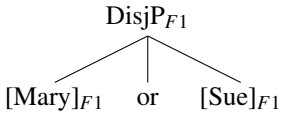
d. $[\![\text{VP2}]\!]^{g} = [\![\textit{only}]\!]^{g}([\![\text{VP1}]\!]^{f})([\![\text{VP1}]\!]^{g})$

$$= \left\{ \begin{array}{l} \lambda y.\lambda w.\forall P \in [\![\text{VP1}]\!]^{f}[P_w(y) \rightarrow \lambda y.\lambda w'.\text{introduce}_{w'}\ (y, \text{John}, x) \subseteq P(y)] \\ \mid x \in [\![\text{DisjP}]\!]^{g} \end{array} \right\}$$

$$= \left\{ \begin{array}{l} \lambda y.\ \lambda w.\text{ONLY}(y\ \text{introduce}_w\ \text{John to Mary}) \\ \lambda y.\lambda w.\text{ONLY}(y\ \text{introduce}_w\ \text{John to Sue}) \end{array} \right\}$$

6 According to the standard assumption of focus alternatives, a focused phrase introduces a set of alternatives which has the same semantic type as the focused phrase. However, in the current analysis, the focus alternatives of a focused disjunctive phrase have a type different from a disjunctive phrase: a disjunctive phrase is assumed to have the same type as a *wh*-phrase, namely, type-*e*/*t* (see section 3.2), but the focus semantic value of a disjunctive phrase is a set of type-*e* entities like (66b). In order to solve this problem, we assume that the focus index of a disjunction is inherited from its disjuncts through percolation (Beck and Kim 2006; Trukenbrodt 2013), as illustrated in (i). Note that the focus index of DisjP is the same as that of the disjuncts. This helps guarantee that h map a variable to an object of the same type as the disjuncts.

(i)



e. $[\![\text{IP1}]\!]^g = \left\{ \begin{array}{l} \lambda w.\text{ONLY}(\text{Peter introduce}_w \text{ John to Mary}) \\ \lambda w.\text{ONLY}(\text{Peter introduce}_w \text{ John to Sue}) \end{array} \right\}$

f. $[\![\text{IP2}]\!]^g = \lambda w.\ \exists p \in [\![\text{IP1}]\!]^g \wedge p(w)$

In short, disjunctive phrases in declarative sentences pattern like (non-)interrogative *wh*-phrases in the contexts of focus intervention. The parallelism is not surprising, given the assumption we have adopted, namely, that disjunctive phrases and *wh*-phrases share the same type of ordinary semantic values as sets of alternatives. In the next section, we turn to another structure involving disjunction, i.e., alternative questions. We show that focus intervention presents itself consistently there.

4.3 Alternative questions

Disjunctive phrases not only occur in declarative sentences but also in questions. The form *Did John dance or sing?* can be understood as an alternative question or a polar question, depending on whether the disjunctive phrase is existentially closed before the Q operator. [7]

If there is no existential closure before the Q operator, an alternative question is formed. Following the view that disjunctive phrases denote sets of alternatives, a lot of studies have proposed that the compositional analysis of alternative questions follows Hamblin's semantics (von Stechow 1991; Biezma and Rawlins 2012; see also Beck and Kim 2006). Specifically, the disjunctive phrase in (68a) denotes a set of the ordinary semantic values of its disjuncts, i.e., a set of properties, as in (68b). With the help of pointwise functional application, the interpretation of the alternative question is given in (68c); that is, it denotes a set of propositions.

(68) a. [$_{\text{CP}}$ Did John [$_{\text{DisjP}}$ *dance or sing*]]? Alt-Q

b. $[\![\text{DisjP}]\!]^g = \{\lambda x.\lambda w.\text{dance}_w(x),\ \lambda x.\lambda w.\text{sing}_w(x)\}$

c. $[\![\text{CP}]\!]^g = \{\lambda w.\text{dance}_w(\text{John}),\ \lambda w.\text{sing}_w(\text{John})\}$

On the other hand, if there is an existential closure before the Q operator (be it the predicate-level or the propositional-level $\exists$), the same surface form gives rise to a polar question. The following steps illustrates the composition with a predicate-level $\exists$. [8]

(69) a. [$_{\text{CP}}$ Did John [$_{\text{VP}}$ $\exists$ [$_{\text{DisjP}}$ *dance or sing*]]]? Polar-Q

7 Strictly speaking, the forms of these two types of questions are also different, once we consider their intonational differences (Han and Romero 2004a, Biezma and Rawlins 2012).

8 Note that for simplicity we follow Hamblin (1973) and assume that a polar question denotes a set of positive and negative answers. For a different view, see Biezma and Rawlins (2012).

b. $[\![\text{DisjP}]\!]^g = \{\lambda x.\lambda w.\text{dance}_w(x), \lambda x.\lambda w.\text{sing}_w(x)\}$

c. $[\![\text{VP}]\!]^g = \lambda x.\lambda w.\exists P[P \in [\![\text{DisjP}]\!]^g \wedge P_w(x)]$

d. $[\![\text{CP}]\!]^g = \{\lambda w.\exists P[P \in [\![\text{DisjP}]\!]^g \wedge P_w(x)], \lambda w.\neg\exists P[P \in [\![\text{DisjP}]\!]^g \wedge P_w(x)]\}$

If focus intervention can be found in declaratives with disjunctions, it is expected to show up in alternative questions. As pointed out by Beck and Kim (2006), focus intervention indeed shows up in alternative questions. Consider some of their examples in (70a-b) and (71a-c) (taken from Beck and Kim 2006: 172; notational conventions are our own).

(70) a. ?*Did **only** $[\text{Mary}]_F$ introduce Sue $[_{\text{DisjP}}$ *to Bill or (to) Tom*]?

b. ?*Did **only** $[\text{Mary}]_F$ introduce $[_{\text{DisjP}}$ *Sue or Molly*] to Bill?

More examples show that the choice of focus-sensitive operators and their syntactic positions (pre-IP or pre-VP) do not affect the generalization, as long as the focus-sensitive operators precede two different types of sets of alternatives:

(71) a. ?*Did Peter **only** give $[\text{Mary}]_F$ $[_{\text{DisjP}}$ *a book or a pen*]?

b. ?*Did Peter **also** give $[\text{Mary}]_F$ $[_{\text{DisjP}}$ *a book or a pen*]?

We have already learned from the last section that the quantificational domain approach expects the disjunctive phrases in (70) and (71) to take narrow scope since the wide scope reading is ruled out by focus intervention. Unfortunately, for an alternative question to be well-formed, the disjunctive phrase must take wide scope (Larson 1985; Han and Romero 2004a; Biezma and Rawlins 2012). As a consequence, these sentences cannot be interpreted as grammatical alternative questions. The only available interpretations are polar-questions, which require the disjunctive phrases to take narrow scope.

Although Beck and Kim (2006) come to the same conclusion based on their minimality account, the quantificational domain approach makes a prediction that is crucially different from them. According to Beck and Kim (2006), focus-sensitive operators interfere with the disjunctive phrases in alternative questions. As a result, the sentences in (72) should be ruled out, contrary to fact.

(72) a. Did Peter **only** give $[_{\text{DisjP}}$ *Mary or Jane*$]_F$ a pen?

b. Did Peter **also** give $[_{\text{DisjP}}$ *Mary or Jane*$]_F$ a pen?

However, the quantificational domain approach predicts that these sentences should be acceptable. As argued in the last section, a disjunctive phrase can associate with a focus-sensitive operator and take wide scope at the same time. So, they can give rise to alternative questions like the ones in (72).

He (2011) argues that alternative questions in Mandarin should be analyzed along the lines of Hamblin's semantics (cf. Erlewine 2014). If this is indeed the case, the contrast between (70)/(71) and (72) should also be found in Mandarin. We confirm the contrast with the following set of data (*haishi* 'or' introduces disjuncts almost exclusively for alternative questions):

(73) a. ?* **Zhiyou** [Libai]$_F$ he-le [$_{\text{DisjP}}$ *kafei haishi hongcha*]?
only Libai drink-Asp coffee HAISHI black.tea
'Which one of x, x is coffee or tea, such that only Libai drank x?'

b. Libai **zhi** he-le [$_{\text{DisjP}}$ *kafei haishi hongcha*]?
Libai only drink-Asp coffee HAISHI black.tea
'Which one of x, x is coffee or tea, such that Libai only drank x?'

(74) a. ?* **Shi** [Libai]$_F$ he-le [$_{\text{DisjP}}$ *kafei haishi hongcha*]?
SHI Libai drink-Asp coffee HAISHI black.tea
'Which one of x, x is coffee or tea ,such that it was Libai who drank x?'

b. Libai **shi** he-le [$_{\text{DisjP}}$ *kafei haishi hongcha*]?
Libai SHI drink-Asp coffee HAISHI black.tea
'Which one of x, x is coffee or tea, such that it was x that Libai drank?'

Although focus intervention in alternative questions is not new in the literature, only until now do we realize that focus-sensitive operators can take disjunctive phrases as their associates without triggering focus intervention. This empirical advancement is a natural consequence of the theoretical progress introduced by the quantificational domain approach to focus intervention.

5 Remaining issues and comparison with other proposals

5.1 The availability of the focus index

An astute reader may have noticed that the proposed analysis requires a non-uniform assumption on the availability of focus indices in *wh*-phrases and disjunctive phrases. In particular, *wh*-phrases are assumed not to bear any focus index, whether they associate with a focus-sensitive operator or not. However, disjunctive phrases can come with or without focus indices, depending on whether they are interpreted as focus or not. Does this non-uniform assumption weaken the parallelism between *wh*-phrases and disjunctive phrases? We argue that it does not, since there are independent reasons to believe that the difference is needed.

The first consideration is a theoretical argument related to feature redundancy. As pointed out by Watanabe (2002) and Ishihara (2003), in-situ interrogative *wh*-phrases should not share the same focus feature with focused phrases, even though

the former are always phonetically prominent in questions. The reason is that *wh*-phrases inherently denote sets of alternatives: if they were assigned a focus feature that evokes alternatives, it would result in redundancy. Hence, Watanabe (2002) suggests that the focus feature of an interrogative *wh*-phrase is uninterpretable and must be deleted after being checked by the Q operator. Consequently, it is meaningless at the semantic component. By contrast, denoting sets of alternatives is not an inherent property of other linguistic items, hence a focus feature must be assigned to evoke their alternatives. Since a disjunctive phrase is make up of two or more non-*wh*-expressions, assigning a focus feature in the form of an index to the individual disjuncts does not result in redundancy. The only extra stipulation we need is to allow the focus index on the disjuncts to become the focus index of the disjunctive phrase. We implement this idea using the notion of feature percolation.

The second reason is an empirical argument based on association with focus. Since (for reasons unknown to us) English does not readily allow focus association with *wh*-phrases, we use Mandarin examples to illustrate this point. Consider the following sentences:

(75) a. Libai **zhi** chi-le *shenme dongxi*?
Libai only ate-Asp what thing
'What is the thing x such that Libai only ate x?'

b. Libai **zhi** chi-le *mifan haishi miantiao*?
Libai only ate-Asp rice or noodles
'Did Libai only ate rice or noodles?'

For concreteness, let us assume that the *wh*-phrase in (75a) denotes a set of contextually salient food:

(76) $[\![\textit{shenme dongxi}]\!]^g$ = {vegetables, rice, noodles, ...}

Since the *wh*-phrase bears no focus index, the focus-sensitive operator takes its secondary value, which is identical to its ordinary semantic value, as the quantificational domain. Hence, if the answer to (75a) is 'rice', it implies that Libai didn't eat vegetables, noodles or any other contextually salient food in the set of alternatives.

What about the denotation of the disjunctive phrase? We have assumed that the ordinary semantic value of a disjunctive phrase is a set of alternatives made of its disjuncts. In this case, the denotation of the disjunctive phrase in (75b) is as follows:

(77) $[\![\textit{mifan haishi miantiao}]\!]^g$ = {rice, noodles}

If a disjunctive phrase had no focus index when it is interpreted as a focus, the focus-sensitive operator would make use of its secondary value, which is again identical to its ordinary semantic value, as the quantificational domain. Then, the

same answer 'rice' should only imply that Libai didn't eat noodles. In other words, Libai is free to eat anything else not included in this domain. However, the domain of the focus-sensitive operator in (75b) is larger than (77). For example, the answer 'rice' requires that Libai only ate rice but not noodles *or anything else*. What this tells us is that when the disjunctive phrase is a focus, the exhaustivity holds true of a wider domain. We argue that the focus index on a disjunctive phrase, which is inherited from the disjuncts (see section 4.2.1), gives rise to a focus semantic value that contains at least a member disjoint from the ordinary semantic value of the disjunctive phrase.

5.2 Setting apart quantifier intervention from focus intervention

Although this paper has offered a novel account for focus intervention, it does not address any questions about quantifier intervention, which refer to the phenomenon that certain quantifiers cannot precede in-situ *wh*-phrases. The following are some cross-linguistic examples of quantifier intervention:

(78) Japanese (Tomioka 2007: 1571)

a. ?* **Daremo** *nani*-o yom-ana-katta-no?
anyone what-Acc read-Neg-Past-QP
'What did no one read?'

b. ?? **Daremo-ga** *nani*-o yon-da-no?
everyone-Nom what-Acc read-Past-QP
'What did everyone read?'

c. ?? **Dareka-ga** *nani*-o yon-da-no?
someone-Nom what-Acc read-Past-QP
'What did someone read?'

(79) Korean (Beck and Kim 1997: 339, 371)

a. * **Amuto** *muôs*-ûl sa-chi anh-ass-ni?
anyone what-Acc buy-CHI not-do-Past-QP
'What did no one buy?'

b. ?? **Nukuna-ka** *ônû* *kyosu*-lûl chonkyôngha-ni?
everyone-Nom which professor-Acc respect-QP
'which professor did everyone respect?'

(80) German (Beck and Kim 1997: 340, 369)

a. * Wer hat **niemanden** *wo* angetroffen?
who has nobody where met
'Who didn't meet anyone where?'

b. * Wen haben **wenige** *wo* getroffen?
who have few where met
'Who did few meet where?'

Beck's (2006) study attempts to provide a uniformly explanation for quantifier and focus intervention. Based on Kim's (2002) observation that quantifiers causing quantifier intervention contain focus-sensitive operators in their morphology in some languages, such as Korean and Japanese, Beck suggests building the focus-sensitive $\sim$ operator into all quantifiers that trigger intervention. The consequence is that intervention triggered by quantifiers are subsumed under focus intervention (see also Miyagawa 2010).

This solution suffers from a number of problems. For one thing, as pointed out by Szabolcsi (2006), building $\sim$ into quantifiers lack independent empirical motivations. Additionally, we would like to highlight an observation that has not been taken up seriously: while focus-sensitive operators are consistent intervention triggers across languages, quantifiers constitute a much more heterogeneous class (see Beck 2006: 10). What counts as an intervener in a language may very well be a non-intervener in other languages. For example, the quantificational adverbial *often* causes quantifier intervention in German but not in Korean, as shown below (Beck 2006: 9).

(81) a. German

Luise zahltauf, welche Uni **oft** *welche Linguisten* eingeladen
Luise enumerates which university often which linguists invited
hat.
has

'Luise enumerates which university often invited which linguists.'

b. Korean

Minsu-nun **chachu** *nuku*-lul p'ati-e teliko-ka-ss-ni?
minsu-Top often who-Acc party-Dir take-Past-Q

'Who did Minsu often take to the party?'

Universal quantifiers are also inconsistent interveners. They are interveners in Japanese, as shown in (78b), as well as in German, as evidenced by the inability of the *wh*-phrase to take wide scope (Mayr 2013:4):

(82) Wen hat jeder Junge wann beobachtet?
who has every boy when observe
*'Who is such that every boy observed him when?'
'For every boy, who did he observe when?'

But they do not trigger intervention in Mandarin, as observed by Yang (2008, 2012):

(83) a. **Mei ge ren dou** jian-le *shei*?
every Cl person DOU meet-Asp who
'Who did everyone meet?'

b. **Suoyou ren dou** jian-le *shei*?
all person DOU meet-Asp who
'Who did all the people meet?'

Crucially, the *wh*-phrases in these examples can take wide scope over the universal quantifiers. In other words, these questions can be answered by a single sentence such as 'everyone met John' or 'all the people met John.'

Furthermore, we have found that universal quantifiers are only a subclass of non-triggers for focus intervention in Mandarin. A more general description is that strong quantifiers are non-triggers. The following examples show that strong quantifiers, like *dabufen* 'most' and *gege* 'each', do not trigger quantifier intervention:

(84) a. **Dabufen xuesheng** dou jian-le *shei*?
most student DOU meet-Asp who
'Who was the person x such that most students met x?'

b. **Gege xuesheng** dou jian-le *shei*?
each student DOU meet-Asp who
'Who was the person x such that each students meet x?'

In contrast, weak quantifiers uniformly cause intervention:

(85) a. ?* **You ge xuesheng** jian-le *shei*?
have Cl student meet-Asp who
'Who was the person x such that a student met x?'

b. ?* **Xuduo xuesheng** jian-le *shei*?
many student meet-Asp who
'Who was the person x such that many students met x?'

c. ?* **Meiyou xuesheng** jian-le *shei*?
no student meet-Asp who
'Who was the person x such that no student met x?'

The weak quantifiers do not contain any morphological focus-sensitive operators; nor are they sensitive to focus. Therefore, any focus-theoretic account is hard to extend to intervention triggered by weak quantifiers. Even if we adopt Beck's (2006) approach and postulate that quantifiers involve a focus sensitive $\sim$ operator, we still cannot account for the contrast between strong quantifiers and weak quantifiers.

What these inconsistencies suggest is that quantifier intervention seems to be of a different nature from focus intervention (see also Yang 2008, 2012). Therefore, extending an analysis based on either type of intervention effects to the other may not be a desirable move. Instead of stipulating common features in focus-sensitive operators and quantifiers, we have chosen to remain silent on quantifier intervention, but to capture as much generality as we can in focus intervention. Of course, it may turn out that quantifier intervention and focus intervention are indeed the same phenomenon. However, before the nature of quantifier intervention is sufficiently clarified, we hesitate to extend the proposed account of focus intervention to quantifier intervention.

5.3 Comparison with other proposals

So far, our discussion about previous studies on focus intervention has limited to the ones assuming Beck's (2006) framework. In fact, to our knowledge, there are three other recent semantic/pragmatic approaches to focus intervention. They include Haida's (2007) interrogative-as-focus approach, Tomioka's (2007) and Eilam's (2011) information structure approach, and Mayr's (2013) non-additivity approach.[9] In this section, we would like to provide a comparison of these proposals with the quantificational domain approach, which is based on the interaction of alternatives in different dimensions. In particular, we show that none of these accounts can adequately address the challenge posed by F-WH association, nor can they adequately respond to the novel observations on generalized focus intervention.

5.3.1 The interrogative-as-focus approach

It has been observed that focused phrases and interrogative *wh*-phrases have some common properties in many languages, such as bearing stress, requiring movement, and sharing morphological markers (Horvath 1986; Ishihara 2003; Haida 2007; Dong 2009; Slade 2011; Trukenbrodt 2013; a.o.). Based on this observation, Haida (2007) proposes that interrogative *wh*-phrases are no different from focused phrases, in the sense that they have a focus denotation in addition to an ordinary denotation. In particular, Haida assumes that a *wh*-phrase denotes an existential quantifier in the sense of Dynamic Semantics, and it is assigned a focus feature in a question. The focus feature is a function turning a generalized quantifier into the corresponding

9 Slade (2011) also belongs to the interrogative-as-focus approach. It emphasizes that interrogative *wh*-phrases have ordinary semantic value as well as focus semantic value. In this regard, it can handle F-WH association. However, it remains silent on focus intervention. For this reason, we do not include it as a contending proposal for focus intervention.

exhaustive generalized quantifier. In other words, it brings exaustivity to the meaning of *wh*-phrases.

Since this line of analysis relies on the presence of a focus feature on *wh*-phrases in questions to trigger focus intervention, it is not clear how it can be extended to account for focus intervention in constructions other than questions. More concretely, since non-interrogative *wh*-phrases and disjunctive phrases in declaratives show little affinity with focus, we should not expect focus intervention with these expressions. This problem was not very serious when the interrogative-as-focus approach came out a few years ago, as the empirical paradigm of focus intervention predominantly only included questions. However, the quantificational domain hypothesis has enabled us to extend the empirical paradigm of focus intervention to include non-interrogative *wh*-sentences and disjunctions, which is shown in section 4. The fact that focus intervention arises in these sentences considerably holds back the interrogative-as-focus approach.

5.3.2 The information structure approach

Tomioka (2007) proposes that focus intervention is a pragmatic effect, rather than a semantic one. Following Krifka (2001), he assumes that the information structure of a *wh*-question can be partitioned into two parts: the part carrying the given information (the non-*wh* part) and the part carrying focus (the *wh*-part). Once a non-*wh* element cannot be confined to given information, a *wh*-question becomes pragmatically infelicitous, giving rise to focus intervention. There is a class of elements that cannot be treated as given information, known as anti-topic items. Focused phrases are in this class. Put it simply, a focused phrase in a *wh*-question is an extra focus, which cannot be treated as given information and hence violates the information structure of questions. Since Eilam (2011), this approach has been extended to other relevant constructions, such as alternative questions, giving this approach a certain degree of generality.

A merit of this approach is that it does not wrongly exclude F-WH association. This is because a *wh*-phrase is already a focus in a question, associating with a focus-sensitive operator does not change this status. As long as there is no other focused phrase falling into given information, a question with F-WH association still respects the information structure.

Nevertheless, this approach suffers from two problems. For one thing, neither Tomioka (2007) nor Eilam (2011) has offered a compositional analysis for the derivation of F-WH association. Therefore, despite its compatibility with F-WH association, it is unclear how F-WH association is interpreted and what implications F-WH association has for this approach. In addition, since this approach relies on having an extra focus in a *wh*-question to account for focus intervention, it predicts

that focus intervention does not arise in declarative sentences with only one focused phrases. In other words, it suffers from the same problem as the interrogative-as-focus approach.

5.3.3 The non-additivity approach

Based on the discovery that not all quantifiers give rise to intervention effects, Mayr (2013) argues that minimality is not the real explanation to focus intervention. Instead, he proposes that it is non-additive operators that trigger focus intervention. To see that the focus-sensitive operator *zhiyou* 'only' is non-additive, observe that the truth value of "$only(\phi \vee \psi)$" is not equivalent to that of "$only(\phi) \vee only(\psi)$":

(86) a. **Zhiyou** [Libai]$_F$ chuxi-le wanyan huozhe wuhui.
only Libai attend-Asp dinner or ball
'Only [Libai]$_F$ attended the dinner or the ball.'
$\nleftrightarrow$
b. **Zhiyou** [Libai]$_F$ chuxi-le wanyan huozhe **Zhiyou** [Libai]$_F$ chuxi-le wuhui.
only Libai attend-Asp dinner or only Libai attend-Asp ball
'Only [Libai]$_F$ attended the dinner or only [Libai]$_F$ attended the ball.'

In the scenario that Libai is the only person attending the dinner but there are people other than Libai attending the ball, (86b) is true but (86a) is not.

Mayr (2013) imposes a condition on *wh*-question interpretation, namely, that the disjunction of the alternatives in the Hamblin denotation of a *wh*-question must be equivalent to the resulting proposition when a *wh*-phrase is interpreted as an existential quantifier in its surface scope position. The latter can be seen as the existential presupposition of *wh*-questions (Karttunen 1977; Dayal 1996). In other words, this condition on *wh*-questions requires that the disjunction of the Hamblin alternatives return the existential presupposition. For example, the Hamblin denotation of the *wh*-question in (87a) is (87b), a set of possible answers to the question. The disjunction of the possible answers results in the proposition in (87c), which is logically identical to the proposition when the *wh*-phrase is interpreted as an existential quantifier, as in (87d).

(87) a. [$_{CP}$ Q [$_{IP}$ Libai chuxi-le shenme huodong]]
Libai attend-Asp what activity
'Which activity did Libai attend?'
b. $[\![\text{CP}]\!]^g = \left\{ \begin{array}{l} \lambda w.(\text{attend}_w(\text{Libai, the dinner}) \\ \lambda w.(\text{attend}_w(\text{Libai, the ball}) \\ \lambda w.(\text{attend}_w(\text{Libai, the concert}) \end{array} \right\}$

c. $\vee[\![\text{CP}]\!]^g = \lambda w.(\text{attend}_w(\text{Libai, the dinner}) \vee (\text{attend}_w(\text{Libai, the ball}) \vee (\text{attend}_w(\text{Libai, the concert})$
$\leftrightarrow$
d. $\lambda w.\exists x \in \{\text{the dinner, the ball, the concert}\} \wedge \text{attend}_w(\text{Libai}, x)$

This condition does not hold in (88a), in which the focus-sensitive operator *zhiyou* 'only' c-commands the *wh*-phrase. The Hamblin denotation of the *wh*-question would be (88b). Its disjunction is (88c). If the *wh*-phrase is interpreted as an existential quantifier in its surface scope, i.e., it is scoped over by *zhiyou*, the proposition in (88d) is induced. Since *zhiyou* is non-additive, (88c) is not equivalent to (88d). As a consequence, focus intervention arises.

(88) a. ?*[$_{\text{CP}}$ Q [$_{\text{IP}}$ **zhiyou** [Libai]$_F$ chuxi-le shenme huodong]]
only Libai attend-Asp what activity
'What was the activity x such that only [Libai]$_F$ attended x?'

b. $[\![\text{CP}]\!]^g = \left\{ \begin{array}{l} \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai, the dinner}) \\ \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai, the ball}) \\ \lambda w.\text{ONLY}(\text{attend}_w(\text{Libai, the concert}) \end{array} \right\}$

c. $\vee[\![\text{CP}]\!]^g = \lambda w.(\text{ONLY}(\text{attend}_w(\text{Libai, the dinner})) \vee (\text{ONLY}(\text{attend}_w(\text{Libai, the ball})) \vee (\text{ONLY}(\text{attend}_w(\text{Libai, the concert}))$
$\leftrightarrow$
d. $\lambda w.\text{ONLY}(\exists x \in \{\text{the dinner, the ball, the concert}\} \wedge \text{attend}_w(\text{Libai}, x))$
$= \lambda w.\text{ONLY}((\text{attend}_w(\text{Libai, the dinner})) \vee (\text{attend}_w(\text{Libai, the ball})) \vee (\text{attend}_w(\text{Libai, the concert})))$

However, the availability of F-WH association is direct counterevidence for the non-additivity approach. Take (89a) as an example. (89b) is the disjunction of the Hamblin denotation of (89a). Since *zhi* is non-additive, (89b) is not equivalent to the proposition (89c), where the *wh*-phrase is interpreted as an existential quantifier in its surface scope, i.e., it is scoped over by *zhi*. Given the context that Libai attends the dinner and the ball, (89b) is judged false, but (89c) can be true.

(89) a. Libai **zhi** chuxi shenme huodong?
Libai only attend what activity
'What is the activity x such that Libai attend x and nothing else?'

b. $\vee \left\{ \begin{array}{l} \text{Libai attends the dinner and nothing else,} \\ \text{Libai attends the ball and nothing else,} \\ \text{Libai attends the concert and nothing else} \end{array} \right\}$
= (Libai attends the dinner and nothing else) $\vee$ (Libai attends the ball and nothing else) $\vee$ (Libai attends the concert and nothing else)
$\leftrightarrow$

c. $\lambda w.\text{ONLY}(\exists x \in \{\text{the dinner, the ball, the concert}\} \wedge \text{attend}_w(\text{Libai}, x))$
≈ ((Libai attends the dinner) ∨ (Libai attends the ball) ∨ (Libai attends the concert)) and Libai does not attend any other activities

The non-equivalence of (89b) and (89c) violates 'the formal condition on *wh*-questions' of Mayr (2013), hence the non-additivity approach predicts that (89a) should be ruled on by focus intervention, contrary to fact.

In addition, the formal condition is an *ad hoc* condition on *wh*-questions. Without further stipulations, it predicts that focus intervention only surfaces in *wh*-questions. Therefore, focus intervention in non-interrogative sentences, as discussed in section 4, poses a challenge for the non-additivity approach.

6 Conclusion

Through exploring focus intervention, this paper has initiated a new line of research on alternative semantics: the interaction of alternatives in different dimensions. It proposes a novel way of carrying out Beck's (2006) insight that focus intervention can be studied in the framework of alternative semantics. Our implementation relies on the intuition that focus alternatives and ordinary alternatives are alternatives along different dimensions. The interaction of different types of alternatives gives rise to inappropriate quantificational domains of focus-sensitive operators, causing focus intervention. This is why the present proposal is called 'the quantificational-domain approach to focus intervention'. In the absence of focus alternatives or ordinary alternatives, the presence of focus-sensitive operators does not cause any harm, explaining why F-WH association is well-formed. This approach differs from the seminal work of Beck (2006) in not treating ordinary alternatives as a special type of focus alternatives.

The quantificational domain approach leads to a number of consequences. First, focus-sensitive operators are no longer taken to be inherent interveners; they become problematic only when they take a set of sets of alternatives as its quantificational domain. On this view, focus intervention is not an intervention phenomenon, but a purely quantificational phenomenon. Second, this approach allows for a very general understanding of focus intervention, providing a unified analysis for focus intervention with interrogative *wh*-phrases, non-interrogative *wh*-phrases and disjunctive phrases.

References

Alexatib, S. (2014). Free choice under *only*. In J. Iyer and L. Kusmer (Eds.), *The Proceedings of the North Eastern Linguistics Society 44*, Volume 1, Amherst, pp. 15–28. GLSA.

Aloni, M. (2003). Free choice in modal contexts. In M. Weisgerber (Ed.), *Proceedings of Sinn und Bedeutung 7*, pp. 25 – 37.

Alonso-Ovalle, L. (2006). *Disjunction in alternative semantics*. Ph. D. thesis, University of Massachusetts at Amherst.

Alonso-Ovalle, L. (2008). Alternatives in the disjunctive antecedents problem. In C. B. Chang and H. H. J. (Eds.), *Proceedings of the 26th West Coast Conference on Formal Linguistics*, Somerville, MA, pp. 42–50. Cascadilla Proceedings Project.

Aoun, J. and Y.-H. A. Li (1993). *Wh*-elements in situ: syntax or LF. *Linguistic Inquiry 24*, 199–238.

Beck, S. (1996). Quantified structures as barriers for LF movement. *Natural Language Semantics 4*, 1–56.

Beck, S. (2006). Intervention effects in alternative questions. *Natural Language Semantics 14*, 1–56.

Beck, S. and S.-S. Kim (1997). On *wh*- and operator scope in Korean. *Journal of East Asian Linguistics 6*, 339–384.

Beck, S. and S.-S. Kim (2006). Intervention effects in alternative questions. *Journal of Comparative German Linguistics 9*, 165–208.

Beck, S. and Rullmann (1999). A flexible approach to exhaustivity in questions. *Natural Language Semantics 7*, 249–297.

Biezma, M. and K. Rawlins (2012). Responding to alternative and polar questions. *Linguistics and Philosophy 35*, 361–406.

Cable, S. (2010). *The grammar of Q*. Oxford: Oxford University Press.

Cheng, L. L.-S. (1991). *On the typology of WH-questions*. Ph. D. thesis, Massachusetts Institute of Technology.

Cheng, L. L.-S. (2008). Deconstructing the *shi...de* construction. *The Linguistic Review 25*, 235–266.

Chierchia, G. (2001). A puzzle about indefinites. In C. Cecchetto, G. Chierchia, and M. T. Guasti (Eds.), *Semantic interfaces: reference, anaphora and aspect*, pp. 51–89. Stanford, California: CSLI.

Constant, N. (2014). *Constrast Topic: Meaning and realization*. Ph. D. thesis, UMass, Amherst, MA.

Crain, S. (2012). *The Emergence of meaning*. Cambridge University Press.

Dayal, V. (1996). *Locality in Wh Quantification*. Dordrecht: Kluwer.

Dong, H. (2009). *Issues in the semantics of Mandarin questions*. Ph. D. thesis, Cornell University.

Eckardt, R. (2007). Inherent focus on *wh*-phrases. In E. Puig-Waldmueller (Ed.), *Proceedings of Sinn and Bedeutung 11*.

Eilam, A. (2011). *Explorations of the informational component*. Ph. D. thesis, University of Pennsylvania.

Erlewine, M. Y. (2014). Alternative questions through focus alternatives in Mandarin Chinese. In *Proceedings of Chicago Linguistics Society 48*.

von Fintel, K. (1994). *Restrictions on Quantifier Domains*. Ph. D. thesis, University of Massachusetts.

Fox, D. (2007). Free choice and the theory of scalar implicatures. In U. Sauerland and P. Statava (Eds.), *Presupposition and Implicature in Compositional Semantics*. Plagrave Macmillan.

Groenendijk, J. and M. Stokhof (1984). *Studies on the semantics of questions and the pragmatics of answers*. Ph. D. thesis, University of Amsterdam, Amsterdam.

Grohmann, K. K. (2006). *Wh*-movement: Moving on. In L. L.-S. C. Cheng and N. Corver (Eds.), *Top issues in questions: topics-topicalization-topicalizability*, pp. 362–383. de Gruyter.

Hagstrom, P. (1998). *Decomposing questions*. Ph. D. thesis, MIT, Cambridge, MA.

Haida, A. (2007). *The indefiniteness and focusing of wh-words*. Ph. D. thesis, Humboldt-Universität zu Berlin, Berlin.

Hamblin, C. L. (1973). Questions in Montague English. *Foundations of Language 10*, 41–53.

Han, C.-h. and M. Romero (2004a). Disjunction, focus, and scope. *Linguistic Inquiry 35*(2), 179–217.

Han, C.-h. and M. Romero (2004b). The syntax of *Whether/Q...or* questions: Ellipsis combined with movement. *Natural Language and Linguistic Theory 22*(3), 527–564.

He, C. (2011). *Expansion and closure: Towards a theory of wh-construals in Chinese*. Ph. D. thesis, The Hong Kong Polytechnic University.

Hoh, P.-S. and W.-Y. Chiang (1990). A focus account of moved *wh*-phrases at s-structure in chinese. *Lingua 81*, 47–73.

Horvath, J. (1986). *FOCUS in the theory of grammar and the syntax of Hungarian*. Foris: Dordrecht.

Huang, C.-T. J. (1982a). *Logical relations in Chinese and the theory of grammar*. Phd, Massachusetts Institute of Technology.

Huang, C.-T. J. (1982b). Move *wh* in a language without *wh*-movement. *The Linguistic Review 1*, 369–416.

Huang, C.-T. J. (1988). Shuo *shi* he *you* [on *be* and *have* in chinese]. *The Bulletin of the Institute of History and Philology, Academia Sinica 59*, 43–64.

Ishihara, S. (2003). *Intonation and interface conditions*. Ph. D. thesis, Massachusetts Institute of Technology.

Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy 1*(1), 3–44.

Kim, S.-S. (2002). Intervention effects are focus effects. *Japanese/Korean Linguistics 10*, 615–628.

Kim, S.-S. (2006). Questions, focus and intervention effects. In S. Kuno, I.-H. Lee, J. Whitman, S.-Y. Bak, and Y.-S. Kang (Eds.), *Harvard studies in Korean linguistics XI*, pp. 520–533. Seoul: Hanshin Publishing Company.

Kitagawa, Y., D. Roehrs, and S. Tomioka (2004). Multiple *wh*-interpretations. In H.-J. Yoon (Ed.), *Generative Grammar in a Broader Perspective: Proceedings of the 4th GLOW in Asia*, pp. 209–233.

Kotek, H. and M. Y. Erlewine (to appear). Covert pied-piping in english multiple *wh*-questions. *Linguistic Inquiry*.

Kratzer, A. (1991). The representation of focus. In A. von Stechow and D. Wunderlich (Eds.), *Semantics: An international handbook of contemporary research*, pp. 825–834. Berlin: de Gruyter.

Kratzer, A. (2005). Indefinites and the operators they depend on: From Japanese to Salish. In G. N. Carlson and F. J. Pelletier (Eds.), *Reference and Quantification: The Partee Effect*, pp. 113–142. CSLI Publications.

Kratzer, A. and J. Shimoyama (2002). Indeterminate pronouns: The view from Japanese. In Y. Otsu (Ed.), *The Proceedings of the third Tokyo conference on psycholinguistics*, pp. 1–25. Hituzi Syobo, Tokyo.

Krifka, M. (2001). For a structured meaning account of questions and answers. In C. Fery and W. Sternefeld (Eds.), *Studia Grammatica 52*, Berlin, pp. 287–319.

Larson, R. K. (1985). On the syntax of disjunction scope. *Natural Language and Linguistic Theory 3*, 217–264.

Lee, H.-c. (2005). *On Chinese focus and cleft constructions*. Ph. D. thesis, National Tsing Hua University.

Li, A. Y.-H. (1992). Indefinite *wh* in Mandarin Chinese. *Journal of East Asian Linguistics 1*(2), 12–155.

Li, H. (2013). Association between focus particles and *wh*-phrases. In N. Goto, K. Otaki, A. Sato, and K. Takita (Eds.), *The Proceedings of GLOW in Asia IX*, pp. 109–123. Mie University, Japan.

Liao, H.-C. (2011). *Alternatives and exhaustification: Non-interrogative uses of Chinese wh-words*. Ph. D. thesis, Harvard University.

Lin, J.-W. (1996). *Polarity licensing and wh-phrase quantification in Chinese*. Ph. D. thesis, University of Massachusetts.

Lin, J.-W. (1998a). Distributivity in Chinese and its implications. *Natural Language Semantics 6*(2), 201–243.

Lin, J.-W. (1998b). On existential polarity *wh*-phrases in Chinese. *Journal of East Asian Linguistics 7*, 219–255.

Lin, J.-W. (2004). Choice function and scope of existential polarity *wh*-phrases in Mandarin Chinese. *Linguistics and Philosophy 27*, 451–491.

Martí, L. (2003). *Contextual variables*. Ph. D. thesis, University of Connecticut.

Mayr, C. (2013). Intervention effects and additivity. *Journal of Semantics 0*, 1–42.

Miyagawa, S. (2010). *Why Agree? Why Move?* Cambridge, MA: MIT Press.
Novel, M. and M. Romero (2010). Movement, variables and Hamblin alternatives. In M. Prinzhorn, V. Schmitt, and S. Zobel (Eds.), *Proceedings of Sinn und Bedeutung 14*, pp. 322–338. University of Vienna.
Partee, B. H. and M. Rooth (1983). Generalized conjunction and type ambiguity. In R. Bäuerle, C. Schwarze, and A. von Stechow (Eds.), *Meaning, use and interpretation of language*, pp. 362–383. de Gruyter.
Pesetsky, D. (2000). *Phrasal movement and its kin*. Cambridge, MA: MIT Press.
von Prince, K. (2012). Predication and information structure in Mandarin Chinese. *Journal of East Asian Linguistics 21*, 329–366.
Rawlins, K. (2008). *(Un)conditionals: An investigation in the syntax and semantics of conditional structures*. Ph. D. thesis, UCSC.
Rawlins, K. (2013). (Un)conditionals. *Natural Language Semantics 40*, 111–178.
Reinhart, T. (2006). *Interface Strategies*. MIT Press.
Roberts, C. (2012). Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics & Pragmatics 5*, 1–69.
Rooth, M. (1985). *Association with focus*. Ph. D. thesis, UMass.
Rooth, M. (1992). A theory of focus interpretation. *Natural Language Semantics 1*, 75–116.
Rullmann, H. and S. Beck (1998). Presupposition projection and the interpretation of *which*-questions. In D. Strolovitch and A. Lawson (Eds.), *Proceedings of SALT VIII*, Ithaca, NY, pp. 215–232. CLC Publications.
Shimoyama, J. (2006). Indeterminate phrase quantification in Japanese. *Natural Language Semantics 14*, 139–173.
Simons, M. (2005). Dividing things up: The semantics of *or* and the modal/*or* interactions. *Natural Language Semantics 13*, 271–316.
Slade, B. (2011). *Formal and philological inquiries into the nature of interrogatives, indefinites, disjunction, and focus in Sinhala and other languages*. Ph. D. thesis, University of Illinois, Urbana-Champaign.
von Stechow, A. (1991). Focusing and background operators. In W. Abraham (Ed.), *Discourse particles: Descriptive and theoretical investigations on the logical, syntactic and pragmatic properties of discourse particles in German*, pp. 37–81. Amsterdam, Philadelphia: Benjamins.
Szabolcsi, A. (2006). How unitary are intervention effects? Presented at Brussels Conference on Generative Linguistics.
Tancredi, C. (1990). Syntactic association with focus. In D. Meyer, S. Tomioka, and L. Zidani-Eroglu (Eds.), *Proceedings of the First Meeting of the Formal Linguistics Society of Midamerica*, University of Wisconsin, Madison, pp. 289–303.
Tomioka, S. (2007). Pragmatics of LF intervention effects: Japanese and Korean

interrogatives. *Journal of Pragmatics 39*, 1570–1590.
Trukenbrodt, H. (2013). An analysis of prosodic f-effects in interrogatives: Prosody, syntax and semantics. *Lingua 124*, 131–175.
Tsai, W.-T. D. (2004). Tan *zhi* yu *lian* de xingshi yuyi [on the formal semantics of *only* and *even* in Chinese]. *Studies of the Chinese Language 2*, 99–111.
Watanabe, A. (2002). Loss of overt *wh*-movement in Old Japanese. In D. Lightfoot (Ed.), *Syntactic effects of morphological change*, pp. 179 – 195. New York: Oxford University Press.
Wold, D. E. (1996). Long distance selective binding: The case of focus. In T. Galloway and J. Spence (Eds.), *Proceedings of SALT VI*, Ithaca, NY, pp. 311–328. CLC Publications.
Wu, J. (1999). *Syntax and semantics of quantificational in Chinese*. Ph. D. thesis, University of Maryland, College Park.
Xie, Z. (2013). Focus, (non-)exhaustivity, and intervention effects in *wh*-in-situ argument questions. *Linguistic Review 30*, 585–617.
Yang, C.-Y. B. (2008). *Intervention effects and the covert component of the grammar*. Ph. D. thesis, National Tsing Hua University, Taiwan.
Yang, C.-Y. B. (2012). Intervention effects and *wh*-construals. *Journal of East Asian Linguistics 21*, 43–87.
Yatsushiro, K. (2009). The distribution of quantificational suffixes in Japanese. *Natural Language Semantics 17*, 141–173.
Zhang, N. (1997). *Syntactic dependencies in Mandarin Chinese*. Ph. D. thesis, University of Toronto.