Focus intervention effects and the quantificational domain of focus operators

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1 Introduction A number of recent studies (Beck 2006, Cable 2010, Mayr 2013) suggest that the semantic composition of a *wh*-question is hampered when a *wh*-phrase comes in the scope of a focus operator (1), triggering focus intervention effects (FIEs). (All examples in this abstract come from Mandarin; see Beck 2006, Tomioka 2007, Yang 2012, a.o., for crosslinguistic data).

(1) ?*Ta   zhi   rang   [Lee]$_F$ jian   shei?
    he   only   allow   Lee   meet   who
    'Who is the person x such that he allows *only Lee* to meet x?'

However, Aoun & Li (1993) report that a focus operator can associate with an in-situ *wh*-phrase in its scope without triggering FIEs, as shown in (2) (also Eilam 2011, Xie to appear). Systematic association of focus operators and *wh*-phrases (FWHA) can be found in other languages, including Turkish and Bengali.

(2) Ta   zhi   rang   shei jian   Lee?
    he   only   allow   who meet   Lee
    'Who is the person x such that he allows *only x* to meet Lee?'

Based on the contrast between FIEs and FWHA, we propose that FIEs are due to *the inappropriate quantificational domain of a focus operator*, rather than the direct interference of a focus operator with the interpretation of a *wh*-question. We show that this proposal not only connects FWHA and FIEs, but also extends them to multiple *wh*-questions and contrastive topic constructions, enriching the empirical paradigm of FIEs.

2 Proposal We propose that FIEs arise iff a focus operator scopes over a constituent that provides a set of sets as the quantificational domain for the focus operator.

2.1 Framework In Rooth's (1985, 1992) focus semantics, a sentence has two values—an ordinary value and a focus value. Kratzer (1991) proposes a designated assignment function h to derive focus values. Specifically, a focused phrase has an ordinary value (3a), and bears a focus index evoking a secondary value, i.e., a distinguished variable by the application of h (3b). The focus value of the focused phrase corresponds to the set of secondary values that is derived via quantifying over h (3c).

(3) a. $[\![[Lee]_{F1}]\!]^g = $ Lee;   b. $[\![[Lee]_{F1}]\!]^{g,h} = h(1)$;   c. $[\![[Lee]_{F1}]\!]^f = \{ [\![[Lee]_{F1}]\!]^{g,h} \mid h \in H\}$

Adopting Hamblin's (1973) semantics, we assume that a *wh*-phrase does not bear a focus index but denotes a set of alternatives as its ordinary value (4a). Due to the lack of the focus index, the secondary value of a *wh*-phrase is equal to its ordinary value (4b).

(4) a. $[\![who]\!]^g = \{x_{<e>} \mid x$ is a person$\}$;   b. $[\![who]\!]^{g,h} = [\![who]\!]^g$

2.2 Deriving FIEs The LF structure of (1) is (5) (the English gloss is used throughout for simplicity). Following the flexible functional application (FFA) (Hagstrom 1998), *who* is composed in a pointwise manner. As a result, the ordinary value of VP1 is a set of properties (6a). The secondary value of VP1 is (6b), in which the assignment function h is activated to interpret [Lee]$_{F1}$ as a distinguished variable. Therefore, the focus value of VP1 is (6c), which is a set of sets of properties.

(5) [$_{CP}$ [$_{IP}$ he [$_{VP2}$ only [$_{VP1}$ allow [Lee]$_{F1}$ meet who]]]]

(6) a. $[\![VP1]\!]^g = \{\lambda y.\ y$ allows Lee to meet $x \mid x \in \{$John, Peter, …$\}$ $\}$
     b. $[\![VP1]\!]^{g,h} = \{\lambda y.\ y$ allows $h(1)$ to meet $x \mid x \in \{$John, Peter, …$\}\}$
     c. $[\![VP1]\!]^f = \{\{\lambda y.\ y$ allows $h(1)$ to meet $x \mid x \in \{$John, Peter, …$\}\} \mid h \in H\}$

According to Kratzer (1991), the focus value of a given constituent provides the quantificational domain for a focus operator. In (6), therefore, *only* takes $[\![VP1]\!]^f$ as its quantificational domain. At the level of the ordinary value, the composition of *only* with VP1 is facilitated by the FFA, which results in a new set (7).

(7) $[\![VP2]\!]^g = [\![only\ VP1]\!]^g$

$= \{\lambda y. \forall P \in [\![\text{VP1}]\!]^f [P(y) \rightarrow P(y) = y \text{ allows } x \text{ to meet Lee}] \mid x \in \{\text{John, Peter, } \dots\}\}$

$= \begin{Bmatrix} \lambda y. \forall P \in [\![\text{VP1}]\!]^f [P(y) \rightarrow P(y) = y \text{ allows John to meet Lee}], \\ \lambda y. \forall P \in [\![\text{VP1}]\!]^f [P(y) \rightarrow P(y) = y \text{ allows Peter to meet Lee}], \dots \end{Bmatrix}$

Note that the quantificational domain of *only* is inappropriate. In (7), *only* should quantify over properties, but *its quantificational domain is a set of sets of properties*. The composition is illicit, giving rise to FIEs.

2.3 Deriving FWHA The LF structure of (2) is (8). Since no focused phrase is contained in the scope of *only*, the secondary value of VP1 is equivalent to its ordinary value, i.e., a set of properties (9).

(8) [CP [IP he [VP2 only [VP1 allow who meet Lee]]]]

(9) $[\![\text{VP1}]\!]^g = [\![\text{VP1}]\!]^{g,h} = \{\lambda y. y \text{ allows } x \text{ to meet Lee} \mid x \in \{\text{John, Peter, } \dots\}\}$

Although *h* is not used to compute VP1, $[\![\text{VP1}]\!]^{g,h}$ still denotes a set of alternatives by virtue of containing *who*. *Only* can directly take $[\![\text{VP1}]\!]^{g,h}$ as its quantificational domain. At the level of the ordinary value, *only* is applied to each member of the set in (9), resulting in a new set (10).

(10) $[\![\text{VP2}]\!]^g = [\![only \text{ VP1}]\!]^g$

$= \{\lambda y. \forall P \in [\![\text{VP1}]\!]^{g,h}[P(y) \rightarrow P(y) = y \text{ allows } x \text{ to meet Lee}] \mid x \in \{\text{John, Peter, } \dots\}\}$

$= \begin{Bmatrix} \lambda y. \forall P \in [\![\text{VP1}]\!]^{g,h}[P(y) \rightarrow P(y) = y \text{ allows John to meet Lee}], \\ \lambda y. \forall P \in [\![\text{VP1}]\!]^{g,h}[P(y) \rightarrow P(y) = y \text{ allows Peter to meet Lee}], \dots \end{Bmatrix}$

The quantificational domain of *only* is a set of properties, hence the composition is successful.

3 Multiple *wh*-phrases Our analysis predicts that FIEs do not arise when a focus operator scopes over multiple *wh*-phrases. Consider (11).

(11) Ta zhi [VP song-le   shei shenme   shu]?
     he only   send-Asp who what   book
     'Who is the person x and what is the book y such that he *only* sent x y?'

Our account views (11) as a subcase of FWHA. Since the two *wh*-phrases denote sets of alternatives at the ordinary semantic level, the two sets can interact with each other. According to the FFA, such interaction yields a set rather than a set of sets, resulting in the single-pair interpretation (see Hagstrom 1998, Erkardt 2007). The denotation of the VP in (11) is (12), i.e. a set of properties. Hence, $[\![\text{VP}]\!]^{g,h}$ in (12) can serve as an appropriate quantificational domain for *only*.

(12) $[\![\text{VP}]\!]^g = [\![\text{VP}]\!]^{g,h} = \{\text{sent } x\ y \mid x \in [\![who]\!]^g, y \in [\![what\ book]\!]^g\}$

4 Contrastive topic (CT) Our analysis also predicts that FIEs could appear in a wider context than *wh*-questions. This is borne out by CT constructions in Mandarin. Constant (2010, 2011) argues that the focus value of a CT construction denotes a set of sets. In (13a), for example, the second clause denotes a set of sets of propositions as its focus value, as in (13b).

(13) a. Mama meitian hen wan cai hui   jia, [S [Baba]CT ne, gancui jiu [bu   hui   jia]F].
        mother everyday very late just return home father   NE simply just not return home
        'Every day, mom comes home very late, and Dad does not even come home at all.'

   b. $[\![S]\!]^f = \begin{Bmatrix} \{\text{Mom comes home late, Mom does not come home, } \dots\} \\ \{\text{Dad comes home late, Dad does not come home, } \dots\} \end{Bmatrix}$

Suppose that a focus operator scopes over the CT construction, it should take the set of sets in (13b) as its domain and trigger FIEs. (14) shows that this is indeed an illicit composition.

(14) *Zhiyou [S [baba]   ne, gancui jiu [bu   hui   jia]F]
       only   father   NE simply just not   return   home
       'Only Dad NE, does not even come back at all.'

5 Summary and implications We have developed a novel compositional semantics for FIEs, which enables us to reconcile the conflict between FIEs and FWHA, and envision a fuller picture of FIEs beyond *wh*-questions. Our analysis implies that *wh*-phrases do not bear any semantic focus feature (see also Ishihara 2003, Eckardt 2007), hence differing fundamentally from non-*wh* focused phrases.