

# Focus intervention, multiple association, and the unity of focus and *wh* alternatives

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I develop a framework for the compositional semantics of focus association that differs minimally from Rooth 1992 in letting focus-sensitive operators optionally pass up evaluated focus alternatives. My proposal is informed by prior work on various complex constructions involving multiple alternative-sensitive operators and alternative sources — including multiple association with a single focus, multiple overlapping associations with separate foci, focus intervention effects in *wh*-questions, and focus association with *wh*-phrases — all of which I show can be accurately modeled in my framework. The framework allows us to maintain the idea due to Beck (2006) that alternatives computed for the semantics of questions (Hamblin 1973 a.o.) and of focus (Rooth 1985 a.o.) are formally the same objects, defusing the argument in Li & Law 2016 against such unification.

**Keywords** focus association, squiggle, focus intervention effects, multiple focus, Hamblin alternatives, focus alternatives, Alternative Semantics

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# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Patterns of focus association and intervention in questions</b>	<b>3</b>
<b>3</b>	<b>Two approaches to two varieties of alternatives</b>	<b>7</b>
3.1	Focus interpretation following Rooth 1992 . . . . .	10
3.2	Beck's unified Rooth-Hamblin semantics . . . . .	12
3.3	Li & Law's non-unified approach . . . . .	14
<b>4</b>	<b>Proposal</b>	<b>18</b>
4.1	Multiple focus association by passing up alternatives . . . . .	18
4.2	Focus association with <i>wh</i> . . . . .	23
4.3	The continued need for the resetting squiggle ( $\sim_{\text{reset}}$ ) . . . . .	25
<b>5</b>	<b>Patterns of overlapping association</b>	<b>29</b>
5.1	Reenforcing the problem with focus intervention . . . . .	30
5.2	Multiple focus association with overlap . . . . .	34
5.3	On the unselectivity of focus interpretation . . . . .	38
<b>6</b>	<b>Conclusion</b>	<b>41</b>

# 1 Introduction

Pioneering work on the semantics of *wh*-questions (Hamblin, 1973) and focus (Rooth, 1985) has independently motivated the idea that expressions may have denotations that are *sets of alternatives*. In brief, these alternatives represent different possible answers to a question or different possible values for a focused constituent. Moreover, Hamblin and Rooth independently proposed equivalent mechanisms by which these alternative-set denotations for complex expressions are computed. Given the conceptual and formal similarity between Hamblin’s *wh*-alternatives and Rooth’s focus-alternatives, a natural question is what the exact relationship between these two notions are. Are they actually the same formal objects? Or are they distinct types of meanings, with parallel modes of composition? And from a more practical perspective, how should we model the compositional semantics of utterances that contain both *wh*-phrases (or other sources of Hamblinian alternatives) as well as focus-sensitive operators?

One prominent position, developed in Beck 2006 and adopted in much subsequent work, takes Hamblin’s *wh*-alternatives to be the same formal objects as Rooth’s focus alternatives. Beck (2006) discusses restrictions on the use of focus-sensitive operators in *wh*-questions (so-called “focus intervention effects”) as motivation for this unified view. In brief, Beck argues that an intervening focus-sensitive operator will block the projection of a *wh*-phrase’s alternatives up to the clause edge, leading to ungrammaticality. However, Li & Law (2016) argue against this unified approach. Li & Law’s motivation comes from examples of focus association with *wh*-phrases, which suggests that focus-sensitive operators do *not* necessarily disrupt the projection of *wh*-alternatives. Li & Law then argue that these interactions are best modeled by keeping Hamblinian alternatives and Roothian focus alternatives apart, as “alternatives in different dimensions.”

In this paper, I argue that the unified approach to *wh*- and focus alternatives as in Beck 2006 can be maintained. Although Li & Law are correct in noting that focus association with *wh*-phrases poses a challenge to the Beck 2006 theory as presented there, I will show that independently motivated amendments to the theory of focus association — in particular, in Krifka 1991, Bade & Sachs 2019, and Kotek 2019 — allow us to address Li & Law’s challenge while maintaining Beck’s core architectural proposal.

More broadly, I discuss a number of different configurations involving multiple alternative-sensitive operators. See (1) below, where lines indicate intended association dependencies. These configurations that I discuss include those where multiple operators associate with a single alternative source (1a); where multiple, separate association dependencies do not overlap (1b); and where they do overlap (1c), or at least are intended to.

(1) **Configurations of association with multiple alternative-sensitive operators:**

- a. [ Op<sub>1</sub> [ ... Op<sub>2</sub> [ ...  $\alpha$  ...  
└──────────┘  
└────────┘
- b. [ Op<sub>1</sub> [ ...  $\alpha$  ... [ Op<sub>2</sub> [ ...  $\beta$  ...  
└────────┘          └────────┘
- c. [ Op<sub>1</sub> [ ... Op<sub>2</sub> [ ...  $\alpha$  ...  $\beta$  ...  
└────────┘          └────────┘

First, I propose a technique — echoing that in Krifka 1991 and many others but most closely following the presentation in Bade & Sachs 2019 — that allows for multiple alternative-sensitive operators to associate with a single alternative source, as in (1a). In such cases, the lower operator (Op<sub>2</sub>) will apply pointwise to each of the alternatives, which the higher alternative-sensitive operator then associates with. I argue that this correctly accounts for examples of focus association with *wh*-phrases — i.e. (1a), where Op<sub>2</sub> is a focus-sensitive operator,  $\alpha$  is a *wh*-phrase, and Op<sub>1</sub> is a question operator Q — as well as examples of multiple focus association of the sort discussed by Krifka (1991), as in (2) below.

(2) **Multiple association with a single focus:** (Krifka, 1991: 131, 1992: 22)

[At yesterday’s party, people stayed with their first choice of drink. Bill only drank [wine]<sub>F</sub>, Sue only drank [beer]<sub>F</sub>, and...]  
 John even only drank [water]<sub>F</sub>.  
└──────────┘

Focus-sensitive operators also have the option of “resetting” their alternative sets, which Rooth (1992) and Beck (2006) had assumed to always be the case, which may be used in non-overlapping configurations as in (1b), and in particular is required for questions of this form where Op<sub>1</sub> = Q and  $\alpha$  is a *wh*-phrase. I argue that both modes of composition are generally available for any focus-sensitive operator.

I then turn to configurations that intend to express multiple overlapping associations, as schematized in (1c) above. Although such configurations as such are generally not possible, due to the unselectivity of focus-sensitive operators (an assumption which I discuss further below), I predict that some configurations that superficially appear to be of this form are grammatical under my framework, which I show to be correct. Specifically, I show that my proposal then correctly explains some previously unexplained contrasts among the experimental results on overlapping multiple focus configurations reported in Beck & Vasishth 2009. I then show that classic focus intervention configurations — intended to be (1c) with Op<sub>1</sub> = Q,  $\alpha = wh$ , and Op<sub>2</sub> associating with focus  $\beta$  — are independently ruled out by a pragmatic economy constraint on focus interpretation discussed in Kotek 2019 and based on Buccola & Spector 2016.

This paper is organized as follows. In section 2, I first briefly introduce the empirical phenomena of focus intervention effects and focus association with *wh*-phrases, drawing on Li & Law’s examples from Mandarin Chinese. In section 3, I then introduce the contrasting frameworks for the compositional semantics for *wh*-questions and focus in Beck 2006 and Li & Law 2016, highlighting how they do or do not account for the relevant data. I then put forward my own proposal in section 4 which can address the full empirical picture of focus intervention and focus association with *wh*-phrases, while maintaining the unified approach to *wh*- and focus alternatives. I then discuss patterns of overlapping focus association and the nature of illicit focus intervention configurations in section 5. I conclude in section 6.

This paper will also be of interest to readers who are practically interested in the compositional semantics of multiple focus association constructions, without interest in the nature of the relationship between *wh* and focus alternatives or the nature of focus intervention effects. Such readers may safely move ahead and read the following sections: background on the Rooth 1992 theory of focus interpretation, in section 3.1; my proposal for multiple focus association constructions such as in (2), configuration (1a), and the non-overlapping configuration (1b), in section 4.1; my discussion of overlapping multiple focus association, configuration (1c), in sections 5.2 and 5.3; and a summary of the modes of interpretation involved in the configurations in (1), in section 6.

## 2 Patterns of focus association and intervention in questions

The primary empirical evidence in the debate around the relationship between *wh* and focus alternatives involves patterns of focus association in questions with *wh*-in-situ. Here I follow Li & Law 2016 in presenting representative examples from Mandarin Chinese, a *wh*-in-situ language, although the relevant phenomena are widely attested cross-linguistically.

The Mandarin Chinese focus particle *zhǐ* expresses the same semantics as English *only* (Tsai, 2004). *Zhǐ* is a VP-level adverb that associates with a focus within its scope. *Wh*-questions can include a focus particle such as *zhǐ*, as long as the *wh*-word is outside of the scope of the focus particle, as in (3).

### (3) *Wh*-question with *wh*-word above *zhǐ* ‘only’:

*Shéi zhǐ yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí wǎnyàn.*

who only invite-PFV Li Bai attend dinner

‘Who only invited [Li Bai]<sub>F</sub> to attend the dinner?’

However, if the *wh*-word is within the scope of the focus particle, the result is judged by speakers to be highly degraded or ungrammatical. As Li & Law also note, the relative linear order or structural

position of the intended focus and the *wh*-word does not matter, as seen through the same judgment for (4b). If both the focus associate of the operator and the *wh*-word are within the scope of the focus particle, the result is highly degraded. This degradation is what is known as a “focus intervention effect” in this literature.

(4) **Focus intervention effect:**

a. ?\*Tā **zhǐ** yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí *shénme huódòng*? (Li & Law, 2016: 204 ex. 3a)  
 3sg only invite-PFV Li Bai attend what activity

Intended: ‘What activity did he/she only invite [Li Bai]<sub>F</sub> to attend \_\_\_?’

b. ?\*Tā **zhǐ** yāoqǐng-le *shéi* chūxí [wǎnyàn]<sub>F</sub>?  
 3sg only invite-PFV who attend dinner

Intended: ‘Who did he/she only invite \_\_\_ to attend [the dinner]<sub>F</sub>?’

It’s important to note that the intended question meanings in (4) are not themselves logically problematic or impossible to express; rather, it is the specific structural configuration that causes a problem. For instance, if the *wh*-phrase is fronted to a position outside of the scope of the focus particle, the result is grammatical, as in (5).

(5) **Avoiding focus intervention by fronting the *wh*-phrase:** (Li & Law, 2016: 205 ex. 5a)

*Shénme huódòng*, tā **zhǐ** yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí \_\_\_?  
 what activity 3sg only invite-PFV Li Bai attend

‘What activity did he/she only invite [Li Bai]<sub>F</sub> to attend \_\_\_?’ cf (4a)

In summary, focus intervention effects refer to the degradation of *wh*-questions where a focus-sensitive operator (Op) intervenes between the *wh*-phrase and an operator that interprets the *wh*-phrase (here, Q). See the schema in (6) below, which instantiates the overlapping multiple association schema in (1c) above. The lines in (6) indicate the intended association dependencies between alternative sources and their interpreting operators, the mechanisms for which I clarify in the following section. Recall that the relative order of the *wh*-phrase and focus in (6) is not relevant.

(6) **Focus intervention schema:** (Beck 2006: 12 ex. 35; Li & Law 2016: 208 ex. 13)

?\* [ Q [ ... Op [ ... *wh* ... XP<sub>F</sub> ... ] ] ] e.g. (4)

Beck (2006: 6–10) highlights that similar patterns of focus intervention effects, reflecting the contrasts above, are attested in many *wh*-in-situ languages of the world. (See also, more recently, Howell, Hohaus, Berezovskaya, Sachs, Braun, Durmaz, & Beck 2022 for further discussion of this cross-linguistic picture.) The same pattern is also observable in *wh*-fronting languages such as German and English for certain *wh*-words that stay in-situ in questions with multiple *wh*-words (see also Pesetsky, 2000; Kotek, 2014, 2016a, 2019). Beck proposes that the focus intervention configuration as in (6b) is uninterpretable, because (i) the interpretation of *wh* by Q is disrupted by the intervening Op and also because (ii) the *wh*-phrase in the scope of Op disrupts the interpretation of the focus by Op. I will present Beck’s framework and proposal for focus intervention in section 3.2 below.

Against this backdrop, Haoze Li and colleagues (in Li 2012, Li & Cheung 2012, 2015, and Li & Law 2014a,b, 2016) highlight the relevance of focus-sensitive operators associating *with wh*-phrases, as in example (7) below, reproduced with the paraphrase that Li & Law (2016) provide. I schematize the relevant pattern in (8), which is a particular instantiation of the multiple association schema in (1a). The lines indicate that the *wh*-phrase itself is the associate of the focus-sensitive operator (Op), while also being interpreted by an interrogative operator (Q). See Li 2012: 112–113 and Li & Law 2016: 206–208 for evidence that the focus particle indeed associates with the *wh*-phrase in such examples, rather than with some other material.

(7) **Focus association with *wh*-phrase:** (Li & Law, 2016: 205 ex. 6a)

Lǐ Bái **zhǐ** chūxí-le *shénme huódòng*?

Li Bai only attend-PFV what activity

≈ ‘What was the activity *x* such that Li Bai attended only *x*?’

(8) **Focus association with *wh* schema:**

✓ [ Q [ ... Op [ ... *wh* ... ] ] ] e.g. (7)

The grammaticality of focus association with *wh*-phrases has been noted in prior work on Mandarin Chinese, since at least Huang 1982: 378 ex. 27 and Aoun & Li 1993: 207 ex. 29b, but such patterns had not been problematized in the literature on focus intervention effects until these works by Li and

colleagues, cited above.<sup>1</sup> As Li & Law correctly observe, and I discuss in section 3.2 below, the Beck 2006 theory incorrectly predicts structures of the form in (8) to be uninterpretable, just as focus intervention constructions (6) are.<sup>2</sup> Li & Law then present a new proposal for the full range of patterns above, which I present in section 3.3 below, and which differs substantially from Beck's in its theoretical assumptions.

Here I have presented a small sample of examples which suffices to illustrate the key contrasts that motivate Li & Law's argument. Li and colleagues also show that these patterns of focus intervention (6) and association with *wh*-phrases (8) hold of another form of 'only,' *zhǐyǒu* (see e.g. Li & Cheung, 2015, Sun, 2021, and citations there), as well as a focus particle *shì* that expresses cleft-like exhaustivity (see e.g. Teng, 1979, Paul & Whitman, 2008, Erlewine, 2022 and citations there). They also show that these patterns extend to the interpretation of alternative question disjunction, as well as the interpretation of non-interrogative *wh*-phrases and disjunctions. In the latter cases, the relevant *wh*- or disjunction-interpreting operator is not Q but another, non-interrogative operator (e.g. an existential operator akin to that in Kratzer & Shimoyama 2002), but the descriptive schemas in (6) and (8) hold with another operator in place of Q. For ease of presentation, I will only discuss focus intervention in *wh*-questions and focus association with *wh*-phrases below, although my overall discussion also extends to these other cases. See Erlewine to appear for a concrete proposal for the compositional semantics of interrogative disjunction as well as non-interrogative uses of *wh*-phrases and disjunction in Mandarin, which is compatible with my proposal here, and which allows us to together capture these additional facts presented by Li & Law.

To my knowledge, the empirical picture presented in Li & Law 2016 is entirely accurate, as is their claim that focus association with *wh*-phrases pose a significant challenge for the Beck 2006 theory of focus intervention effects without further qualification. What I take issue with here is Li & Law's suggestion that such data constitutes a challenge to the general approach to *wh* and focus semantics espoused by Beck. To make the theoretical stakes more concrete, in the next section, I present Beck's and Li & Law's contrasting proposals for the relationship between Hamblin's *wh*-alternatives and Rooth's focus alternatives. I then present my own proposal in sections 4 and 5, which allows us to address the full range of data under consideration while maintaining Beck's architectural assumptions.

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<sup>1</sup> Yang (2008, 2012) does discuss such examples in passing (see Yang 2008: 65 ex. 57b; 2012: 53 ex. 29), but the description there is incomplete, as it suggests simply that VP-level focus particles categorically do not trigger intervention, contrary to fact. Even with VP-level particles, it is the choice of focus associate that matters, as observed in (4) vs (7) above.

<sup>2</sup> Mayr 2014 also notes, in passing, the problem of focus association with *wh*-phrases as a problem for the Beck 2006 theory. See page 546 note 26.



### 3 Two approaches to two varieties of alternatives

I now present the theoretical background and debate regarding the relationship between *wh* and focus alternatives. As noted in the introduction, Hamblin (1973) and Rooth (1985, 1992) independently motivated the idea that expressions may denote a set of alternatives, in order to account for the semantics of *wh*-questions and focus, respectively. Hamblin and Rooth’s alternative set denotations are furthermore computed in an identical manner, through a process that is now widely called *pointwise composition*.<sup>3</sup> An important question for semantic theory is what the relationship between these two types of alternatives are. Should the two be thought of as the same type of logical objects, or as similar but formally distinct?

I will first clarify this question by briefly introducing Hamblin and Rooth’s frameworks. The two are not identical, owing to the distinct empirical phenomena that motivated their development. Notably, we can describe Hamblin’s framework as a *one-dimensional* one: each expression has one semantic value, which is of a set type. Expressions which do not contain *wh*-phrases such as the noun phrase *Alice* or the clause *Alice attended the dinner* will have singleton set denotations. *Wh*-phrases denote a non-singleton set of individuals,<sup>4</sup> with *wh*-containing expressions such as the question *who attended the dinner* denoting a corresponding non-singleton set of propositions.

- (9) **Some denotations in Hamblin semantics (one-dimensional):** (Hamblin, 1973: based on)
- |              |                          |
|--------------|--------------------------|
| <i>Alice</i> | { Alice }                |
| <i>who</i>   | { Alice, Bob, Cara,... } |

Subsequent work has motivated the use of such a one-dimensional Hamblin semantics framework for the analysis of *wh*-quantification (Shimoyama, 2001, 2006), negative polarity and free choice indefinites (Krifka, 1994; Kratzer & Shimoyama, 2002; Chierchia, 2006, 2013), and disjunction (Aloni, 2003; Simons, 2005; Alonso-Ovalle, 2006; Biezma & Rawlins, 2012).

In contrast, Rooth’s work on focus shows that it is necessary to distinguish a particular value for a focused constituent — the *prejacent* value — from its alternatives, which has led to an influential *two-dimensional* system dubbed *Alternative Semantics*. Rooth (1992) describes each expression  $\alpha$  as having an *ordinary semantic value*  $\llbracket \alpha \rrbracket^o$  and a *focus semantic value*  $\llbracket \alpha \rrbracket^f$ . However, following more recent

<sup>3</sup> I do not describe this compositional mechanism here, as its details are not crucial for our discussion. Rooth notes in Rooth 1992 (p. 84 note 7) that this formal similarity between Hamblin’s *wh*-alternatives and his own alternatives for focus in Rooth 1985 was pointed out to him later by Dietmar Zaefferer.

There is also an alternative method for the computation of such alternative sets using so-called “distinguished variables” (Kratzer, 1991; Wold, 1996), used by both Beck (2006) and Li & Law (2016) in their presentation (see note 14), but these details too are not necessary here, except in note 16 below. See the Appendix to Beck 2016 for a concise presentation of both approaches.

<sup>4</sup> Hamblin (1973: 53) himself suggests that nominal *wh*-phrases denote sets of generalized quantifier meanings, but I instead follow most subsequent work in this tradition by taking nominal *wh*-phrases to denote sets of individuals of type *e*. See Rooth 2016: sec. 2.3 for discussion.

work such as Beck 2007, 2016 and Rooth 2016, I will refer here to the latter as an *alternative semantic value* instead, notated  $\llbracket \alpha \rrbracket^{\text{alt}}$ . The alternative semantic value for expressions which do not contain focus is simply the singleton set of their ordinary semantic value. In contrast, focused constituents have a non-singleton set of alternatives as their alternative semantic value, such as  $[Alice]_F$  in (10) below, which includes the ordinary value as a member.

(10) **Some denotations in Rooth’s Alternative Semantics (two-dimensional):** (Rooth, 1985, 1992)

	ordinary value:	alt. sem. value:
<i>Alice</i>	Alice	{Alice}
$[Alice]_F$	Alice	{Alice, Bob, Cara,...}

These non-trivial alternatives from focus then propagate so that focus-containing expressions also have non-singleton alternative semantic values. For instance,  $[Alice]_F$  attended the dinner has a set of propositions of the form  $\{^{\wedge}Alice$  attended the dinner,  $^{\wedge}Bob$  attended the dinner,  $^{\wedge}Cara$  attended the dinner, ...} as its alternative semantic value.

In addition to these sets of alternatives, however, for the interpretation of focus, we also must keep track of the preadjacent values in the ordinary dimension of meaning. For example, although  $[Alice]_F$  and  $[Bob]_F$  have equivalent alternative semantic values,  $\llbracket [Alice]_F \rrbracket^{\text{alt}} = \llbracket [Bob]_F \rrbracket^{\text{alt}}$ , their ordinary semantic values are distinct. The two-dimensional semantics is thus crucial for distinguishing expressions that vary only in their choice of focus, such as  $[Alice]_F$  attended the dinner and  $[Bob]_F$  attended the dinner. I illustrate the use of these two dimensions of meaning for the interpretation of focus-sensitive operators such as *only* below.

Given the formal similarity of the set denotations motivated for *wh*-alternatives in Hamblin 1973 and for focus in Rooth 1985, 1992, a natural question is what the exact relationship between these two formal objects are. Broadly, two approaches have emerged. The first is to treat Hamblinian *wh*-alternatives in Rooth’s alternative semantic dimension of meaning, as argued in Beck 2006. Formally, *wh*-phrases and *wh*-containing expressions then have no defined ordinary semantic values, as also suggested earlier in Ramchand 1997. Beck & Kim (2006) then also extend this approach to disjunctions, as formally parallel to *wh*-phrases; see also Erlewine 2014a, to appear. This first approach has been widely and productively adopted in many works; see e.g. Cable 2010; Truckenbrodt 2013; Constant 2014; Kotek 2014, 2019; Kotek & Erlewine 2016; among others. In contrast, Li & Law advocate for a second approach, following Eckardt 2007, wherein expressions that introduce Hamblinian alternatives such as *wh*-phrases do so as sets in the ordinary semantic dimension. I give some sample denotations again to highlight the difference between the two approaches in (11).<sup>5</sup>

(11) **Two approaches to integrating Hamblin and Rooth’s semantics (two-dimensional):**

a. Beck’s (2006) unified approach:

	ordinary value:	alt. sem. value:	
<i>Alice</i>	Alice	{ Alice }	
$[Alice]_F$	Alice	{ Alice, Bob, Cara,... }	
<i>who</i>	undefined	{ Alice, Bob, Cara,... }	also Ramchand 1997
<i>Alice or Bob</i>	undefined	{ Alice, Bob }	Beck & Kim 2006

b. Li & Law’s (2014a; 2016) non-unified approach:

	ordinary value:	alt. sem. value:
<i>Alice</i>	Alice	undefined
$[Alice]_F$	Alice	{ Alice, Bob, Cara,... }
<i>who</i>	{ Alice, Bob, Cara,... }	undefined
<i>Alice or Bob</i>	{ Alice, Bob }	undefined

The two approaches thus reflect substantially different conceptions of the compositional semantic architecture that underlies a wide range of phenomena. As both Beck (2006) and Li & Law (2016) have argued, the grammatical behavior of sentences with both *wh*-phrases and focus association — which indeed exhibit non-trivial interactions, as summarized in the preceding section — constitutes a crucial testing ground for distinguishing between such theoretical approaches. In particular, Li & Law argue that the possibility of focus association with *wh*-phrases (schematized in (8) above) is problematic for Beck’s approach but addressed in their own, second approach. They comment therefore that “having sets of alternatives in different dimensions gives us more explanatory power” (p. 203).

In the remainder of this section, I first illustrate the basics of Rooth’s proposal for the interpretation of focus, which applies equally to the two approaches in (11) above. I then present each of the two approaches in further detail, together with how they do or do not account for the patterns of focus-*wh* interactions in section 2 above. This will provide the background for my own positive proposal in sections 4 and 5 below.

<sup>5</sup> In Li & Law 2016, unlike in Hamblin 1973, ordinary semantic values are however not sets unless they include a *wh*-phrase or disjunction, as reflected in  $\llbracket Alice \rrbracket^o = \llbracket [Alice]_F \rrbracket^o = Alice$  in (11b) below. See Li & Law 2016: 209–212. On the computation of alternative semantic values in Li & Law 2016 (their “focus semantic values”) and where they are defined, see notes 14 and 16 below.

Qing (2018) discusses an alternative and perhaps more principled approach to maintaining Hamblinian alternatives in the ordinary dimension and focus alternatives in the alternative semantic dimension, as predicted by “essentially stacking Charlow’s (2014) focus and set monads” (p. 655 note 6). While conceptually attractive, this approach does not obviously derive or explain the full set of *wh* and focus interactions as I argue that Beck’s unified approach in (11a) can.

### 3.1 Focus interpretation following Rooth 1992

I first give a brief illustration of the compositional semantics of focus-sensitive operators, most closely following the framework presented in Rooth 1992. Concretely, I discuss the interpretation of *only*, which presupposes the truth of its prejacent and expresses at-issue that all alternatives in a contextually-determined set  $C$  that are not entailed by the prejacent are false (12).

$$(12) \quad \llbracket \text{only}_C \rrbracket^0 = \lambda p_{\langle s,t \rangle} . \text{ONLY}(C)(p) \\ = \lambda p_{\langle s,t \rangle} . \lambda w_s : p(w) . \forall q \in C [(p \Rightarrow q) \rightarrow \neg q(w)]$$

Rooth 1992 proposes that a *focus interpretation operator*  $\sim$  (squiggle) serves to enforce that a contextual variable (e.g.  $C$ ) is congruent to — and more specifically, a subset of — the alternative semantic value of the complement of *only* and other focus-sensitive operators. In this way, Rooth (1992) suggests, expressions such as *only* that can be described as focus-sensitive do not make direct reference to the alternative semantic dimension of meaning; all focus-sensitivity effects are due to expressions such as *only* making reference to a variable such as  $C$ , with a corresponding focus interpretation operator  $\sim$ .

A feature that will become important here is that Rooth’s  $\sim$  “resets” the alternative semantic value of its complement, reflecting the intuition that “focus has been interpreted [by  $\sim$ ], so we want to neutralize the semantic effect of the foci” below (Rooth, 1992: 94–95). The alternatives in the complement of  $\sim$  will then be inaccessible for additional operators above.<sup>6</sup> For perspicuity, I will refer to Rooth’s  $\sim$  operator as  $\sim_{\text{reset}}$  and give its syncategorematic description in (13) below. Technically, the definition of the alternative semantic value in (13b) — taken from Rooth 1992: 95 ex. 42 — reflects this “resetting” of alternatives, in Beck’s terms, blocking the propagation of alternatives introduced within  $\alpha$  to higher alternative semantic values.

(13) **Rooth’s resetting focus interpretation operator:**<sup>7</sup>

- a.  $\llbracket [\sim_{\text{reset}} C] \alpha \rrbracket^0 = \llbracket \alpha \rrbracket^0$ , with presupposition:  $C \subseteq \llbracket \alpha \rrbracket^{\text{alt}}$
- b.  $\llbracket [\sim_{\text{reset}} C] \alpha \rrbracket^{\text{alt}} = \{ \llbracket \alpha \rrbracket^0 \}$

Now consider example (14) below. To simplify the presentation, I consider the interpretation of the structure in (14a), which reflects *only* with its complement VP, with *we* in its predicate-internal argument position. Suppose that there are three contextually relevant individuals that we may have seen, Alice,

<sup>6</sup> Some authors informally describe this property by saying that  $\sim$  will “use up” (e.g. Beck & Vasishth, 2009: 162) or “consume” (e.g. Kratzer & Selkirk, 2020: 34–39) the alternatives introduced by foci in its scope.

<sup>7</sup> This formulation is modeled after that in Beck 2006: 15 and Li & Law 2016: 210 note 7. For Rooth,  $\sim$  also ensures that  $C$  contains  $\llbracket \alpha \rrbracket^0$  and at least one other value; see Rooth 1992: 93 ex. 40. See also Kratzer & Selkirk 2020 and Goodhue 2022 for more recent proposals for the requirements of  $\sim$ .

Bob, and Cara, so we take the set  $C$  in (14c) to be the relevant set of alternatives. As  $C \subseteq \llbracket \text{VP1} \rrbracket^{\text{alt}}$ , the presupposition of  $\sim_{\text{reset}}$  holds. The ordinary and alternative semantic denotations for the node labeled VP2 are as in (14d), reflecting the resetting effect of  $\sim_{\text{reset}}$ . Finally, the interpretation of this full structure is the ordinary semantic value for VP3 is as in (14e) below.

(14) We only saw [Alice]<sub>F</sub>.

- a.  $\llbracket \text{VP3} \text{ only}_C \llbracket \text{VP2} [\sim_{\text{reset}} C] \llbracket \text{VP1} \text{ we see [Alice]_F \rrbracket \rrbracket \rrbracket$
- b.  $\llbracket \text{VP1} \rrbracket^{\text{o}} = \wedge \text{we see Alice}$   
 $\llbracket \text{VP1} \rrbracket^{\text{alt}} = \{ \wedge \text{we see Alice}, \wedge \text{we see Bob}, \wedge \text{we see Cara}, \dots \}$
- c.  $C = \{ \wedge \text{we see Alice}, \wedge \text{we see Bob}, \wedge \text{we see Cara} \}$
- d.  $\llbracket \text{VP2} \rrbracket^{\text{o}} = \llbracket [\sim_{\text{reset}} C] \llbracket \text{VP1} \rrbracket^{\text{o}} \rrbracket = \wedge \text{we see Alice}$   
 $\llbracket \text{VP2} \rrbracket^{\text{alt}} = \llbracket [\sim_{\text{reset}} C] \llbracket \text{VP1} \rrbracket^{\text{alt}} \rrbracket = \{ \wedge \text{we see Alice} \}$
- e.  $\llbracket \text{VP3} \rrbracket^{\text{o}} = \text{ONLY}(C) (\llbracket \text{VP2} \rrbracket^{\text{o}})$   
 $= \lambda w : \text{we see Alice in } w . \text{ we don't see Bob and we don't see Cara in } w$

Composing this expression with a higher temporal operators, we derive the attested interpretation for (14), presupposing that we saw Alice and asserting that we didn't see the other relevant individuals, Bob and Cara.

I conclude this section with some comments on the assumptions and notation I use for focus semantics here, in relation to that in Beck 2006, Li & Law 2016, and related work. First, in my presentation here, I adopted the use of the focus interpretation operator  $\sim$  from Rooth 1992. A widespread alternative approach is to give focus-sensitive operators (e.g. *only*) themselves syncategorematic entries that make direct reference to both the ordinary and alternative semantic values of their complement, and which themselves reset alternative semantic values, blocking the propagation of alternatives. Note that the presentation in Li & Law 2016 takes such a “direct reference” approach; see their p. 210 ex. 15 and footnote 7.<sup>8</sup>

Second, I assume that alternative semantic values for complex expressions are derived from that of their component parts through a process of pointwise composition, following Rooth 1985, 1992 and much other work in this literature. An alternative here is to posit distinguished variables for positions of focus, together with separate, designated assignment functions for these variables (Kratzer, 1991;

<sup>8</sup> Note as well that Li & Law's denotation for 'only' (Li & Law, 2016: 210 ex. 15) assumes a VP complement of  $\langle e, \langle s, t \rangle \rangle$  type, in contrast to the propositional type for VP assumed in my presentation here. My own presentation reflects the adoption of the predicate-internal subject hypothesis for both English and Mandarin; see McCloskey 1997 for an overview and Huang 1993 and Lin 1998 for discussion specific to Mandarin. This choice in Li & Law's presentation however does not affect their or my main points.

Wold, 1996). Both Beck 2006 and Li & Law 2016 *do* adopt this approach to the formal semantics of focus in their presentations. However, I will not, as the adoption of distinguished variables complicates the presentation and is generally unnecessary for understanding and comparing Beck and Li & Law’s proposals.

Third, and relatedly, I follow the assumption of Rooth 1992 and Beck 2006 that  $\sim_{\text{reset}}$  is *unselective*: that is, it cannot selectively consider the effects of one focus in its scope but not another, unlike the distinguished variables formalization of Kratzer 1991 and Wold 1996 which allows for this. See discussion in Beck 2006 (especially pp. 32–35) on this aspect of Rooth’s proposal, as well as more recent discussion and motivation of this view in Howell et al. 2022. I will discuss this aspect of the theory myself near the end of this paper, in section 5.3.

### 3.2 Beck’s unified Rooth-Hamblin semantics

I now introduce the approach to the semantics of *wh*-questions and their focus intervention effects put forward in Beck 2006. The key point of this approach is that Hamblinian alternatives for *wh*-questions and Roothian alternatives for focus are the same sorts of objects: they are alternative semantic values, originally proposed by Rooth as “focus semantic values” and crucially distinct from ordinary semantic values. This unified approach to the two sorts of alternatives has successfully been employed in subsequent work on the detailed syntax/semantics of a wide range of *wh*-question constructions and their cross-linguistic variation, most notably in Cable 2010 and Kotek 2014, 2019. It has also been adopted in some work on the interpretation of disjunction (Beck & Kim, 2006; Erlewine, 2014a, to appear), echo questions (Beck & Reis, 2018), and non-interrogative uses of *wh*-words (e.g. Erlewine & Kotek, 2016; Uegaki, 2018; Beck, 2020; Erlewine, 2020, to appear).

Under this approach, the Hamblin denotation of a *wh*-phrase is its alternative semantic value, and *wh*-phrases have no defined ordinary semantic value, as independently proposed by Ramchand (1997). See (15). A *wh*-containing clause as in (16) therefore has a set of corresponding propositions as its alternative semantic value, via pointwise composition, but again with no ordinary semantic value.

- (15)  $\llbracket \text{who} \rrbracket^{\circ}$  undefined  
 $\llbracket \text{who} \rrbracket^{\text{alt}} = \{\text{Alice, Bob, Cara, ...}\}$

- (16)  $\llbracket \text{we saw who} \rrbracket^{\circ}$  undefined  
 $\llbracket \text{we saw who} \rrbracket^{\text{alt}} = \{\wedge \text{we saw Alice, } \wedge \text{we saw Bob, } \wedge \text{we saw Cara, ...}\}$

The final interpretation of a *wh*-question is, following Hamblin, a set of propositions. Beck (2006: 16) proposes that what is interpreted in the end must be the ordinary semantic value, so there is a need for

an operator that “lifts” a *wh*-containing clause’s alternative semantic value into the ordinary dimension. Beck therefore proposes the question operator *Q*, with the syncategorematic denotation in (17), which applies at the edge of questions.<sup>9</sup> Its application to (16) results in (18), a valid question denotation in this framework.

(17) **Beck’s question operator *Q*:** (Beck, 2006: 16; also ALTSHIFT in Kotek 2019: 32)

- a.  $\llbracket Q \alpha \rrbracket^o = \llbracket \alpha \rrbracket^{alt}$   
 b.  $\llbracket Q \alpha \rrbracket^{alt} = \{ \llbracket Q \alpha \rrbracket^o \} = \{ \llbracket \alpha \rrbracket^{alt} \}$

(18)  $\llbracket Q [\text{we saw who}] \rrbracket^o = \{ \wedge \text{we saw Alice}, \wedge \text{we saw Bob}, \wedge \text{we saw Cara}, \dots \}$   
 $\llbracket Q [\text{we saw who}] \rrbracket^{alt} = \{ \{ \wedge \text{we saw Alice}, \wedge \text{we saw Bob}, \wedge \text{we saw Cara}, \dots \} \}$

Beck (2006) motivates this framework in part from the existence of focus intervention effects (also following Kim 2002), where a focus-sensitive expressions appearing above an in-situ *wh*-phrase leads to the marked degradation of a question. For Beck, focus intervention effects show that focus association with an intervening operator — technically, always Rooth’s  $\sim_{\text{reset}}$  — interrupts the interpretation of *wh*-alternatives by *Q*. In particular, Beck argues, the uninterpretability of such structures is a natural consequence of the alternatives introduced by focus and those introduced by *wh*-phrases being the same sorts of objects, in the same dimension of meaning.

I illustrate the technical problem in the focus intervention configuration by considering the interpretation of the structure in (19). This abstract structure stands in for the more detailed structure of focus intervention effect examples such as in (4a,b) above, and is parallel to that in Beck 2006: 16 ex. 53.

(19)  $?* [CP Q \dots [VP_3 \text{only}_C [VP_2 [\sim_{\text{reset}} C] [VP_1 \dots \text{wh} \dots XP_F \dots$

Beck (2006: 16–17) proposes that such configurations — where Rooth’s  $\sim_{\text{reset}}$  intervenes between a *wh*-phrase and the *Q* which is meant to interpret the *wh*’s alternatives — are uninterpretable due to the effects of  $\sim_{\text{reset}}$ . The node here labeled *VP*<sub>1</sub> contains a *wh*-phrase which has no defined ordinary value, and therefore  $\llbracket VP_1 \rrbracket^o$  will itself be undefined. Now, consider the interpretation of *VP*<sub>2</sub>, interpreted via the syncategorematic entry for  $\sim_{\text{reset}}$  in (13) above. Even assuming that the presupposition of  $\sim_{\text{reset}}$  ( $C \subseteq \llbracket VP_1 \rrbracket^{alt}$ ) is met, the effect of  $\sim_{\text{reset}}$  is such that it defines  $\llbracket VP_2 \rrbracket^o$  as equal to  $\llbracket VP_1 \rrbracket^o$  which is

<sup>9</sup> I note that *Q*, like  $\sim_{\text{reset}}$ , is resetting in (17b), but this does not play a role in our discussion here. This detail of *Q* does however play an important role in Kotek 2019 in allowing for the derivation of multiple *wh*-question meanings in a principled manner. Kotek calls this operator ALTSHIFT, rather than *Q*, as it may be invoked multiply in the interpretation of such complex *wh*-questions. See also Howell et al. 2022 for further discussion comparing the formal properties of  $\sim_{\text{reset}}$  and *Q*.

The denotation for *Q* in (17a) is also proposed earlier by Hong (1995: 57–61), although with different assumptions for the denotation of *wh*-words. He elaborates, “In a sense, the *Q*-morpheme can be thought of as a kind of ‘foregrounder,’ which converts the background alternatives into part of the foreground representation, or the meaning proper” (p. 60).

undefined; furthermore,  $[[VP2]]^{alt}$  is defined to be the singleton set containing  $[[VP2]]^0$ , which again is undefined. Therefore, we predict the node VP2 to be undefined in both dimensions of meaning. The systematic uninterpretability of such configurations predicted by this framework leads to the observed focus intervention effects, according to Beck 2006.

In addition, it is not possible for the focus-sensitive operator and its  $\sim_{reset}$  to “selectively” associate with the focus, leaving the alternatives of the *wh*-phrase untouched in some way. This follows from the “unselective” nature of the focus interpretation operator as defined in Rooth 1992, as Beck (2006) discusses. I discuss this unselectivity property again in section 5.3.

Notice, however, that the presence or interpretational effects of the F-marked constituent in (19) does not actually play a role in Beck’s explanation for the uninterpretability of such structures. Therefore, as Li & Law (in Li 2012 and Li & Law 2014a, 2016) rightly point out, Beck’s proposal makes the incorrect prediction that examples of focus association *with wh*-phrases (as in (7) above) should also be degraded in the exact same way as canonical focus intervention effect examples. Despite its pioneering and influential account for focus intervention accounts, then, this serious issue teaches us that the Beck 2006 theory cannot be maintained as is.<sup>10</sup>

### 3.3 Li & Law’s non-unified approach

Having highlighted this major challenge to Beck 2006, Li & Law then present their own proposal, which makes use of a radically different theoretical assumption — that Hamblinian alternatives for *wh*-phrases and Rooth’s alternatives for focus should be kept apart, as “alternatives in different dimensions” — together with a non-standard adjustment to the semantics of ‘only.’ In this section, I introduce and briefly discuss Li & Law’s account. Readers who are primarily interested in my own proposal for focus association with *wh*-phrases in Beck’s framework may skip ahead to section 4.

As I previewed earlier, Li & Law depart from Beck 2006 and follow Eckardt 2007 in treating *wh*-phrases as introducing alternatives in the ordinary semantic dimension, whereas focus introduces alternatives in the alternative semantic dimension. I first illustrate the problem of focus intervention in their framework. Following their presentation, I discuss the interpretation of their Mandarin focus intervention example, repeated from (4) above. Using the notation and assumptions I have introduced above, I assume the structure in (20b) for this structure.<sup>11</sup>

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<sup>10</sup> Li & Law (2016) additionally level a more conceptual criticism against Beck’s (2006) approach to focus intervention effects, describing Beck 2006 (and related works) as “attributing focus intervention to the focus feature on interrogative *wh*-phrases,” “assum[ing] that interrogative *wh*-phrases are special focused phrases...” (p. 238). But this reflects an incorrect reading of these proposals; as Beck & Reis (2018) note, “saying that *wh* is an alternative trigger is not the same thing at all as saying that the *wh*-phrase is ‘inherently focused’ (a misrepresentation found e.g. in Slade 2011, and others...)” (p. 396). Here I concentrate on Li & Law’s empirical argument against Beck 2006 from focus association with *wh*-phrases.



(20) a. ?\*Tā zhǐ yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí shénme huódòng? = (4a)  
 3sg only invite-PFV Li Bai attend what activity

Intended: ‘What activity did he/she only invite [Li Bai]<sub>F</sub> to attend \_\_\_?’

b. [CP Q ... [VP3 only<sub>C</sub> [VP2 [<sub>~reset</sub> C] [VP1 3sg invite [Li Bai]<sub>F</sub> attend *what activity*]]]]

Now consider the interpretation of the VP1 node in Li & Law’s framework for *wh*- and focus alternatives. As VP1 contains a *wh*-phrase,  $[[VP1]]^o$  will be a set of propositions that vary over the position of the *wh*-phrase; see (21). Next, consider the alternative semantic value. Because VP1 contains a focus,  $[[VP1]]^{alt}$  will be a set that varies over different values in the position of focus. However, because the ordinary denotation  $[[VP1]]^o$  is itself a set of propositions,  $[[VP1]]^{alt}$  will be a *set of sets* of propositions.

$$(21) \quad [[VP1]]^o = \left\{ \begin{array}{l} \wedge 3sg \text{ invites Li Bai to the dinner,} \\ \wedge 3sg \text{ invites Li Bai to the ball,} \\ \wedge 3sg \text{ invites Li Bai to the concert} \end{array} \right\}$$

$$[[VP1]]^{alt} = \left\{ \begin{array}{l} \left\{ \begin{array}{l} \wedge 3sg \text{ invites Li Bai to the dinner,} \\ \wedge 3sg \text{ invites Li Bai to the ball,} \\ \wedge 3sg \text{ invites Li Bai to the concert} \end{array} \right\}, \\ \left\{ \begin{array}{l} \wedge 3sg \text{ invites Du Fu to the dinner,} \\ \wedge 3sg \text{ invites Du Fu to the ball,} \\ \wedge 3sg \text{ invites Du Fu to the concert} \end{array} \right\}, \\ \left\{ \begin{array}{l} \wedge 3sg \text{ invites Gao Shi to the dinner,} \\ \wedge 3sg \text{ invites Gao Shi to the ball,} \\ \wedge 3sg \text{ invites Gao Shi to the concert} \end{array} \right\} \end{array} \right\}$$

Note that (21) here reflects the denotations given in exx. 23a and 24 in Li & Law 2016, with change of notation only to reflect my use of the predicate-internal subject hypothesis (see note 8).<sup>12</sup>

Li & Law propose that the focus intervention effect of example (20a) reflects the inability to interpret focus-sensitive operators such as ‘only’ based on a VP denotation of the form in (21). According to Li & Law, ‘only’ will compose pointwise with each of the individual alternatives in the ordinary semantic value  $[[VP2]]^o = [[VP1]]^o$ . The semantics of ‘only’ (as in (12) above) requires that the set *C* be a set of

<sup>11</sup> (20b) here differs from the structure given in Li & Law 2016: 212 ex. 22 only in (a) the adoption of the predicate-internal subject hypothesis (see note 8 above) and (b) the insertion of Rooth’s focus interpretation operator (<sub>~reset</sub>). Li & Law instead assume a denotation for ‘only’ that makes direct reference to both the ordinary and alternative semantic values of its complement; see Li & Law 2016: 210 ex. 15.

<sup>12</sup> I furthermore assume that VP2 and VP1 in (20b) have identical denotations, with the presupposition of <sub>~reset</sub> satisfied by  $C = [[VP1]]^{alt}$ . This reflects our explicit reference to Rooth’s <sub>~reset</sub> operator, unlike in Li & Law’s presentation, but does not affect the substance of their account.

propositions. However, in Li & Law’s framework, the set of alternatives  $C$  (a subset of  $[[VP1]]^{alt}$ ) will be a *set of sets* denotation, making ‘only’ uninterpretable. Li & Law conclude, “We take the lack of a licit quantificational structure to be the underlying reason for focus intervention” (p. 213).

For Li & Law, the architectural assumption of keeping separate Hamblinian alternatives for *wh*-phrases (and other sources of Hamblin alternatives) and Roothian focus alternatives plays a key role in explaining focus intervention effects. A focus-sensitive operator can successfully associate with a focus in its scope, if no *wh*-phrase is present (see their section 3.1). But if the operator’s sister includes a *wh*-phrase as well as a focused constituent, as in so-called focus intervention configurations, the alternative semantic value will necessarily be a *set of sets* denotation instead of the expected set denotation.

Additionally, they argue, a focus-sensitive operator can also successfully associate with a *wh*-phrase if no focused phrase is present, thereby accounting for the possibility of focus association with *wh*-phrases. Concretely, I discuss their grammatical Mandarin Chinese example of this form, repeated here as (22a), for which I assume the structure in (22b).

- (22) a. Lǐ Bái **zhǐ** chūxí-le shénme huódòng? = (7)  
 Li Bai only attend-PFV what activity  
 ≈ ‘What was the activity  $x$  such that Li Bai attended only  $x$ ?’  
 b. [CP Q ... [VP3 only<sub>C</sub> [VP2 [ $\sim_{reset}$  C] [VP1 Li Bai attend *what activity*]]]]

In the framework put forward by Li & Law, VP1 will have an ordinary semantic value of a set of propositions that correspond to different answers for the *wh*-phrase (23), just as in the focus intervention example above. However, as VP1 contains no focused material, Li & Law (2016) claim that “VP1 here lacks a focus semantic value” (p. 215),<sup>13</sup> that is, what I call the alternative semantic value here:

$$(23) \quad \begin{array}{l} [[VP1]]^o = \left\{ \begin{array}{l} \wedge 3sg \text{ invites Li Bai to the dinner,} \\ \wedge 3sg \text{ invites Li Bai to the ball,} \\ \wedge 3sg \text{ invites Li Bai to the concert} \end{array} \right\} \\ [[VP1]]^{alt} \text{ undefined} \end{array}$$

The question now is how ‘only’ can compose with this structure, and in particular what set of alternatives it will consider. Li & Law (2016: 215) propose the following:

We know from Sect. 3.1 that *zhi* ‘only’ takes the focus semantic value of its sister as a quantificational domain. Since VP1 here lacks a focus semantic value [alternative semantic

<sup>13</sup> I note again that the LF in (22b) presents the subject in its predicate-internal position, but the VP1 here is otherwise equivalent to that in Li & Law 2016: 215, exx. 32 and 33. This description that I quote should therefore fairly apply to my (22–23) as well. See also note 16 below for more on what “lack[ing] a focus semantic value” here means.

value], we assume that *zhi* is flexible enough to use the secondary semantic value [see comment below] of VP1 as its quantificational domain.

Here I set aside what Li & Law mean by “secondary semantic value.”<sup>14</sup> It suffices to note that in their own terminology, they state in the preceding paragraph that “the ordinary semantic value and the secondary semantic value of VP1 are the same” (p. 215) in these cases of focus association with *wh*-phrases. In other words, Li & Law stipulate that ‘only’ in these examples exceptionally use a set which is equal to the ordinary semantic value as its quantificational domain,<sup>15</sup> even though ‘only’ must otherwise quantify over a focus semantic value, because the relevant constituent here contains no F-marking and therefore “lacks a focus semantic value.”<sup>16</sup> This is a non-trivial adjustment to the compositional semantics of focus-sensitive operators, to my knowledge without independent motivation beyond these cases of focus association with *wh*-phrases or other Hamblinian alternative triggers.

In summary, although Li & Law’s proposal may account for both focus intervention effects and focus association with *wh*-phrases, it is important to note that this result does not immediately fall out from their assumption to keep Hamblinian *wh*-alternatives and Roothian focus alternatives apart; they also

<sup>14</sup> As mentioned above, the presentation in Li & Law follows Kratzer 1991 and Wold 1996 in evaluating focused constituents as “distinguished variables” that are sensitive to a secondary assignment *h*. Li & Law describe a node  $\alpha$  as having (i) an ordinary semantic value  $\llbracket \alpha \rrbracket^g$  relative to regular assignment function *g*, (ii) a secondary semantic value  $\llbracket \alpha \rrbracket^{g,h}$  relative to a regular assignment function *g* and a designated assignment function *h*, and — apparently if and only if  $\alpha$  contains a focused phrase (see note 16 below) — (iii) a focus semantic value  $\llbracket \alpha \rrbracket^f = \left\{ \llbracket \alpha \rrbracket^{g,h} \mid h \in H \right\}$ , where *H* is the set of designated assignments in Kratzer and Wold’s sense. This notation follows that in Wold 1996, although the term “secondary semantic value” comes from Mayr (2013: 133ff, 2014: 534–536). See Li & Law 2016 page 209 and especially example 14 there.

<sup>15</sup> Li & Law themselves describe this as a stipulation in Li & Law 2014a: “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” (pp. 281–282). The same basic intuition is suggested first in Li 2012: “Each member of the set... provides an ordinary semantic value for *zhi*; and other members, as alternatives, provide a focus semantic value for *zhi*” (p. 120).

<sup>16</sup> The idea that the focus semantic value  $\llbracket \alpha \rrbracket^f$  is undefined if  $\alpha$  does not contain a focus is based on my best understanding of Li & Law’s discussion, which claims that “VP1 here lacks a focus semantic value” (Li & Law, 2016: 215) in such a case. But I admit that the logic behind Li & Law’s statement here is actually not clear to me.

Using Li & Law’s own definition for focus semantic values (see note 14 above), the focus semantic value of VP1 would in fact be well defined, although there is an interesting question as to what it denotes here. Specifically, in the basic cases of focus association with *wh*-phrases as in (22), there is no F-marking in the structure at all, so in Kratzer and Wold’s terms, there are no distinguished variables and no need for any distinguished assignments  $h \in H$ . If *H* is then the empty set,  $\llbracket \text{VP1} \rrbracket^f = \left\{ \llbracket \text{VP1} \rrbracket^{g,h} \mid h \in H \right\}$  will also be the empty set, as the formula  $h \in H$  will be false for all values of the placeholder *h*. But alternatively, if we treat *H* as non-empty in such a case — and this may be necessary, for instance if there is some F-marking in the utterance, independent of the focus-association with *wh*-phrase in question — then because  $\llbracket \text{VP1} \rrbracket^{g,h}$  is *h*-invariant and therefore equal to  $\llbracket \text{VP1} \rrbracket^g$  (as Li & Law 2016 note, which I have quoted from above),  $\llbracket \text{VP1} \rrbracket^f = \left\{ \llbracket \text{VP1} \rrbracket^{g,h} \mid h \in H \right\}$  will be the singleton set of  $\left\{ \llbracket \text{VP1} \rrbracket^g \right\}$ .

In summary, the focus semantic value of VP1 should be well defined here, by their own definition, but will either be the empty set or a set of sets denotation (the latter parallel to that in the focus intervention configuration in (20–21) above). In either case, these sets indeed would lead to problems as the quantificational domain of ‘only.’ Recall that having an invalid type of focus semantic value to use as the quantificational domain of ‘only’ was exactly the reason cited by Li & Law for the ungrammaticality of focus intervention configurations. By this logic alone, Li & Law then ought to predict focus association with *wh*-phrases to be uninterpretable, just as the focus intervention configurations are. This is precisely where Li & Law’s statement that “VP1 here lacks a focus semantic value” (Li & Law, 2016: 215) comes in. I conclude then that this statement is itself a stipulation to distinguish the case of focus association with *wh*-phrases from the case of focus intervention effects, so that ‘only’ then quantifies instead over the secondary semantic value (see note 14) in the former case but not the latter.

had to make a non-trivial adjustment to the compositional semantics of focus-sensitive operators, as I have highlighted above. They also do not conclusively show that such facts *cannot* be addressed if we adopt Beck’s unified Rooth-Hamblin Alternative Semantics framework, although this appears to be the suggestion of their paper. I will show, in the following section, that it is in fact possible to maintain Beck’s overall theoretical framework while also accounting for the grammaticality of focus association with *wh*-phrases.

## 4 Proposal

I now present my proposal, which allows us to account for patterns of focus association with *wh*-phrases while maintaining Beck’s unified approach to *wh*- and focus alternatives and much of her intuition for the nature of focus intervention effects. Schematically, the focus of this section will be patterns of multiple association with a single alternative source, as in (24a) below. I first introduce a technical approach to configuration (24a) that has been independently motivated in the literature on implicature calculation and association with focus, in section 4.1, and then show how this technique naturally accounts for patterns of focus association with *wh*-phrases, in section 4.2.

(24) **Configurations of association with multiple alternative-sensitive operators:** =(1)

- a. [ Op<sub>1</sub> [ ... Op<sub>2</sub> [ ...  $\alpha$  ...  
└──────────┘ └──────────┘
- b. [ Op<sub>1</sub> [ ...  $\alpha$  ... [ Op<sub>2</sub> [ ...  $\beta$  ...  
└──────────┘ └──────────┘
- c. [ Op<sub>1</sub> [ ... Op<sub>2</sub> [ ...  $\alpha$  ...  $\beta$  ...  
└──────────┘ └──────────┘

Along the way, I will also demonstrate how my proposal correctly accounts for non-overlapping configurations as in (24b). Then, in section 5, I discuss patterns of overlapping association (24c) which includes focus intervention configurations and independently motivated restrictions on such configurations.

### 4.1 Multiple focus association by passing up alternatives

The main ingredient for my proposal is a technique for multiple alternative-sensitive operators to associate with a single alternative source, so that the higher operator considers alternatives that the lower operator has applied pointwise to. This technique was to my knowledge first described in Krifka 1991 in terms of the Recursive Structured Meanings of Jacobs 1991, and has recently been further motivated and applied to additional problems in works such as Guerzoni 2003, Nakanishi 2006a,b, Crnič 2011a,b,

Bade & Sachs 2019, Panizza & Sudo 2020, and Wimmer 2022a,b. Here I will most closely follow the formalization in Bade & Sachs 2019, which is stated in terms of the grammar allowing for a variant of Rooth’s focus interpretation operator that simply passes up the alternative semantic value of its sister, rather than resetting them. For perspicuity, I call Bade & Sachs’s variant  $\sim_{\text{pass}}$  in (25), in contrast to Rooth’s  $\sim_{\text{reset}}$  (13). Bade & Sachs (2019: 31) explicitly propose for  $\sim_{\text{pass}}$  to be unselective, just as  $\sim_{\text{reset}}$  is, which I also follow.

(25) **A focus interpretation operator that passes up alternatives:** ( $\sim_E$  in Bade & Sachs 2019: 31)

- a.  $\llbracket [\sim_{\text{pass}} C] \alpha \rrbracket^{\circ} = \llbracket \alpha \rrbracket^{\circ}$ , with presupposition:  $C \subseteq \llbracket \alpha \rrbracket^{\text{alt}}$
- b.  $\llbracket [\sim_{\text{pass}} C] \alpha \rrbracket^{\text{alt}} = \llbracket \alpha \rrbracket^{\text{alt}}$

My proposal is that any focus-sensitive operator may cooccur with  $\sim_{\text{reset}}$  or  $\sim_{\text{pass}}$  as its corresponding Roothian focus interpretation operator.

I first demonstrate the use of  $\sim_{\text{pass}}$  in Krifka’s original example in (26) below, repeated from the introduction. The linguistic context here makes it clear that the intended focus of *only* is the object, *water*, contrasting with contextual alternatives such as wine and beer. Similarly, the relevant set of alternatives considered in the evaluation of *even* involve VP meanings of the form *only drink water* in contrast with *only drink wine*, *only drink beer*, etc.; in other words, *even* also narrowly associates with the focus *water*.<sup>17</sup>

(26) **Multiple association with a single focus:** (Krifka, 1991: 131, 1992: 22)

[At yesterday’s party, people stayed with their first choice of drink. Bill only drank [wine]<sub>F</sub>, Sue only drank [beer]<sub>F</sub>, and...]  
 John even only drank [water]<sub>F</sub>.  
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Consider the LF in (27a) below for (26). For ease of presentation, I again present a structure with the subject reconstructed in its predicate-internal position. I propose that the alternative set *C* for the

<sup>17</sup> Note that a superficially identical sentence is compatible with the nested focus configuration as in (i) below. We can see that the focus of *even* in (i) is the entire VP *only drank water* because of the shape of the relevant alternatives under discussion: that is, other VPs conjured up by the description of being a notorious party guest, which makes the choice of only drinking water rather surprising. See Krifka 1991, 2008 as well as Branan & Erlewine 2023 for further discussion of the consideration of discourse context to identify the position of focus as the locus of variation between contextually relevant alternatives. I will not elaborate on the computation for (i) here, as our interest here is in the configuration in (26).

(i) [John, who is quite notorious as a party guest, did not only behave well at yesterday’s party...]  
 he even [ only drank [water]<sub>F</sub> ]<sub>F</sub>. (Krifka, 1991: 131, 1992: 22)

lower operator, *only*, is restricted by  $\sim_{\text{pass}}$ , whereas the alternative set  $C'$  for the higher operator, *even*, is restricted by  $\sim_{\text{reset}}$ .

- (27) a.  $[\text{VP}_5 \text{ even}_{C'} [\text{VP}_4 [\sim_{\text{reset}} C'] [\text{VP}_3 \text{ only}_C [\text{VP}_2 [\sim_{\text{pass}} C] [\text{VP}_1 \text{ John drink [water]}_F]]]]]$
- b.  $[\text{VP}_1]^o = \wedge \text{John drinks water}$   
 $[\text{VP}_1]^{\text{alt}} = \{ \wedge \text{John drinks water}, \wedge \text{John drinks wine}, \wedge \text{John drinks beer} \}$
- c.  $C = [\text{VP}_1]^{\text{alt}}; [\text{VP}_2]^o = [\text{VP}_1]^o; [\text{VP}_2]^{\text{alt}} = [\text{VP}_1]^{\text{alt}}$
- d.  $[\text{VP}_3]^o = \text{ONLY}(C)(\wedge \text{John drinks water})$   
 $[\text{VP}_3]^{\text{alt}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{John drinks water}), \text{ONLY}(C)(\wedge \text{John drinks wine}), \\ \text{ONLY}(C)(\wedge \text{John drinks beer}) \end{array} \right\}$

Let us assume that *water* has only two contextually salient alternatives, *beer* and *wine*, then reflected in (27b). Supposing that  $C$  is simply equal to the set of propositional alternatives  $[\text{VP}_1]^{\text{alt}}$ , we satisfy the presupposition of  $[\sim_{\text{pass}} C]$  and simply pass up the VP1 denotations in VP2 (27c). *Only* then composes pointwise with each proposition at the VP2 level, resulting in the VP3 denotations in (27d).

We suppose further that the higher alternative set  $C'$  is again equal to the alternative set for the  $\sim$  operator's sister,  $[\text{VP}_2]^{\text{alt}}$  (28a), satisfying the presupposition of  $\sim_{\text{reset}}$ . Unlike at the VP2 level, however,  $\sim_{\text{reset}}$  at VP4 resets the alternative set, resulting in the VP4 denotations as in (28b) below. The evaluation of *even* at VP5 using the alternative set  $C'$  introduces a scalar inference, that the prejacent is less likely than (some or all of) its alternatives (28c),<sup>18</sup> while passing up the VP4 denotations as in (28b). The predicted scalar inference in (28c) is supported by the example's context in (26) and by our practical knowledge of the nature of parties, intuitively reflecting the requirements of *even* in example (26).<sup>19</sup>

<sup>18</sup> On the question of whether or not *even* requires its prejacent to be the least likely alternative, see note 32 below. The example here is compatible with both formulations, so I assume the stronger formulation — that the prejacent is the least likely — in my illustration in (28) below.

<sup>19</sup> Exclusive particles such as English *only* are generally treated as presupposing the truth of their prejacent (see e.g. Horn, 1969), although others treat this as an existential presupposition (that is, that at least one of the alternatives is true; see e.g. Horn 1996 and Geurts & van der Sandt 2004) or a scalar existential presupposition (roughly, that there is a true alternative that is at least as strong as the prejacent, which in apparently non-scalar examples means entailing the prejacent; see Velleman et al. 2012 and Coppock & Beaver 2014). See also discussion in Crnič 2024. An important question here is whether and how such presuppositions of the individual alternatives project via the evaluation of *even*. For instance, we would not like the Horn 1969-style prejacent presupposition to project universally from each formula of the form  $\text{ONLY}(C)(\wedge \text{John drinks } X)$  in the computation of the scalar inference in (28c), as they are mutually contradictory.

Here I choose to follow Erlewine (2014b,c), who independently argues that the scalar inference of *even* expresses orderings (whether by likelihood, as assumed in the presentation here, or by noteworthiness, etc.) between the felicity and truth of the prejacent and the felicity and truth of its alternatives. In other words, any presuppositional requirements of the alternatives being compared will undergo Local Accommodation; see Heim 1983 as well as the *A* operator of Beaver & Krahmer 2001. This assumption makes the example here compatible with any of the above options for the presupposition of *only*. Alternatively, we could adopt the existential presupposition approach as in Horn 1996, whereby all formulae of the form  $\text{ONLY}(C)(\wedge \text{John drinks } X)$  simply presuppose that John drinks one of the contextually salient alternatives, which is indeed satisfied in this context.

- (28) a.  $C' = \llbracket \text{VP3} \rrbracket^{\text{alt}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{John drinks water}), \text{ONLY}(C)(\wedge \text{John drinks wine}), \\ \text{ONLY}(C)(\wedge \text{John drinks beer}) \end{array} \right\}$
- b.  $\llbracket \text{VP4} \rrbracket^{\circ} = \llbracket \text{VP3} \rrbracket^{\circ} = \text{ONLY}(C)(\wedge \text{John drinks water})$   
 $\llbracket \text{VP4} \rrbracket^{\text{alt}} = \{ \llbracket \text{VP4} \rrbracket^{\circ} \} = \{ \text{ONLY}(C)(\wedge \text{John drinks water}) \}$
- c.  $\text{even}_{C'} \rightsquigarrow \text{ONLY}(C)(\wedge \text{John drinks water}) <_{\text{likely}} \text{ONLY}(C)(\wedge \text{John drinks beer}) \wedge$   
 $\text{ONLY}(C)(\wedge \text{John drinks water}) <_{\text{likely}} \text{ONLY}(C)(\wedge \text{John drinks wine})$

Notably, the scalar inference of *even* in (28c) requires reference to the relative likelihood of propositions that each include the contribution of *only*, as per Krifka’s discussion of such examples. This is made possible by the invocation of  $\sim_{\text{pass}}$  for the set  $C$  which serves as the quantificational domain for *only* in (27–28).

Recall that the formulation of  $\sim_{\text{pass}}$  as in (25) above is what Bade & Sachs (2019) propose as a variant of the standard Rooth 1992 focus interpretation operator in Rooth 1992, which I here call  $\sim_{\text{reset}}$  (see (13)). Bade & Sachs 2019 is itself a commentary on recent work in formal semantics and pragmatics that assumes the postulation of a covert exhaustive operator  $\text{EXH}$  for the calculation of scalar implicatures (see e.g. Chierchia, Fox, & Spector, 2008, 2012). In particular, a number of these works propose that  $\text{EXH}$  may apply recursively, with a lower  $\text{EXH}$  applying pointwise to its prejacent’s alternatives, then feeding the interpretation of a higher  $\text{EXH}$ . As one prominent example of this approach, in (29) below, I reproduce an example with a free choice inference and the LF structure proposed for it in Fox 2007.

- (29) **Free choice inferences from recursive exhaustification:** (Fox, 2007: 104 exx. 74, 77)
- a. You may eat the cake or the ice cream.
- b.  $[ \text{EXH}_{C'} [ \text{EXH}_C [ \text{you may eat the cake or the ice cream } ] ] ]$
- c.  $C' = \{ \text{EXH}(C)(p) : p \in C \}$

Bade & Sachs (2019) point out that the interpretation of  $\text{EXH}$  in such proposals conflicts with standard Roothian assumptions about the propagation of alternatives, despite claims in this prior literature otherwise. In Rooth 1992 terms, each instance of  $\text{EXH}$  as in (29b) will have a corresponding focus interpretation operator  $\sim$ . But Rooth’s  $\sim$  ( $\sim_{\text{reset}}$ ) resets the focus alternative value for higher operators, and so the higher operator should not have access to the necessary “pre-exhaustified” alternatives as proposed for  $C'$  in (29c).

To reconcile the results of this literature invoking covert  $\text{EXH}$  with the Roothian syntax/semantics of focus, Bade & Sachs (2019) propose that the lower  $\text{EXH}$  in such configurations must make use of a

non-resetting focus interpretation operator,  $\sim_{\text{pass}}$  in (25) above. I refer the reader to Bade & Sachs 2019 for demonstrations of the successful use of  $\sim_{\text{pass}}$  in order to derive the correct interpretation for the free choice inference in (29), as well as various other uses of pre-exhaustified alternatives as proposed in Crnić 2013, Fox & Spector 2018, and others.<sup>20</sup>

The discussion in Bade & Sachs 2019 is quite narrowly focused on the use of  $\sim_{\text{pass}}$  in configurations where the covert operator  $\text{EXH}$  applies across alternatives. Unfortunately for this reason, Bade & Sachs (2019) call the operator  $\sim_E$  — alluding to the link to  $\text{EXH}$  — and propose to enforce their cooccurrence by syntactic specification: “ $\text{EXH}$  (and possibly other covert operators) comes with a certain subcategorization frame that requires  $\sim_E$  [here:  $\sim_{\text{pass}}$ ] to be in its immediate scope” (p. 31). However, as I demonstrated above in (26–28), what the availability of  $\sim_{\text{pass}}$  allows for — the passing up of alternatives with pointwise application of a lower focus-sensitive operator — is exactly what has been independently motivated as necessary by Krifka (1991) and in other works.

Configurations involving multiple focus-sensitive operators associating with a single focus in the literature following Krifka 1991 include certain combinations of additive and exclusive focus particles (e.g. German *auch nur*, Italian *anche solo*, and Dutch *ook maar* in Guerzoni, 2003: ch. 4, and Japanese *dake demo* in Nakanishi, 2006a,b), configurations involving ‘even’ or ‘only’ with an ‘at least’ operator (e.g. in Slovenian *magari* in Crnić, 2011a: ch. 4, 2011b; English sufficiency modal constructions in Alonso-Ovalle & Hirsch 2022), exclusive particle stacking (e.g. Japanese *dake shika* in Erlewine, 2012; Cantonese *zinghai...zaa3* in Yip 2024), and minimal sufficiency constructions using scalar and exclusive focus particles (e.g. with English *even just* in Panizza & Sudo, 2020, German *selbst/auch...nur* in Wimmer, 2022a, and Mandarin *zhǐyào* with covert ‘even’ in Wimmer 2022b). See especially Crnić 2011a (pp. 111ff), 2011b (pp. 6–10), Erlewine 2012 (pp. 83–84), Panizza & Sudo 2020 (pp. 12–14), Alonso-Ovalle & Hirsch 2022 (p. 29), Wimmer 2022b (p. 426) for discussion of the lower focus-sensitive operator applying pointwise to its alternatives to form the alternative set for the higher operator. Crnić (2013: 548 note 13) and Wimmer (2022a: 459 note 12) in particular explicitly acknowledge that this pointwise modification of alternatives without resetting is not what is expected under the widely adopted Rooth 1992 framework, but without an explicit solution.<sup>21</sup> The configurations of multiple focus association argued to be necessary in all of these works can be recast in terms of the use of  $\sim_{\text{pass}}$ , which

<sup>20</sup> A reviewer notes that the recent proposal in Bar-Lev & Fox 2020, which offers a revision to the formulation of the exhaustification operator, derives free choice inferences as in (29a) without recursive exhaustification as in (29b,c). Nonetheless, even Bar-Lev & Fox (2020) must still invoke recursive exhaustification (effectively using  $\sim_{\text{pass}}$ ) for distributive inferences of the form  $\forall x(Px \vee Qx) \rightsquigarrow \exists x Px, \exists x Qx$ . See Bar-Lev & Fox 2020 note 19 and pp. 198–199, as well as Crnić et al. 2015 for related discussion.

<sup>21</sup> Hengeveld, Iatridou, & Roelofsen (2023: 596 note 28) also explicitly note that resetting (attributed there to Beck 2006, although it is a general feature of Rooth 1992) is a problem for multiple focus association configurations of the type discussed in this section.



provides the correct alternatives using a minimally modified Rooth 1992 framework.

In summary, adopting and extending the Rooth 1992 framework for focus association, I propose that focus-sensitive operators may generally cooccur with Rooth’s own  $\sim_{\text{reset}}$  or its non-resetting variant  $\sim_{\text{pass}}$ , formulated most explicitly in Bade & Sachs 2019. Previous literature has amply established the existence of focus association patterns that necessitate  $\sim_{\text{pass}}$ , but these facts had not been brought together under a single paradigm as I do here. Next, I return to the problem of focus association with *wh*-phrases in section 4.2 and then emphasize the continued need for  $\sim_{\text{reset}}$  in section 4.3.

## 4.2 Focus association with *wh*

The independently motivated non-resetting variant of Rooth’s focus interpretation operator,  $\sim_{\text{pass}}$ , allows for a new approach to the problem of focus association with *wh*-phrases. I illustrate my approach through discussion of Li & Law’s grammatical Mandarin Chinese example in (30), repeated from above.

- (30) Lǐ Bái **zhǐ** chūxí-le *shénme huódòng*? =(7/22a)  
 Li Bai only attend-PFV what activity  
 ≈ ‘What was the activity *x* such that Li Bai attended only *x*?’

I will assume the structure in (31a) for (30), illustrated with the subject Li Bai in its predicate-internal position. Following the presentation in Li & Law 2016: 212ff, I assume that ‘what activity’ ranges over three values; in the unified Beck-style framework I adopt here, these are reflected in the *wh*-phrase’s alternative semantic value, with no defined ordinary value (31b). The *wh*-containing VP1 then also has no defined ordinary value, with a corresponding set of propositional alternatives as its alternative semantic value (31c). Suppose now that the variable *C* is simply equal to the set of propositional alternatives  $\llbracket \text{VP1} \rrbracket^{\text{alt}}$  (31d), thereby satisfying the presupposition of  $[\sim_{\text{pass}} C]$ .

- (31) a.  $[\text{CP } Q \dots [\text{VP}_3 \text{ only}_C [\text{VP}_2 [\sim_{\text{pass}} C] [\text{VP}_1 \text{ Li Bai attend } \textit{what activity}]]]]]$   
 b.  $\llbracket \textit{what activity} \rrbracket^{\text{o}}$  undefined  
 $\llbracket \textit{what activity} \rrbracket^{\text{alt}} = \{\text{the dinner, the ball, the concert}\}$   
 c.  $\llbracket \text{VP1} \rrbracket^{\text{o}}$  undefined  
 $\llbracket \text{VP1} \rrbracket^{\text{alt}} = \{\wedge \text{Li Bai attends the dinner, } \wedge \text{Li Bai attends the ball, } \wedge \text{Li Bai attends the concert}\}$   
 d.  $C = \llbracket \text{VP1} \rrbracket^{\text{alt}}$

Using  $\sim_{\text{pass}}$  as defined in (25), the denotation of the node labeled VP2 is equal to that of VP1: its ordinary semantic value is undefined and its alternative semantic value is a non-singleton set reflecting

variation over the object *wh*-phrase (32a). We now consider VP3, which we derive through standard composition procedures: functional application in the ordinary dimension and pointwise functional application in the alternative dimension. Although  $\llbracket \text{VP2} \rrbracket^o$  is undefined and therefore so is  $\llbracket \text{VP3} \rrbracket^o$ ,  $\llbracket \text{only}_C \rrbracket^{\text{alt}} = \{ \llbracket \text{only}_C \rrbracket^o \}$  (12) composes pointwise with  $\llbracket \text{VP2} \rrbracket^{\text{alt}}$  to yield  $\llbracket \text{VP3} \rrbracket^{\text{alt}}$  (32b). Finally, after composing with temporal operators, the application of Q results in the question denotation in (32c). This denotation accurately reflects the denotation of this question and is in fact identical to the question denotation that Li & Law derive for this same example; see Li & Law 2016: 216 ex. 36.<sup>22</sup>

- (32) a.  $\llbracket \text{VP2} \rrbracket^o$  undefined  
 $\llbracket \text{VP2} \rrbracket^{\text{alt}} = \llbracket \text{VP1} \rrbracket^{\text{alt}} = \{ \wedge \text{Li Bai attends dinner}, \wedge \text{Li Bai attends ball}, \wedge \text{Li Bai attends concert} \}$
- b.  $\llbracket \text{VP3} \rrbracket^o$  undefined  
 $\llbracket \text{VP3} \rrbracket^{\text{alt}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{Li Bai attends the dinner}), \\ \text{ONLY}(C)(\wedge \text{Li Bai attends the ball}), \\ \text{ONLY}(C)(\wedge \text{Li Bai attends the concert}) \end{array} \right\}$
- c.  $\llbracket \text{CP} \rrbracket^o = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{Li Bai attended the dinner}), \\ \text{ONLY}(C)(\wedge \text{Li Bai attended the ball}), \\ \text{ONLY}(C)(\wedge \text{Li Bai attended the concert}) \end{array} \right\}$   
 $\llbracket \text{CP} \rrbracket^{\text{alt}} = \{ \llbracket \text{CP} \rrbracket^o \}$

The viability of my approach — which requires only the  $\sim_{\text{pass}}$  variant of Rooth’s focus interpretation operator, which has substantial independent motivation — defuses Li & Law’s argument that the possibility of focus association with *wh*-phrases is problematic for the unified Rooth-Hamblin Alternative Semantics developed in Beck 2006 and adopted in much subsequent work.

However, at the same time, recall that focus intervention configurations are uninterpretable for Beck 2006 because focus-sensitive operators are always resetting, thereby interrupting the projection of alternatives from *wh*-phrases in their scope. In contrast, in my proposal here, which accurately predicts the possibility of grammatical focus association with *wh*-phrases, focus-sensitive operators do *not* always reset and thereby block the projection of alternatives, as they may involve the focus interpretation operator  $\sim_{\text{pass}}$  as well as  $\sim_{\text{reset}}$ . My proposal here therefore potentially undermines Beck’s explanation for the nature of focus intervention effects. I discuss this issue in the following section, specifically subsection

<sup>22</sup> The representation here in (32c) conceals a non-trivial complication in that different possible answer propositions may introduce different presuppositions that are in fact not compatible with one another, if we assume that the question has a true answer. See note 19 above for background on the presuppositions of ‘only.’ See Li & Law 2016: 232–233 for discussion of this issue, where they suggest adopting a proposal in Nicolae 2015 to take each presupposition to be part of the content of the corresponding answer via Local Accommodation.

5.1, wherein I point to an additional, independently motivated mechanism that restricts the distribution of  $\sim_{\text{pass}}$  so that focus intervention configurations continue to be uninterpretable.

### 4.3 The continued need for the resetting squiggle ( $\sim_{\text{reset}}$ )

Given these many configurations that necessitate the availability of  $\sim_{\text{pass}}$  in the grammar, we might wonder whether the lesson to take away here is that Rooth's  $\sim_{\text{reset}}$  should be replaced wholesale with  $\sim_{\text{pass}}$ . Unfortunately, this is not tenable. In this section, I present two empirical arguments for the continued need for  $\sim_{\text{reset}}$ , in addition to  $\sim_{\text{pass}}$ .

My first argument comes from patterns of focus association and corresponding pitch accents in configurations with multiple foci and multiple focus-sensitive operators. In contexts where we manage a team of salespeople working in Spain, I will discuss potential interpretations for the string in (33), which includes a higher adverbial *only* followed by a focus *Júlia* and a lower *also* followed by a focused *Catalan*. We consider the two LFs (33) in (34) below, which I have simplified here by presenting subjects (*we* and PRO) in their pre-movement, predicate-internal positions and not indicating the contribution of matrix past tense. The two LFs differ only in whether the focus interpretation operator that restricts the alternative set  $C$  for the lower operator *also* is  $\sim_{\text{reset}}$  or  $\sim_{\text{pass}}$ .<sup>23</sup>

(33) We only told [Júlia]<sub>F</sub> to also speak [Catalan]<sub>F</sub>.

- (34) a. [only<sub>C'</sub> [[ $\sim_{\text{reset}}$  C']<sub>VP</sub> we told [Júlia]<sub>F</sub> [TP to also<sub>C</sub> [[ $\sim_{\text{reset}}$  C]<sub>VP</sub> PRO speak [Catalan]<sub>F</sub>]]]]]]  
 b. [only<sub>C'</sub> [[ $\sim_{\text{reset}}$  C']<sub>TP</sub> we told [Júlia]<sub>F</sub> [TP to also<sub>C</sub> [[ $\sim_{\text{pass}}$  C]<sub>VP</sub> PRO speak [Catalan]<sub>F</sub>]]]]]]

I will now present two different uses of the string in (33), which I claim correspond to the two different parses in (34). First, consider example (35) below. As the lines here indicate, the attested, intended reading involves *only* associating narrowly with the higher object, *Júlia*, and the lower *also* associating narrowly with the object, *Catalan*, in a non-overlapping configuration. Similar examples with multiple focus particles with non-overlapping association are discussed in Krifka 1991, 2002, Rooth 1996, Beaver et al. 2007, Wagner 2009, 2012, Büring 2015, Bade 2016, Kratzer & Selkirk 2020, Chow & Erlewine 2022, among others.

<sup>23</sup> Note that I only consider parses with  $\sim_{\text{reset}}$  associated with the higher operator, *only*. I do this so that the denotation of the full clause does not have non-trivial alternatives that go uninterpreted. Alternatively, if this is not a concern or if the alternatives should be interpreted by a higher operator such as the ASSERT of Jacobs 1991 and Krifka 1991 or for the evaluation of congruence as in Roberts 1996 (see p. 31 note 20 for an observation that this is not possible with Rooth's resetting  $\sim_{\text{reset}}$ ), the higher focus interpretation operator could be  $\sim_{\text{pass}}$ . My argument for the continued need for  $\sim_{\text{reset}}$  therefore comes from the choice of operator associated with the lower focus-sensitive operator (here: *also*) in these examples.

(35) **Parse of (33) with non-overlapping *only* and *also*, requiring  $\sim_{\text{reset}}$ :**

[Our salespeople in Spain all speak both Spanish and Catalan. Our presentations are generally in Spanish, but someone suggested that we should tell them to also speak Catalan when taking meetings in Barcelona. But in the end...]

We only told [Júlia]<sub>F</sub> *to also speak [Catalan]*<sub>F</sub>.

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Note that, in the grammatical use of this sentence, there is a pitch accent on the focus *Júlia* but not on the focus *Catalan*. *Catalan* here is a so-called *Second Occurrence Focus (SOF)*, as it is semantically interpreted as a focus (for the interpretation of *also*) but is within a part of the utterance that is destressed — indicated by *small italics* as in Tancredi 1992 — as it is contextually given, due to the prior mention of “to also speak Catalan” in the preceding context. See also Beaver et al. 2007 for more on the acoustic realization of SOF, which differs from having no focus at all.

There are various accounts in the literature for such destressing and SOF realization, but here I follow the influential formulation in Kratzer & Selkirk 2020. Kratzer & Selkirk develop the intuition that SOF reflects focus within a constituent that is formally *G-marked*, indicating Givenness, as defined in (36):

(36) **Givenness:** (Kratzer & Selkirk, 2020: 34, with notation adjusted)

An expression  $\alpha$  is Given with respect to an individual, property, or proposition  $a$  in [the context] iff  $\llbracket \alpha \rrbracket^{\text{alt}} = \{a\}$ .

They then note that “a constituent  $\alpha$  that contains a FoCUS can be Given only if it also contains an operator that consumes [= resets] the alternatives generated by that FoCUS. Otherwise  $\alpha$  wouldn’t have a singleton alternatives set, hence couldn’t be Given.” G-marked material is then “dephrased” in their terms (realized as not associated with any phonological phrases; see pp. 29ff), corresponding to what I have informally called destressing here.

Adopting Kratzer & Selkirk’s account for SOF, as their discussion makes clear, necessitates the use of the LF parse in (34a) with  $\sim_{\text{reset}}$  just below *also*. The resetting operator makes phrases that include it, up to the entire embedded control clause TP *to also speak Catalan*, have singleton alternative sets. These phrases satisfy Givenness (36) due to the explicit mention of telling people “to also speak Catalan” in the preceding discourse and therefore can be G-marked and destressed, deriving the SOF realization of *Catalan* in (35).

Let’s also verify that the LF in (34a) with  $\sim_{\text{reset}}$  derives the correct semantics for example (35). First, the lower operator *also* introduces an additive presupposition that *Júlia* speaks another language other than Catalan, satisfied here by the fact that *Júlia* speaks Spanish, entailed by the context. (I set aside

the question of how this presupposition projects through the higher *only*, as at least in this context, all relevant individuals speak Spanish.)  $\sim_{\text{reset}}$  resets the alternative set so that alternatives above *also* do not reflect variation in the embedded object position. The F-marked *Júlia* introduces non-trivial alternatives that vary only over the object of ‘tell.’ *Only* then quantifies over  $C'$ , varying only in that higher object position, leading to the assertion that all those who are not *Júlia* were not told to (also) speak Catalan. This reflects the accurate interpretation of example (35) above.<sup>24</sup>

Next, consider example (37). As the lines here informally indicate, for the intended interpretation which is indeed natural in this context, *only* associates with both *Júlia* and *Catalan*, to assert that  $\langle \text{Júlia}, \text{Catalan} \rangle$  is the only pair  $\langle x, y \rangle$  such that we told  $x$  to (also) speak  $y$ . At the same time, *also* associates only with the one focus in its scope, *Catalan*; the resulting additive presupposition is again satisfied here regardless of the mode of presupposition projection assumed, as all relevant individuals speak Spanish in this context.

(37) **Parse of (33) with overlapping multiple association, requiring  $\sim_{\text{pass}}$ :**

[Our salespeople in Spain of course all speak Spanish, but some also speak another language of Spain, such as Catalan, Galician, or Basque. Someone suggested that we should tell them to also use those minority languages when taking meetings in their respective regions; that is, to also speak Catalan, or Galician, etc. where appropriate. But in the end...]

We only told [Júlia]<sub>F</sub> to also speak [Catalan]<sub>F</sub>.

Deriving this interpretation requires the use of  $\sim_{\text{pass}}$  with *also*, with an LF similar to that in (34b). (I thank Ka-Fai Yip (p.c.) and an anonymous reviewer for asking whether any example necessitates parses of this form.) The lower  $\sim_{\text{pass}}$  ensures that the alternative set  $C$  for *also* varies over *Catalan* while also passing up these alternatives to compose higher with the focus *Júlia*. This allows for *only* to consider a set of alternatives  $C'$  that varies in both the higher and lower object positions. Such multiple association by *only* in this configuration would not be possible with  $\sim_{\text{reset}}$  below as in the LF in (34a).

Interestingly, these two examples in (35) and (37) differ in their pronunciation. Unlike (35) where *Catalan* is realized as a SOF, *Catalan* in (37) retains its focal pitch accent, even though “to also speak Catalan” is uttered in the preceding discourse context in both cases. This lack of destressing in (37) is

<sup>24</sup> It is also possible to derive the intended interpretation for (35) using  $\sim_{\text{pass}}$ , taking the alternative set  $C'$  for *only* to be a proper subset of the alternative set value of  $\sim_{\text{pass}}$ 's sister which varies only in the position of the object of ‘tell.’ I discuss the effects of domain restriction further in section 5.3 below. However, we then predict the unavailability of G-marking and therefore the retention of focal pitch accent on *Catalan*, just as we observe in example (37) below. The fact that destressing is obligatory in (35) is compatible with the hypothesis that, when both  $\sim_{\text{reset}}$  and  $\sim_{\text{pass}}$  can derive the same, intended interpretation,  $\sim_{\text{reset}}$  must be used. However, at the same time, the obligatory destressing and corresponding use of  $\sim_{\text{reset}}$  here may reflect a more general principle to maximize G-marking and destressing wherever possible.

explained by the need to employ  $\sim_{\text{pass}}$  with *also* for the intended focus association with *only* above. The embedded TP does not have a singleton alternative set and hence cannot be G-marked, explaining the lack of distressing.

Given these correlated differences in focus association and focal pitch accent realization in these examples, and assuming the theory of Givenness and SOF in Kratzer & Selkirk 2020, the SOF realization of *Catalan* in the non-overlapping configuration (35) constitutes an argument for the continued availability of Rooth's resetting focus interpretation operator,  $\sim_{\text{reset}}$ .

My second argument for the necessity of  $\sim_{\text{reset}}$  comes from *wh*-questions where the *wh*-phrase is outside of the scope of a focus-sensitive operator. We have seen two such examples in Mandarin above, which I repeat here in (38). The following discussion also applies equally to their corresponding English translations as well.

(38) **Grammatical *wh*-questions with *wh* outside of the scope of 'only':**

a. *Shéi zhǐ yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí wǎnyàn.* = (3)  
 who only invite-PFV Li Bai attend dinner

'Who only invited [Li Bai]<sub>F</sub> to attend the dinner?'

b. *Shénme huódòng, tā zhǐ yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí \_\_\_?* = (5)  
 what activity 3sg only invite-PFV Li Bai attend

'What activity did he/she only invite [Li Bai]<sub>F</sub> to attend \_\_\_?'

(cf ungrammatical focus intervention example (4a/20a/41a) with the same intended meaning)

Logically, the intended patterns of association here are what I call the non-overlapping configuration (1b/24b): Q at the clause edge evaluates the alternatives from the *wh*-phrase and the lower 'only' associates with the lower focus.

Concretely, let us consider the two possible LFs for example (3/38a) in (39) below, varying only in the choice of focus interpretation operator (bolded) used to constrain the domain of 'only,' *C*. I argue that the attested, grammatical interpretation of such examples requires a parse with  $\sim_{\text{reset}}$  as the focus interpretation operator for the lower focus-sensitive operator, as in (39a) below.

(39) a.  $\checkmark$ [<sub>CP</sub> Q ... [<sub>TP</sub> *who*  $\lambda x$  ... [only<sub>C</sub> [ **$\sim_{\text{reset}}$**  *C*] [<sub>VP</sub> *x* invite [Li Bai]<sub>F</sub> attend dinner]]]]]

b. \*[<sub>CP</sub> Q ... [<sub>TP</sub> *who*  $\lambda x$  ... [only<sub>C</sub> [ **$\sim_{\text{pass}}$**  *C*] [<sub>VP</sub> *x* invite [Li Bai]<sub>F</sub> attend dinner]]]]]

On the parse in (39a), the use of  $\sim_{\text{reset}}$  leads to there being no non-prejacent alternatives projected above 'only.' The propositions in  $\llbracket$ TP $\rracket^{\text{alt}}$  will therefore vary only in their choice of subject, leading to

the correct subject *wh*-question interpretation. In contrast, the LF in (39b) with  $\sim_{\text{pass}}$  predicts a distinct, unattested multiple question interpretation for (3/38a). With  $\sim_{\text{pass}}$  instead of  $\sim_{\text{reset}}$ , alternatives that vary in the position of *Li Bai* will project out of ‘only’ and compose with the subject *wh*-phrase, resulting in  $[[\text{TP}]]^{\text{alt}}$  varying in the positions of both ‘who’ and *Li Bai*. Q in (39b) should therefore produce a multiple question reading similar to ‘Who only invited who to attend dinner?’, which is not the attested interpretation.


In summary, the correct interpretation for example (3/38a) and more generally for questions of this form requires an LF as in (39a) using  $\sim_{\text{reset}}$ , so that the focus alternatives are blocked from contributing to the alternatives evaluated by Q to form a question. Additionally, we should note that the LF with  $\sim_{\text{pass}}$  as in (39b) must be unavailable for some reason, as the predicted interpretation is not attested. I argue that this is due to an independently motivated economy constraint, which I discuss in section 5.1 below; see (49) below.

The two arguments in this section both demonstrate that there are certain grammatical configurations that require the use of Rooth’s original resetting  $\sim_{\text{reset}}$ . Taken together with my arguments for the need for a non-resetting  $\sim_{\text{pass}}$  above, I conclude that any individual focus-sensitive operator is in principle able to cooccur with  $\sim_{\text{reset}}$  or  $\sim_{\text{pass}}$ , although resulting LFs may in some cases be independently ruled out, as I discuss further below.

## 5 Patterns of overlapping association

Having laid out my framework for focus association with and without resetting — using  $\sim_{\text{reset}}$  and  $\sim_{\text{pass}}$ , respectively — I now turn to configurations where multiple overlapping association dependencies are intended, as schematized in (40) below. This includes patterns of focus intervention ( $\text{Op}_1 = \text{Q}$ ,  $\alpha = \textit{wh}$ , and  $\text{Op}_2$  a focus-sensitive operator associating with focus  $\beta$ ), but also configurations of overlapping association with multiple focus-sensitive operators.

(40) **Multiple association with overlap schema:** =(1c/24c)

[ Op<sub>1</sub> [ ... Op<sub>2</sub> [ ...  $\alpha$  ...  $\beta$  ...  


Recall that my discussion thus far has maintained the assumption that focus-sensitive operators are *unselective*, in the sense that they do not discriminate between the effects of distinct foci (or, more generally, sources of alternatives) within their scopes. Configurations with the intended patterns of association as in (40) are then strictly speaking not possible: that is,  $\text{Op}_1$  and  $\text{Op}_2$  cannot actually be sensitive to only the effects of focus on  $\alpha$  and  $\beta$ , respectively. I will however show that configurations

that superficially resemble or are intended to reflect such overlapping association are still possible in my framework using  $\sim_{\text{pass}}$ , under limited circumstances.

I begin in section 5.1 with discussion of focus intervention configurations. I argue that an independently motivated economy constraint accurately rules out parses for such configurations involving  $\sim_{\text{pass}}$ , thereby maintaining the prediction that focus intervention configurations are uninterpretable. In section 5.2, I discuss configurations of this form involving multiple intended focus association dependencies that overlap, specifically addressing the experimental results reported by Beck & Vasishth (2009). My proposal predicts that many but not all such overlapping multiple focus association examples will be infelicitous, which explains a previously unexplained detail in Beck & Vasishth's results. In section 5.3, I then comment further on the unselectivity property of focus-sensitive operators and analytic possibilities for tempering its effects.

## 5.1 Reenforcing the problem with focus intervention

In section 4.2, I proposed that examples of focus association with *wh*-phrases can be interpreted straightforwardly by allowing focus-sensitive operators such as *only* to employ  $\sim_{\text{pass}}$ , a variant of Rooth's  $\sim_{\text{reset}}$  operator that passes up its alternatives. However, by introducing the possibility of overt focus-sensitive operators such as *only* employing either  $\sim_{\text{pass}}$  or  $\sim_{\text{reset}}$ , my proposal now faces the danger of predicting that focus intervention configurations could be interpretable, thus potentially undoing the force of Beck's (2006) proposal.

In this section, I propose that we can maintain the problematic nature of focus intervention in this framework, based on only independently motivated principles. For any focus intervention configuration, I propose that we may now consider a parse involving  $\sim_{\text{reset}}$  or one involving  $\sim_{\text{pass}}$ . The former will be uninterpretable in the manner described by Beck (2006); see discussion of (19) in section 3.2 above. The latter parse, I claim, will be independently ruled out by a general pragmatic economy principle proposed by Buccola & Spector (2016) and extended in Kotek (2019).

To make the matter more concrete, I will present the predicted semantic interpretation for a Mandarin focus intervention example from Li & Law 2016, repeated here as (41a), using the operator  $\sim_{\text{pass}}$ . The syntactic structure I assume is in (41b), presented here with the subject pronoun in its predicate-internal position.

- (41) a. ?\*Tā **zhǐ** yāoqǐng-le [Lǐ Bái]<sub>F</sub> chūxí shénme huódòng? = (4a/20a)  
 3sg only invite-PFV Li Bai attend what activity

Intended: 'What activity did he/she only invite [Li Bai]<sub>F</sub> to attend \_\_\_?'



- b.  $[\text{CP } Q \dots [\text{VP}_3 \text{ only}_C [\text{VP}_2 [\sim_{\text{pass}} C] [\text{VP}_1 \text{ 3sg invite } [\text{Li Bai}]_F \text{ attend } \textit{what activity}]]]]]$

Consider the denotation of the node labeled VP1. The alternative semantic value of VP1 will be a set of propositions that vary both in the position of Li Bai and of ‘what activity,’ as in (42a). This is because, in the Beck-style unified Alternative Semantics framework, both the focused phrase and *wh*-phrase will introduce alternatives in their alternative semantic values, which will be crossed through the process of pointwise composition that results in  $\llbracket \text{VP1} \rrbracket^{\text{alt}}$ . However, as the *wh*-phrase does not have a defined ordinary semantic value, VP1 itself will also lack an ordinary semantic value (42a). Suppose now that  $C = \llbracket \text{VP1} \rrbracket^{\text{alt}}$ . With the presupposition of  $\sim_{\text{pass}}$  satisfied, VP2 will have the same denotation as VP1 in both dimensions, according to  $\sim_{\text{pass}}$ . Composing pointwise with ‘only’ in the standard manner results in the VP3 denotations in (42b). Further composing with temporal operators and Q, we yield the denotation in (42c).

- (42) a.  $\llbracket \text{VP1} \rrbracket^{\text{o}}$  undefined  
 $\llbracket \text{VP1} \rrbracket^{\text{alt}} = \left\{ \begin{array}{l} \wedge 3\text{sg invites Li Bai to the dinner, } \wedge 3\text{sg invites Li Bai to the concert, } \dots, \\ \wedge 3\text{sg invites Du Fu to the dinner, } \wedge 3\text{sg invites Du Fu to the concert, } \dots \end{array} \right\}$
- b.  $\llbracket \text{VP3} \rrbracket^{\text{o}}$  undefined  
 $\llbracket \text{VP3} \rrbracket^{\text{alt}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge 3\text{sg invites Li Bai to the dinner}), \\ \text{ONLY}(C)(\wedge 3\text{sg invites Li Bai to the concert}), \dots, \\ \text{ONLY}(C)(\wedge 3\text{sg invites Du Fu to the dinner}), \\ \text{ONLY}(C)(\wedge 3\text{sg invites Du Fu to the concert}), \dots \end{array} \right\}$
- c.  $\llbracket \text{CP} \rrbracket^{\text{o}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge 3\text{sg invited Li Bai to the dinner}), \\ \text{ONLY}(C)(\wedge 3\text{sg invited Li Bai to the concert}), \dots, \\ \text{ONLY}(C)(\wedge 3\text{sg invited Du Fu to the dinner}), \\ \text{ONLY}(C)(\wedge 3\text{sg invited Du Fu to the concert}), \dots \end{array} \right\}$   
 $\llbracket \text{CP} \rrbracket^{\text{alt}} = \{ \llbracket \text{CP} \rrbracket^{\text{o}} \}$

The final meaning in (42c) is indeed a valid question denotation in this framework, but it is a denotation for a multiple *wh* question, with answer propositions varying in both the position of the invitee and the position of the activity. More specifically, it is what we would expect as the denotation for example (43), reproduced from Li & Law 2016 with their translation. As Li & Law report, this example is grammatical, with ‘only’ associating unselectively with both the invitee and activity positions, i.e. asking for the pair  $\langle x, y \rangle$  such that only  $\langle x, y \rangle$  satisfy the description. See also Li & Cheung 2015 for additional examples of this sort.

(43) ‘Only’ associating with multiple *wh*:

(Li & Law, 2016: 216–217 ex. 37a)

Tā **zhǐ** yāoqǐng-le shéi chūxí shénme huódòng?

3sg only invite-PFV who attend what activity

≈ ‘Who was the person *y* and what was the activity *x* such that he only invited *y* to attend *x*?’

My technique of using  $\sim_{\text{pass}}$  with ‘only,’ presented in the section 4, accurately derives the denotation in (42c) for (43) as well.<sup>25</sup> There is not an inherent problem with the question meaning in (42c).

I propose that this parse in (41b) using the  $\sim_{\text{pass}}$  operator is unavailable for this focus intervention example in (41a) because it runs afowl of the more general pragmatic economy principle in (44):

(44) **Pragmatic economy constraint on focus:**

(Kotek, 2019: 46)

An LF  $\varphi$  containing a focused expression *A* is infelicitous if, for some *B* distinct from *A*,  $\varphi$  is semantically equivalent to  $\varphi[A \mapsto B]$  (the result of substituting *B* for *A* in  $\varphi$ ).

Kotek notes that this constraint is adapted from a similar pragmatic economy constraint on LFs containing numerals proposed by Buccola & Spector (2016: 165).<sup>26</sup> Both constraints propose that a structure is infelicitous if a minimal but non-identical substitution does not affect its overall meaning, reflecting a more basic intuition that the choice of each part of an utterance should meaningfully contribute to the utterance’s overall meaning. Neither work defines the relevant notion of distinctness, but I assume a semantic notion as defined in (45), in turn based on a notion of semantic equivalence appropriate for the two-dimensional semantics employed here.

(45) For the purposes of (44):

a. *X* and *Y* are *semantically equivalent* if  $\llbracket X \rrbracket^o = \llbracket Y \rrbracket^o$  and  $\llbracket X \rrbracket^{\text{alt}} = \llbracket Y \rrbracket^{\text{alt}}$ .

b. *X* and *Y* are *distinct* if they are not semantically equivalent.

Concretely, the constraint in (44) explains the fact that focused phrases in interrogative clauses universally do not take on *wh*-phrase-like interpretations. To my knowledge, this was first noted and

<sup>25</sup> As Li & Law (2016) note, examples of the form in (43) only have single-pair readings and not pair-list readings. This is precisely what my analysis predicts; the result in (42c) is a single-pair denotation. See Kotek 2014, 2016b, 2019 for discussion of the denotations of single-pair versus pair-list readings of multiple *wh* questions and their syntactic differences, with a presentation that adopts Beck’s unified Rooth-Hamblin Alternative Semantics as I do here.

Li & Law (2016: 217) go on to note that “We do not have a sound analysis for the unavailability of pair-list readings in multiple *wh*-questions.” In addition to the inability of *wh*-phrases to move out of the scope of an associating ‘only’ (see e.g. Erlewine, 2014b,c), which Li & Law mention as a factor, under my account here, this restriction on the interpretation of such examples is explained by the unselectivity of  $\sim$  operators. See section 5.3 for further discussion.

<sup>26</sup> As Kotek (2019) notes on page 177 note 21, the idea of this constraint was originally suggested by an anonymous *Journal of Semantics* reviewer, in response to my discussion in an early version of Erlewine to appear. Buccola & Spector (2016: 164 note 30) in turn attribute the idea of their constraint to Emmanuel Chemla, and also discuss its relation to Gricean maxims.

problematized by von Stechow (1991: 53), who notes that the question in (46a) does not have the constituent question interpretation akin to that of (46b).<sup>27</sup>

(46) **Focus cannot be interpreted as a *wh*-phrase:** (von Stechow, 1991: 53 exx. 51a, 52)

a. Has [Ede]<sub>F</sub> arrived?

b. Who has arrived?

Observation:  $\llbracket(a)\rrbracket^o \neq \llbracket(b)\rrbracket^o$

Kotek notes that, under the widely-adopted theory of *wh*-phrases and *wh*-question interpretation put forward in Beck 2006 (as in section 3.2 above), we would indeed predict the application of Q (17) to a focus-containing clause to yield a *wh*-question-like interpretation; i.e. the structure in (47a) would yield the same interpretation as that of (46b). However, Kotek proposes that this parse is blocked, as the same structure where Ede is replaced by one of its focus alternatives, as in (47b), would yield the same denotation, thus violating the pragmatic economy constraint in (44).<sup>28</sup>

(47) a. [ Q [ [Ede]<sub>F</sub> has arrived ] ]

b. [ Q [ [Irene]<sub>F</sub> has arrived ] ]

Prediction:  $\llbracket(a)\rrbracket^o = \llbracket(b)\rrbracket^o$ , therefore both LFs unavailable by (44)

I now return to the focus intervention configuration example in (41a), which might expect to be interpretable with the parse in (48a) below, repeated from (41b) above. Notice that we expect any variant of this sentence where we replace Li Bai with one of its focus alternatives, such as Du Fu in (48b), to yield the exact same semantic denotation. This  $\sim_{\text{pass}}$  parse of the focus intervention construction is thus ruled out by the pragmatic economy constraint in (44).

(48) a. [CP Q ... [VP<sub>3</sub> only<sub>C</sub> [VP<sub>2</sub> [ $\sim_{\text{pass}}$  C] [VP<sub>1</sub> 3sg invite [Li Bai]<sub>F</sub> attend *what activity*]]]]] = (41b)

b. [CP Q ... [VP<sub>3</sub> only<sub>C</sub> [VP<sub>2</sub> [ $\sim_{\text{pass}}$  C] [VP<sub>1</sub> 3sg invite [Du Fu]<sub>F</sub> attend *what activity*]]]]]

Prediction:  $\llbracket(a)\rrbracket^o = \llbracket(b)\rrbracket^o$ , therefore both LFs unavailable by (44)

Similarly, the pragmatic economy constraint explains the unavailability of a multiple question parse for example (3/38a) ‘Who only invited [Li Bai]<sub>F</sub> to attend dinner?’, discussed in section 4.3 above. (49a)

<sup>27</sup> The problem is also recently raised by Hengeveld, Iatridou, & Roelofsen (2023: 596) as a conceptual challenge to the Rooth-Hamblin framework as in Beck 2006, but without acknowledgement of the discussion in von Stechow 1991 or Kotek’s proposal for it.

<sup>28</sup> This forces another parse for (46a), where  $\sim_{\text{reset}}$  adjoins below the CP layer and ensures the validity of this F-marking relative to the discourse context, in the manner described in e.g. Rooth 1992 and Kratzer & Selkirk 2020. See Schwarzschild 1999: 162–163 and Hoeks 2019, 2020 for relevant discussion of focus in polar questions.

presents a candidate LF for this example using  $\sim_{\text{pass}}$ , repeated from (39b) above. Replacing the focused Li Bai with Du Fu as in (49b) again predicts the same final question denotation, and so this LF is also ruled out by the pragmatic economy constraint in (44).

- (49) a.  $[_{CP} Q \dots [_{TP} \textit{who } \lambda x \dots [_{\text{only}_C} [ [\sim_{\text{pass}} C] [_{VP} x \textit{invite} [\textit{Li Bai}]_F \textit{attend dinner}]]]]]$  = (39b)  
 b.  $[_{CP} Q \dots [_{TP} \textit{who } \lambda x \dots [_{\text{only}_C} [ [\sim_{\text{pass}} C] [_{VP} x \textit{invite} [\textit{Du Fu}]_F \textit{attend dinner}]]]]]$   
 Prediction:  $[[a)]^o = [[b)]^o$ , therefore both LFs unavailable by (44)

In summary, under my proposal here, focus intervention effect configurations conceivably allow for two different parses, but both are systematically blocked by the grammar. A parse with  $\sim_{\text{reset}}$  leads to uninterpretability just as Beck (2006) proposes. A parse with  $\sim_{\text{pass}}$  results in a structure where the particular choice of focus value (prejacent) is irrelevant, and therefore violates the pragmatic economy principle in (44). This failure to arrive at a valid interpretation explains the overall degraded status of such examples, i.e. the focus intervention effect.

## 5.2 Multiple focus association with overlap

Next, I turn to configurations where multiple focus-sensitive operators are intended to associate with distinct foci, with overlap in their association paths. I reproduce one early example of this form in (50):

- (50) **Overlapping focus association with distinct foci:** (Rooth, 1996: 205)  
 [We only introduced Marilyn to [John]<sub>F</sub> Kennedy. (I.e., not to Bobby and Edward Kennedy.)]  
 [We also only introduced [Sue]<sub>F</sub> to [John]<sub>F</sub> Kennedy.]

Although Rooth (1996) reports this example as grammatical, there are conflicting reports in the literature regarding the acceptability of such configurations with overlapping association dependencies. I refer the reader to overviews of these earlier reports in Beck & Vasishth 2009: 162–165. I will also return to example (50) in section 5.3 below.

For this reason, Beck & Vasishth (2009) undertake an experiment that aims to systematically investigate the acceptability of overlapping multiple focus association configurations in English. In this section, I briefly introduce Beck & Vasishth’s experimental design and results and discuss them in relation to my proposal here. In particular, although Beck & Vasishth conclude that “the multiple-focus configuration [with overlap] tends towards being unacceptable rather than acceptable” (p. 172), I predict a potential difference between some of their conditions, which is in fact borne out in their results.

Beck & Vasishth's (2009) experimental items were presented as recordings of conversations between two detectives, one male and one female. I reproduce their target items in (51) below. The male voice utters the preceding utterance in square brackets and then the female voice replies with the target sentence. In each condition, the theme of *show* (*photos* or *movie*) in the preceding utterance is the focus associate of a focus particle, which I will here call Op<sub>2</sub>. Then, the target utterance includes a sentence with two focus particles, in "Op<sub>1</sub> Op<sub>2</sub>" order, where Op<sub>2</sub> associates with the same focus as before, and Op<sub>1</sub> associates with a new focus, the goal argument of *show* (*Robin, boss, assistant, Carol*).

(51) <b>Target items in Beck &amp; Vasishth 2009:</b>	(from Beck & Vasishth, 2009: 176–177)
a. [You only showed the photos to Carol.]	<i>also–only</i>
Right. I also only showed the photos to Robin.	1.800
b. [You only showed the photos to Carol.]	<i>even–only</i>
Right. I even only showed the photos to the boss.	1.666
c. [You showed the photos to Carol. Did you also show the movie to her?]	<i>only–also</i>
No. I only also showed the movie to Robin.	1.866
d. [You showed the photos to Carol's assistant. You even showed the movie to him.]	<i>only–even</i>
No. I only even showed the movie to Carol.	1.666
e. [You showed the pictures to Carol. You even showed her the movie.]	<i>also–even</i>
Yes. I also even showed the movie to Robin.	2.333
f. [You showed the photos to Carol.]	<i>even–also</i>
Yes. I also showed the movie to her. I even also showed the movie to Carol's assistant.	2.733

Participants were instructed, "When you hear the response of the female detective, you need to rate her response as grammatical or ungrammatical" (p. 176), on a 1–4 scale. I produce the condition names ("Op<sub>1</sub>–Op<sub>2</sub>") and average ratings for the target sentences on the right in (51). Figure 1 below shows these ratings with 95% confidence interval error bars.<sup>29</sup>

Beck & Vasishth's claimed conclusion based on these results is that patterns of overlapping multiple focus association are generally unacceptable. However, at the same time, two of their target conditions,

<sup>29</sup> I have simplified the presentation of Beck & Vasishth's (2009) results here in two ways. First, Beck & Vasishth also tested "control" sentences for each condition, which roughly express the same meaning as the targets but avoiding the multiple focus configuration. These control sentences are generally quite complex and also received ratings across the middle of the rating scale; furthermore, the control item for one condition had an error (an incorrect name) (p. 172), further undermining the value of comparing the targets to these controls. Second, Beck & Vasishth also included three other conditions in their experiment, *also–nobody*, *only–nobody*, and *even–nobody*, which are not of interest here, as I concentrate on configurations with two focus-sensitive particles. The average ratings in (51) and my Figure 1 were produced based on the raw results files and R analysis scripts that Beck & Vasishth made available at <https://www.ling.uni-potsdam.de/~vasishth/BeckVasishth>.

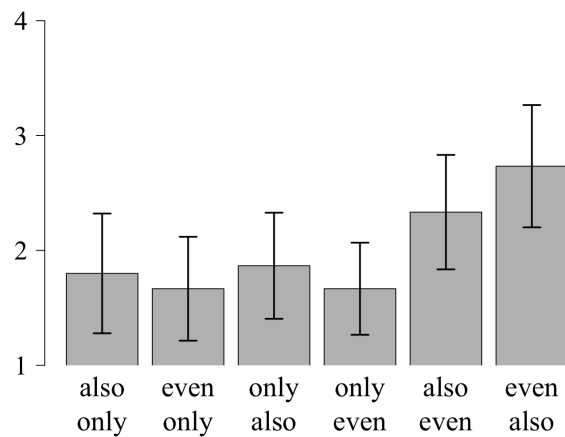


Figure 1: Mean ratings for target items.

*also–even* and *even–also*, appear to be noticeably more acceptable than the others; they note: “A further study might clarify whether conditions *also–even* and *even–also* are really better than the other instances of the multiple-focus schema” (p. 172). See their ratings in (51e,f) and in Figure 1. Beck & Vasishth continue that, on their view, such a difference between conditions would be surprising: “It is not expected from the representative theories discussed in this paper (Rooth, 1992; Wold, 1996) that the choice of focus operator should matter” (p. 172).

I will suggest instead that the relative acceptability of the *also–even* and *even–also* conditions, as compared to the other target conditions, is predicted and explained by my proposal here. First, recall that I assume that focus-sensitive operators are unselective — that is, both  $\sim_{\text{reset}}$  and  $\sim_{\text{pass}}$  cannot be restricted in their sensitivity to the effects of one particular alternative source (focus) in their scope — which is the standard assumption in Rooth 1992 and Beck 2006, among others; see also Howell et al. 2022. (I discuss this assumption further in section 5.3 below.) Beck & Vasishth (2009) in fact take this to be primary conclusion of their results.<sup>30</sup> However, unlike what Beck & Vasishth (2009) then assume, in the framework I develop here, unselectivity does not immediately make the configurations in (51) inherently uninterpretable or ungrammatical. Specifically, I propose that the target sentences may have grammatical parses, albeit not exactly as intended, as structures where both focus-sensitive operators associate with both foci. This is possible through the use of  $\sim_{\text{pass}}$  with the lower operator,  $\text{Op}_2$ , so that non-trivial alternatives are passed up for the evaluation of  $\text{Op}_1$  above.<sup>31</sup> See this schematic LF in (52):

<sup>30</sup> Specifically, they say: “the evidence is consistent with Theory A but not with Theory B” (p. 174), where Theory A refers to unselective association and Theory B to selective association. See page 162.

<sup>31</sup> For the purposes of this demonstration, I assume no non-trivial contextual domain restriction on the variables  $C$  and  $C'$ . I discuss the potential effect of contextual domain restriction in section 5.3 below.

(52) **Multiple unselective association with multiple foci:**

[ Op<sub>1,C'</sub> [ [~<sub>reset</sub> C'] [ ... Op<sub>2,C</sub> [ [~<sub>pass</sub> C] [ ... α<sub>F</sub> ... β<sub>F</sub> ...

Let us see what this parse predicts for the six target conditions. First, consider the cases where Op<sub>2</sub> = *only* (51a,b). The unselective ~<sub>pass</sub> provides *only* with a domain variable *C* that varies in both the theme and goal arguments of *show*. *Only* results in an at-issue claim that ⟨photos, Robin⟩ in (51a) or ⟨photos, boss⟩ in (51b) is the only pair ⟨*x*, *y*⟩ such that the speaker showed *x* to *y*. The addition of Op<sub>1</sub>, *also* or *even*, does not affect this at-issue meaning. In both cases, we then predict the target sentence's assertion to directly contradict the preceding context, explaining their unnatural ratings.

Second, consider the cases where Op<sub>1</sub> = *only* (51c,d). In these cases, Op<sub>2</sub> (*also* or *even*) applies pointwise to the prejacent and each of the alternatives which then serve together as *C'*. There is a question as to how the presuppositional contributions of *also* and *even* in the alternatives in *C'* project through quantification by *only* with *C'* (see also note 19 above), but we can set this aside. What we can be certain of is that *only* will quantify over alternatives in *C'* that vary in the values of both the theme and the goal arguments of the verb, thereby resulting in at-issue requirements that ⟨movie, Robin⟩ in (51c) or ⟨movie, Carol⟩ in (51d) is the only pair ⟨*x*, *y*⟩ such that the speaker showed *x* to *y*, again contradicting the preceding context as with items (51a,b) above.

This leaves the last two conditions, where both operators are *also* or *even*, which contribute presuppositions but otherwise pass up the at-issue contributions of their prejacent. For example, in the *also–even* condition (51e), *even* introduces a projective, not-at-issue scalar requirement that ⟨movie, Robin⟩ is generally less likely than other ⟨*x*, *y*⟩ such that the speaker showed *x* to *y* (see note 32 below), and *also* then introduces a projective, not-at-issue additive requirement that there is another pair besides ⟨movie, Robin⟩ such that the speaker (even) showed *x* to *y*. Similar contributions are made by *even* and *also* in (51f). In both cases, the assertions are unchanged by the two operators, simply expressing that the speaker showed the movie to Robin in (51e) or the movie to the assistant in (51f), and the not-at-issue requirements of *even* and *also* are satisfiable and do not contradict their contexts, and so we predict their relative acceptability.<sup>32</sup>

<sup>32</sup> In the *also–even* example (51e), the context must support the felicitous use of two *even*'s: that the speaker even showed the movie to Carol (per the second sentence of the male detective's setup) and that the speaker even showed the movie to Robin (in the target utterance by the female detective). A reviewer raises a concern that we might predict these two uses of *even* to be mutually incompatible if we assume *even* to require its prejacent to be a scalar endpoint: that is, less likely than all of its alternatives, without exception. However, this concern is only apparent, for two reasons.

First, it is possible that the two instances of *even* are interpreted using two different sets of alternatives. Then, even if we assume a strict scalar endpoint formulation for *even*, as long as each prejacent is the least likely amongst its corresponding set of alternatives, we predict the overall exchange to be natural. (Two different sets of alternatives could also be considered by *even* in the interpretation of the at-issue part of the target sentence and for the evaluation of its higher additive *also*, using a technique of F-marking the alternative set variable, which I discuss in section 5.3 below.)

Second, works such as Bennett 1982 and Kay 1990 describe *even* as requiring that its prejacent be less likely than *some*

I conclude that my proposal, which maintains the unselectivity of focus association while also allowing for the use of  $\sim_{\text{pass}}$  to pass up alternatives for use by a higher alternative-sensitive operator, allows us to make sense of this otherwise unaddressed contrast in Beck & Vasissth's (2009) results. Configurations with multiple overlapping association are indeed not possible, but similar configurations with multiple focus-sensitive operators associating unselectively with multiple foci *are* in principle possible. Further work is necessary to understand the exact meaning contributions that are expressed by such complex configurations and their felicitous contexts of use, beyond what I have offered here.

### 5.3 On the unselectivity of focus interpretation

My discussion above has followed Rooth 1992 in the idea that focus interpretation operators (Rooth's  $\sim_{\text{reset}}$ , as well as  $\sim_{\text{pass}}$  here) are *unselective*; that is, they cannot semantically distinguish between the effects of different alternative sources in their scope and treat them differently. This assumption of unselectivity of focus interpretation is followed and discussed explicitly in Beck 2006 as a component of her explanation for focus intervention effects, as acknowledged by Li & Law (2016: 202) as well. See also Howell et al. 2022 for evidence that focus interpretation is similarly unselective across various languages. This unselectivity played a role in both of sections 5.1 and 5.2 above in deriving the ungrammaticality of focus intervention configurations and in explaining the variable acceptability of attempted overlapping multiple association configurations as reported by Beck & Vasissth (2009). Both of these results would be undermined if focus association could be straightforwardly selective, as for instance Kratzer (1991) and Wold (1996) develop a compositional semantics for.

The challenge is how to reconcile these results, which seem to support the uniform unselectivity of focus interpretation, together with those examples in the literature where overlapping multiple focus association has been described as possible. For instance, here I repeat Rooth's *Marilyn/JFK* example, which I will discuss further below:<sup>33</sup>

(53) **Overlapping focus association with distinct foci:** =(50) (Rooth, 1996: 205)

[We only introduced Marilyn to [John]<sub>F</sub> Kennedy. (I.e., not to Bobby and Edward Kennedy.)]

We also only introduced [Sue]<sub>F</sub> to [John]<sub>F</sub> Kennedy.

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contextually salient alternative(s), but not necessarily all of them. (See for example Schwenter & Vasissth 2000, Schwenter 2002, Greenberg 2016, 2022, and Xiang 2020 for discussion of these two different formulations.) Therefore, even if we had reason to assume that the sets of alternatives under consideration are indeed exactly the same, adopting such a weaker formulation for *even*'s scalar inference allows us to predict the simultaneous felicity of both sentences with *even*. I thank Yael Greenberg (p.c.) for discussion of these analytic possibilities.



Here I present and illustrate a possible approach to the interpretation of such examples with overlapping multiple focus association, which to my knowledge has not been seriously pursued in any prior work: I continue to assume that focus interpretation operators ( $\sim_{\text{reset}}$  and  $\sim_{\text{pass}}$ ) are unselective, but will capitalize on the idea that quantificational domains for focus-sensitive operators are subject to contextual domain restriction (Rooth, 1992; von Stechow, 1994). For concreteness, I discuss Rooth’s *Marilyn/JFK* example in (50/53) above, considering the simplified LF (with subject reconstructed and with no temporal semantics) as in (54b) below. Based on the context Rooth provides, reflected in (54a), I assume that Marilyn is the only salient alternative to Sue, and that John contrasts with his brothers Bobby and Ted. In addition, one detail that should immediately stand out is the F-marking on the variable  $C$ ; see note 34 below. I assume  $C$  to have one contextual alternative, the set  $D$  referenced by the preceding sentence in (54a). (54c,d) give the ordinary and alternative semantic values for the nodes VP1 and VP3, assuming the use of  $\sim_{\text{pass}}$  at VP2, for discussion below.<sup>34</sup>

- (54) a. Context: We only <sub>$D$</sub>  introduced Marilyn to [John]<sub>F</sub> Kennedy.
- $$D = \left\{ \begin{array}{l} \wedge \text{we introduce Marilyn to John,} \\ \wedge \text{we introduce Marilyn to Bobby,} \\ \wedge \text{we introduce Marilyn to Ted} \end{array} \right\}$$
- b.  $[\text{VP}_5 \text{ also}_{C'} [\text{VP}_4 [\sim_{\text{reset}} C'] [\text{VP}_3 \text{ only}_C [\text{VP}_2 [\sim_{\text{pass}} [C]_{\text{F}}] [\text{VP}_1 \text{ 1pl introduce } [Sue]_{\text{F}} \text{ to } [John]_{\text{F}}]]]]]]]$
- c.  $[\text{VP}_1]^0 = \wedge \text{we introduce Sue to John}$
- $$[\text{VP}_1]^{\text{alt}} = \left\{ \begin{array}{l} \wedge \text{we introduce Sue to John, } \wedge \text{we introduce Marilyn to John,} \\ \wedge \text{we introduce Sue to Bobby, } \wedge \text{we introduce Marilyn to Bobby,} \\ \wedge \text{we introduce Sue to Ted, } \wedge \text{we introduce Marilyn to Ted} \end{array} \right\}$$
- d.  $[\text{VP}_3]^0 = \text{ONLY}(C)(\wedge \text{we introduce Sue to John})$
- $$[\text{VP}_3]^{\text{alt}} = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{we intro Sue to John}), \text{ ONLY}(D)(\wedge \text{we intro Marilyn to John}), \\ \text{ONLY}(C)(\wedge \text{we intro Sue to Bobby}), \text{ ONLY}(D)(\wedge \text{we intro Marilyn to Bobby}), \\ \text{ONLY}(C)(\wedge \text{we intro Sue to Ted}), \text{ ONLY}(D)(\wedge \text{we intro Marilyn to Ted}), \end{array} \right\}$$

<sup>33</sup> In addition to adopting the selective focus association of Kratzer and Wold, another possibility pursued in this literature is that foci may move covertly at LF in order to avoid the problematic, overlapping configuration. For instance, for (53), covert movement of *Sue* out of the scope of *only* but still within the scope of *also* changes the overlap configuration into a non-overlap configuration, which is straightforwardly interpretable. See Krifka 2006, Wagner 2006, and Erlewine & Kotek 2018a,b for further motivation and discussion of this approach, although see also Bassi & Longenbaugh 2020. However, if this possibility were in fact generally available, the relative unacceptability of many of Beck & Vasishth’s (2009) overlapping conditions becomes surprising, as they note.

<sup>34</sup> F-marking on  $C$  allows for  $[\text{VP}_3]^{\text{alt}}$  in (54d) to include alternatives that make reference to the set  $C$  or to the set  $D$ . Although somewhat unusual, in the Rooth 1992 framework,  $C$  is also another syntactic node which therefore may bear F-marking, so this LF is predicted to be possible. On the availability of F-marking on phonologically unpronounced material, see for instance Heim 1992: 215 note 13.

For presentational purposes, throughout this paper I have treated the contextually determined alternative sets such as  $C$  and  $C'$  here as directly equal to the alternative semantic values of the sisters of the focus interpretation operators ( $\sim_{\text{reset}}/\sim_{\text{pass}}$ ), although these have been simplified by considering only a restricted domain of individual alternatives for foci and *wh*-phrases, as in (54c,d). If we accordingly set  $C = \llbracket \text{VP1} \rrbracket^{\text{alt}}$  (54c), we predict the example (50/53) to express *only* associating unselectively with both Sue and John: that is, that  $\langle \text{Sue, John} \rangle$  is the only pair  $\langle x, y \rangle$  such that the speakers introduced  $x$  to  $y$ . We would thereby predict this sentence to be infelicitous as it contradicts its preceding context (54a), parallel to the cases of *also-only* and *even-only* from Beck & Vasishth 2009 discussed in the preceding section.

However, the presuppositional requirement of Rooth's focus interpretation operator — of  $\sim_{\text{reset}}$  (13) but also of  $\sim_{\text{pass}}$  in (25) — is for the variable to be a *subset* of the alternative semantic value of its sister. (See also note 7.) In principle, then, these variables could be independently constrained so that they do *not* reflect variation across both focus positions. Concretely, suppose  $C$  and  $C'$  in (54b) are understood as in (55) below.

$$(55) \quad \begin{array}{l} \text{a. } C = \left\{ \begin{array}{l} \wedge \text{we introduce Sue to John,} \\ \wedge \text{we introduce Sue to Bobby,} \\ \wedge \text{we introduce Sue to Ted} \end{array} \right\} \subseteq \llbracket \text{VP1} \rrbracket^{\text{alt}} \text{ in (54c)} \\ \text{b. } C' = \left\{ \begin{array}{l} \text{ONLY}(C)(\wedge \text{we introduce Sue to John}), \\ \text{ONLY}(D)(\wedge \text{we introduce Marilyn to John}) \end{array} \right\} \subseteq \llbracket \text{VP3} \rrbracket^{\text{alt}} \text{ in (54d)} \end{array}$$

In this case, we satisfy the requirements that  $C \subseteq \llbracket \text{VP1} \rrbracket^{\text{alt}}$  and  $C' \subseteq \llbracket \text{VP3} \rrbracket^{\text{alt}}$ , and the LF in (54b) is correctly interpreted as intended and described in Rooth 1996 (modulo tense): We presuppose the prejacent that we introduced Sue to John and assert that we did not introduce Sue to Bobby or Ted (from  $\llbracket \text{VP3} \rrbracket^0 = \text{ONLY}(C)(\wedge \text{we introduce Sue to John})$ , unaffected by *also*), and presuppose by *also* that the non-prejacent alternative  $\text{ONLY}(D)(\wedge \text{we introduce Marilyn to John})$  is true, which is satisfied in this context. Neither selective focus interpretation nor covert movement (see note 33) is necessary to arrive at the correct interpretation for this example. This demonstration thus serves as a proof of concept to show how attested patterns of grammatical, overlapping multiple focus association can be interpreted while maintaining the general unselective property of focus interpretation operators  $\sim_{\text{reset}}$  and  $\sim_{\text{pass}}$ , as per Rooth 1992, Beck 2006, and Howell et al. 2022, among others.

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However, note that the variables  $C$  and  $D$  only cooccur with particular prejacent propositions in  $\llbracket \text{VP3} \rrbracket^{\text{alt}}$ . The selection of alternatives here reflects the fact that VP3 includes  $\sim_{\text{pass}}$ , which following Rooth 1992 presupposes that the sister's ordinary value is in the alternative set (see note 7). Because propositions of the form  $(\wedge \text{we introduce Sue to } X)$  are not in  $D$  and those of the form  $(\wedge \text{we introduce Marilyn to } X)$  cannot be in  $C$  (a subset of  $\llbracket \text{VP1} \rrbracket^{\text{alt}}$ ), alternatives where the prejacent proposition is not in the relevant quantificational domain ( $C$  or  $D$ ) are not included in  $\llbracket \text{VP3} \rrbracket^{\text{alt}}$ .

The immediate question that arises then is, what are the conditions or mechanisms by which domain restriction as in (55) is possible? The general theoretical literature on domain restriction suggests that the appropriate domain restriction (here as in (55)) is something that cooperative speakers may naturally arrive at.<sup>35</sup> However, at the same time, the experimental results in Beck & Vasisht 2009 (in section 5.2 above) suggest that the necessary form of domain restriction may be difficult to accommodate, at least in their experimental setting.

One potentially promising approach to reconciling these conflicting results is to assume that these contextually determined sets are necessarily related to (explicit or implicit) Questions Under Discussion (QUD), following for instance the proposals for *only* in Roberts 1996, 1997 and Beaver & Clark 2008.<sup>36</sup> For example, arriving at the correct interpretation for the *Marilyn/JFK* example in (50/53) would require questions congruent to both of the sets *C* and *C'* in (55) to be salient in the discourse or easily accommodated. This makes the plausible prediction that accessing the intended interpretations for such configurations with overlapping multiple focus associations may require (or at least be strongly facilitated by) substantial manipulation of the discourse context to ensure that the right sorts of salient QUDs are accessible. I leave the more detailed verification of this prediction for future work.

## 6 Conclusion

The idea that linguistic expressions may denote or make reference to sets of alternative meanings, pioneered by Hamblin (1973) and Rooth (1985, 1992), now underlies many productive avenues of research in natural language semantics. Simple cases of question formation or association with focus may be compatible with a range of different formal techniques for their compositional semantics. It is for this reason that we must investigate the behavior of more complex constructions — for example, the multiple focus constructions as in Krifka 1991 and Beck & Vasisht 2009, the focus intervention effects configurations as in Beck 2006, and focus association with *wh*-phrases discussed in Li & Law 2016 — which are more informative for distinguishing between different theoretical approaches. In this paper, I have taken on precisely this challenge, leading to the articulation of a new framework for the compositional semantics of alternatives, which differs only minimally from the established Roothian model but can better model the behavior of such complex constructions.

This paper makes broadly two main contributions. First, I bring together empirical observations

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<sup>35</sup> For instance, Roberts (1996) says, “domain restriction is always constrained by cooperativity: the cooperative hearer assumes that the speaker is cooperative as well (and competent) and on this basis seeks to resolve any apparent failure of cooperativity... by restricting the domain in such a way as to make the contribution cooperative after all” (p. 39).

<sup>36</sup> However, I note that Kadmon & Sevi (2011) convincingly show through their *Granny’s dog* examples that *only* may quantify over a domain that is *not* an established QUD. It must then be possible for the necessary quantificational domains in such examples to be accommodated as ancillary QUDs.

and theoretical insights related to a range of different complex constructions involving alternatives, to articulate a framework that can accurately model these behaviors in a unified fashion. My framework adopts and extends the highly influential Rooth 1992 framework for focus interpretation, wherein apparently focus-sensitive operators such as *only* make reference to a contextually determined variable whose value is restricted by an adjoined focus interpretation operator (originally,  $\sim$ ), rather than making direct reference to focus alternatives themselves. Specifically, in addition to the unselective and resetting focus interpretation operator proposed in Rooth 1992, which I call  $\sim_{\text{reset}}$ , there is also an unselective and non-resetting variant that I call  $\sim_{\text{pass}}$ .  $\sim_{\text{pass}}$  passes up the alternative set for its sister, which has the effect of letting the relevant focus-sensitive operator apply pointwise to the prejacent and each of its alternatives, then feeding further focus-sensitive quantification above.

Concretely, I offer a schematic summary of the different complex association patterns discussed here and the appropriate focus interpretation operators in each case. See (56):

(56) **Configurations of association with multiple alternative-sensitive operators:**

- a.  $[\text{Op}_1 [\dots \text{Op}_2 [\dots \alpha \dots]]] \Rightarrow \text{Op}_2 \text{ must use } \sim_{\text{pass}}$
- b.  $[\text{Op}_1 [\dots \alpha \dots] [\text{Op}_2 [\dots \beta \dots]]] \Rightarrow \text{Op}_2 \text{ must use } \sim_{\text{reset}}$
- c.  $[\text{Op}_1 [\dots \text{Op}_2 [\dots \alpha \dots \beta \dots]]] \Rightarrow \text{Op}_2 \text{ must use } \sim_{\text{pass}}, \text{ with significant domain restriction}$

Multiple association with a single alternative source as in (56a) must use  $\sim_{\text{pass}}$ . This effectively implements the theoretical insight of Krifka 1991 for multiple focus constructions in an extended Rooth 1992 framework, as also independently motivated by Bade & Sachs (2019) in the domain of implicature calculation. I showed that this approach also immediately derives patterns of focus association with *wh*-phrases, which had previously been presented as a challenge to the Beck 2006 approach to focus intervention effects. Multiple, non-overlapping association with separate alternative sources as in (56b) must use  $\sim_{\text{reset}}$  so that the higher operator does not unwittingly quantify over alternatives that vary in both  $\alpha$  and  $\beta$ 's positions. Finally, multiple, overlapping association with separate alternative sources as in (56c) is strictly speaking not possible, given the unselective nature of  $\sim_{\text{reset}}/\sim_{\text{pass}}$ ; however, configurations of this form may appear to be possible through the use of  $\sim_{\text{pass}}$  and non-trivial contextual domain restriction.

The paper's second contribution is related to a debate in the literature regarding the relationship between alternatives posited for *wh*-phrases in Hamblin 1973 and as alternative values for focused phrases in Rooth 1985, 1992. A prominent and widely-adopted solution has been the unified Rooth-Hamblin Alternative Semantics developed in Beck 2006 and subsequent works, which takes *wh*-alternatives and focus

alternatives to be formally equivalent, both being alternatives introduced in alternative semantic values (traditionally, “focus semantic values”) in Rooth’s two-dimensional Alternative Semantics framework.

Li and colleagues (especially Li & Law 2016) make an important contribution to this literature by highlighting the possibility of grammatical focus association with *wh*-phrases and the fact that Beck’s (2006) influential proposal for focus intervention effects, as is, incorrectly predicts such configurations to be ungrammatical. Li & Law then advocate for a different semantic framework that keeps Hamblinian and Roothian alternatives apart, claiming that “having sets of alternatives in different dimensions gives us more explanatory power” (p. 203). My paper here serves as a rebuttal to this broader theoretical consequence claimed in Li & Law 2016. Specifically, the independently motivated framework that I put forward here can immediately derive patterns of focus association with *wh*-phrases, as an instance of the pattern in (56a), while assuming the unity of focus and *wh* alternatives. I conclude that we can maintain this general framework of Rooth-Hamblin Alternative Semantics, with focus and *wh* alternatives unified, as a productive theoretical foundation for current and future work on the semantics of alternatives.

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