Wh-intervention is caused by movement into regions of focus alternatives computation

Hadas KOTEK, Yale University

July 2019

Comments welcome!

Certain quantificational and focus elements ("interveners") have long been known to disrupt the interpretation of *wh*-in-situ (Hoji 1985 and many others), but the correct description of the set of interveners and the nature of intervention effects have been the subject of continued debate. In this paper, I tie the distribution of intervention and the nature of interveners to the interpretation of movement configurations at LF. Building mainly on data from intervention effects in English and Japanese, I show that movement cannot target a region in the structure in which focus alternatives are simultaneously computed. I propose that this restriction on the grammar of scope-taking is the result of a logical problem with Predicate Abstraction computed over non-singleton alternatives. This problem is noted in Rooth's (1985) seminal work introducing the theory of alternatives, and in later work such as Poesio (1996); Hagstrom (1998); Kratzer and Shimoyama (2002); Shan (2004); Novel and Romero (2009); Charlow (2015, 2017); Beck (2016); Ciardelli, Roelofsen, and Theiler (2017), who all attempt to correct this problem in some way. I argue instead that the data presented in this paper provide an empirical argument for a static, simple-typed system with movement alongside alternative computation as scope-taking mechanisms. Dynamic access to assignments may only be possible at certain intervals — clause or phase edges. The proposal has far-reaching implications for how a wide array of linguistic phenomena should be modeled, including the nature of movement, reconstruction, focus, and intensionality.

Keywords: intervention effects, scope-taking, assignment function, *wh*-questions, movement, focus alternatives, Predicate Abstraction
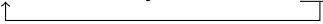
Contents

1 Introduction

This paper sets out to investigate the syntax and semantics of *wh*-in-situ, using English multiple *wh*-questions as its main testing ground, with supporting data from Japanese, and leading to important lessons for the basic architecture of compositional syntax/semantics.

A well-known fact about English questions is that only one *wh*-phrase is fronted in the process of question formation, and any other *wh*-phrases remain *in-situ*.

(1) **A multiple *wh*-question in English:**

Who did Mary introduce ⎯ to ⎯|*whom*|?
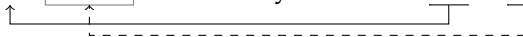
The literature offers two types of approaches to the interpretation of *wh*-in-situ: one involving covert movement, and the other involving in-situ composition — using Rooth-Hamblin alternative computation, unselective binding, or choice functions (e.g. Hamblin 1973; Pesetsky 1987; Reinhart 1997, 1998). These two modes of scope-taking — movement and non-movement — have been invoked in many other parts of the grammar, for example in theories of Association with Focus, existentials and indefinites, and disjunction, among others.
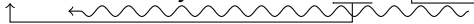
(2) **Two ways of interpreting *wh*-in-situ in an English multiple question:**[1]

Who did Mary introduce to |*whom*|*?*

   a. <u>LF:</u> *Who* |*whom*| C did Mary introduce ⎯ to ⎯?   *covert movement*

   b. <u>LF:</u> *Who* C did Mary introduce ⎯ to |*whom*|?   *in-situ composition*

One pressing question is how the use of these mechanisms might be diagnosed, given that this is not obvious from the surface form of the question. Over the years, several diagnostics of LF structures have been developed: syntactic islands and the licensing of parasitic gaps and of Antecedent Contained Deletion indicate the presence of (covert) movement in such structures (e.g. Ross 1967; Sag 1976; Nissenbaum 2000; Pesetsky 2000). On the other hand, 'focus' intervention effects reflect the use of in-situ composition (e.g. Beck 2006, 2016; Cable 2010; Kotek 2014; Li and Law 2016).[2]

---

[1]Throughout, solid arrows indicate overt movement, dashed arrows indicate covert movement, and curly arrows indicate areas of in-situ (alternative) computation. These arrows are used as a notational convenience only.

[2]The theories of intervention effects currently dominating the literature assume that this in-situ composition involves Rooth-Hamblin alternatives. I will continue to adopt this assumption here, which — as we will see — will become crucial later. As no theory of intervention has been developed based on a choice-function mechanism or using unselective

I argue that intervention effects are the result of a movement operation whose landing site is a position where Rooth-Hamblin (focus) alternatives (projected from an in-situ *wh*-phrase) are being computed:

(3) **Intervention as a crossing dependency between movement and focus alternatives:**
*LF: [$_{\text{CP}}$ C ... **DP** λx ... *wh* ... x]

I propose that this ungrammaticality is the result of a logical incompatibility between the interpretation of movement and the computation of alternatives. As has been shown in work going back to Rooth (1985) and more recently in Poesio (1996); Shan (2004), and Novel and Romero (2009), among others, Predicate Abstraction (PA) over non-singleton sets of alternatives cannot be defined to yield the desired interpretation in static semantic models, such as the one developed in the popular Heim and Kratzer (1998) framework. Although the authors mentioned above (and several others) attempt to fix this problem by changing one or more basic assumptions about Grammar — the nature of movement, of focus, or of the semantic types system — I argue instead that our simple static system should be maintained. Intervention happens precisely when the undefined operation of PA over alternatives is attempted, as described in the generalization in (4).

(4) **Intervention is the result of Predicate Abstraction over alternatives:**
Scope-taking via movement into regions of focus alternatives computation leads to ungrammaticality at LF.

Intervention is avoided whenever the configuration in (3) can be avoided at LF — by moving the *wh* or the intervener out of the way, so that PA over sets of alternatives is no longer needed in the structure. I motivate this claim through a careful study of the patterns of intervention effects in English multiple questions. Additional support is provided from the behavior of intervention effects in Japanese.

This claim, that intervention is the result of scope-taking via movement into regions of alternative computation, has far-reaching implications across various domains of grammar. I discuss several of these implications — concentrating in particular on the nature of (successive-cyclic) movement and reconstruction, intentionality, and focus. I conclude by discussing some open questions and avenues for future research.

binding, I will leave for future work the question of how (or if) my proposal can be adapted and reframed using these tools. See Pesetsky (2000); Grohmann (2006); Tomioka (2007b); Mayr (2010, 2014); Li and Law (2016); Branan (2017b) for approaches which attribute the source of intervention to a problem other than the computation of focus alternatives, but do not propose another mode of composition for *wh*-in-situ. See also section 5.2 for some discussion of these alternative proposals.

2 Background

Before presenting the main claim I set out to defend in the paper — that intervention can be described as a crossing dependency, the result of scope-taking via movement into a region where alternatives are computed — I provide a brief survey of our current understanding of intervention effects, concentrating in particular on English data, which is central to this paper. I additionally introduce some expository assumptions about the syntax and semantics of *wh*-questions, to ground the discussion in sections 3 and 4.

2.1 Intervention effects

Over the past 30 years, a large and growing literature has described *intervention effects* in *wh*-questions. Descriptively, this refers to the inability of an in-situ *wh*-phrase to be outscoped by certain quantificational elements, called *interveners*. Such effects are most easily observed in *wh*-in-situ languages, such as Japanese, prompting an extensive body of literature to study these effects (Hoji 1985; Hagstrom 1998; Kim 2002; Beck and Kim 2006; Tomioka 2007b, a.o.).

Consider (5a–c), where the *wh*-мо "NPI" serves as an intervener.[3] The word order in (5a) is grammatical, but it becomes unavailable when an intervener is present, (5b). The question is rescued by scrambling the interrogative *wh*-word over the intervener (5c).[4]

(5) **A canonical intervention example in Japanese:**　　　(Tomioka 2007b: 1571–1572)

　　a.　✓ Hanako-ga　*nani-o*　　yon-da-no?
　　　　　Hanako-NOM what-ACC read-PAST-Q
　　　　　'What did Hanako read?'

　　b.　* **Dare-mo** *nani-o*　　yoma-nak-atta-no?
　　　　　who-MO　what-ACC read-NEG-PAST-Q

　　c.　✓ *Nani-o*　　**dare-mo** ___ yoma-nak-atta-no?
　　　　　what-ACC who-MO　　　read-NEG-PAST-Q
　　　　　'What did no one read?'

A similar phenomenon is observed in German, for *wh*-in-situ in multiple *wh*-questions such as (6a). Here we observe the negative quantifier *niemand* ('no one') acting as an intervener: *niemand* cannot precede an in-situ *wh*-word (6b). The resulting ungrammaticality can be avoided by scrambling the *wh*-phrase over the intervener, as in (6c).

---

[3]More accurately, *wh*-мо is an *neg*-word — a negation-dependent universal quantifier, see Shimoyama (2008).

[4]Throughout the paper, interrogative *wh* are in *italics* and quantifiers of interest (potential interveners) — as well as sentential negation below — are in **bold**.

(6) **A canonical intervention example in German:** (Beck 1996: 4, 6)

    a. ✓ *Wer* hat Luise *wo* angetroffen?
       who has Luise where met
       'Who met Luise where'?

    b. * *Wer* hat **niemanden** *wo* angetroffen?
       who has no one where met

    c. ✓ *Wer* hat *wo* **niemanden** angetroffen?
       who has where no one met
       'Who didn't meet anybody where'?

Descriptively, therefore, intervention effects affect *wh*-in-situ. Theoretically, I adopt here the idea that intervention effects affect alternative computation but not movement: interveners disrupt the interpretation of alternatives projected by *wh* which must be interpreted by interrogative C (Beck 2006; Beck and Kim 2006; Kotek 2014, 2016b). However, I will describe a new and different mechanism causing intervention than proposed in these previous works. The crucial ingredient that differentiates my proposal from all previous ones is in not predicting a stable set of interveners, but rather taking intervention to be a flexible phenomenon, dependent on the syntactic structure and semantic scope-taking mechanisms available in the language and used in a given derivation.

I describe the mechanism of Rooth-Hamblin alternatives in more detail in section 2.2.2 below, and I elaborate on the idea that alternatives are crucial for the understanding of intervention effects in section 3.At this stage, we can stay agnostic with respect to the exact inventory of so-called interveners, and provide the following schematic description of the phenomenon: Intervention effects happen when an LF-in-situ *wh*-phrase is separated from the interrogative complementizer by an intervener, and can be avoided by moving the *wh*-phrase above the intervener.

(7) **The Beck (2006) LF intervention schema:**

    a. ✓ [$_{CP}$ C ... *wh*]

    b. * [$_{CP}$ C ... **intervener** ... *wh*]

    c. ✓ [$_{CP}$ C ... *wh* **intervener** ... *t*]

Turning next to English, the most comprehensive study of intervention effects in English is presented in Pesetsky 2000. Pesetsky observes a correlation between superiority and intervention effects in multiple questions with D-linked *wh*-phrases, building and expanding on an observation in É Kiss 1986. D-linked questions exceptionally allow for superiority violations, (8b); however,

in-situ *wh*-phrases in superiority-violating questions are sensitive to intervention effects, (8c), while superiority-obeying questions appear to be immune from such effects, (8d).[5]

(8) **Intervention effects in English correlate with superiority:**

    a.   *Which student* ___ read *which book*?   *obeying*

    b.   *Which book* did *which student* read ___?   *violating*

    c.   *Which student* **didn't** ___ read *which book*?   *obeying*

    d.   * *Which book* **didn't** *which student* read ___?   *violating*

        (cf *Which book* did *which student* **not** read ___?)

The intervention effect in English is not limited to sentential negation.[6] Pesetsky (2000) provides data with additional interveners such as *only NP*, *no one*, *never*, and *very few*. See additional data involving universal quantification in section 4. (The data here is from Pesetsky 2000, ch 5.)

(9) **Intervention effect with *only* only affects superiority-violating question:**

    a.   *Which* girl did **only** Mary introduce ___ to *which* boy?

    b.   * *Which* boy did **only** Mary introduce *which* girl to ___?

(10) **Intervention effect with *very few* only affects superiority-violating question:**

    a.   *Which* picture did **very few** children want to show ___ to *which* teacher?

    b.   * *Which* teacher did **very few** children want to show *which* picture to ___?

(11) **Intervention effect with *never* only affects superiority-violating question:**

    a.   *Which* student did he **never** claim ___ would talk about *which* topic?

    b.   * *Which* topic did he **never** claim *which* student would talk about ___?

(12) **Intervention effect with *no one* only affects superiority-violating question:**

    a.   *Which* book did **no one** give ___ to *which* student?

---

[5]D-linking in the examples here is crucial. Non-D-linked questions must obey Superiority and hence do not provide the right grounds for testing for the presence of intervention.

(i) **The Superiority effect** (Kuno and Robinson 1972):
    When TP contains two *wh*-words, the one that undergoes *wh*-movement is the one closest to the interrogative C.

(ii) a.   *Who* ___ read *what*?

    b.   * *What* did *who* read ___?

(iii) a.   *Who* did Jane persuade ___ to read *what*?

    b.   * *What* did Jane persuade *who(m)* to read ___?

[6]In fact, I return to sentential negation to question its status as an intervener in English in section 5.3.

b.　* *Which* student did **no one** give *which* book to ___?

In all cases, the observed generalization is that only superiority-violating questions are subject to intervention effects. Superiority-obeying questions are immune from these effects. This, along with evidence from the licensing of Antecedent Contained Deletion, leads Pesetsky (2000) to his proposal that superiority-obeying and superiority-violating multiple questions in English must be derived from underlyingly distinct LFs, which I will now introduce. In the coming sections I will refine the generalization observed by Pesetsky, but nonetheless continue to adopt the syntactic assumptions underlying the behavior we observe above.

A note on judgments

Before moving on, two notes are in order about the nature of the data and judgments introduced throughout this paper.

First, intervention effect-related judgments are notoriously difficult to obtain. Unlike judgments in other domains such as island effects, judgments here are sometimes described as confusing, weak, or hard to interpret. The literature variably describes the contrast between an intervention-sentence and a non-intervention-sentence as a *, ??, or ?, making comparisons across sources very difficult. Experimental studies of intervention are rare, in part because of this difficulty (but see Haida and Repp 2013; Kitagawa, Tamaoka, and Tomioka 2013; Kotek and Erlewine 2016; Kotek 2014, 2019, and Tomioka 2019 for some attempts and discussion of the difficulty associated with the design and interpretation of results). See in particular the discussion in Tomioka 2019, who takes this to be an open problem in this domain. A close experimental investigation of intervention effects will be beyond the scope of this paper, but would be a welcome extension of this paper.

Second, it is important to note that for many speakers, intervention effects in multiple questions are diagnosed by the loss of the *pair-list* reading of the question (A2) in (13). A *single-pair* answer reading may survive (A1). This has been reported for intervention effects in superiority-violating questions in English and for intervention effects in German questions in footnotes in previous work (Pesetsky 2000; Beck 2006, cf also Beck 1996). See discussion in Kotek (2014) for details.

(13) **A single-pair and a pair-list reading of a multiple question:**
　　Q:　*Who* ate *what*?
　　A1:　Sarah ate the beans.　　　　　　　　　　　　　　　　　　　*single-pair*
　　A2:　Sarah ate the beans, Mary ate the eggplant, and Sue ate the broccoli.　　*pair-list*

2.2 *Wh*-questions preliminaries

With preliminary data on intervention effects in place, next I spell out the assumptions I adopt in this paper concerning the syntax and semantics of English multiple questions.

2.2.1 English interrogative syntax

As shown in section 2.1, intervention effects in English questions are sensitive to Superiority: we see that superiority-violating questions are subject to intervention effects, while superiority-obeying questions are immune from such effects. I adopt the analysis developed in Pesetsky (2000) and adopted in Beck 2006, where this pattern is explained by assuming different LFs for superiority-obeying and superiority-violating multiple questions. To make this explicit, we adopt the following set of assumptions:

First, we assume that an interrogative probe on C multiply searches for all interrogative phrases in its c-command domain. Second, adopting Relativized Minimality (Rizzi 1990, cf. Chomsky 1995), we assume that the *wh*-phrase base-generated highest in the question (throughout: wh_1) is always found by the probe before any lower ones (throughout: wh_2) can be.[7]

In the case of superiority-obeying questions, we assume the following derivation: (a) The interrogative probe on C finds wh_1, Agrees with it, and attracts it to Spec,CP to satisfy an EPP requirement. (b) The probe then goes on to find and Agree with wh_2. (c) Wh_2 is active and may move following this agreement operation. Traditionally, such movement is assumed to target an inner specifier of CP, tucking in below wh_1 (Richards 1997). Kotek 2014, 2019 shows cases in which movement is *partial*: targeting a position lower in the clause, such as the edge of vP or the edge of an island. This choice is guided by the particulars of the derivation, and will be a topic I return to below. (d) A pronunciation rule as in (15) ensures that the highest *wh*-phrase in Spec,CP is pronounced at the head of its movement chain (hence, in its moved position), and all other *wh*-phrases are pronounced at the tail of their respective chains (hence, in-situ). The resulting LF is shown in (14a).

In the case of superiority-violating questions we assume a slightly different derivation: (a) The interrogative probe on C finds wh_1, Agrees with it, but leaves it *in-situ*. (b) The probe then goes on to find and Agree with wh_2, attracting to the *highest* Spec,CP. (c) This ensures the correct pronounced word order for this question, given the pronunciation rule (15). The resulting LF is shown in (14b).

---

[7]Where "higher" and "lower" are defined in terms of asymmetric c-command: we deal here with structures in which wh_1 asymmetrically c-commands wh_2. For simplicity, I do not consider questions with more than two *wh*-phrases in this paper.

(14) **LFs for superiority-obeying and superiority-violating questions in English:**

    a. <u>LF</u>: *Which student*$_1$ *which book*$_2$ C ___ read ___ ?   *obeying*

    b. <u>LF</u>: *Which book*$_2$ C did *which student*$_1$ read ___ ?   *violating*

(15) **Pronunciation rule (English) (Pesetsky 2000: 28):**

    a. The first instance of *wh*-phrase movement to C is overt, in that *wh* is pronounced in its new position and unpronounced in its trace positions.

    b. Secondary instances of *wh*-phrase movement to C are covert, in that *wh* is pronounced in its trace position and unpronounced in its new position.

By the end of the derivation for superiority-obeying questions, all *wh*-phrases are above TP at LF, hence above any interveners. The structure is therefore predicted not to be sensitive to intervention effects, as desired (recall the schema in (7)). Superiority-violating questions, on the other hand, contain a *wh*-phrase that is interpreted in-situ at LF; hence, if an intervener separates this in-situ *wh*-phrase from C, we predict an intervention effect.

2.2.2 In-situ composition

Finally, I introduce here the mechanism of in-situ composition introduced by the squiggly arrows in the examples above — *Rooth-Hamblin alternatives*. Rooth-Hamblin alternatives are a parallel mode of semantic composition, where a set of alternatives (known as *focus-semantic* or *alternative* values) is computed compositionally for each syntactic node in the derivation in parallel to its ordinary semantic value (Rooth 1985, 1992, see also Hamblin 1973). This computation has been argued to supply operators such as focus operators and question complementizers with a relevant set of alternative denotations or propositions.

I adopt the bi-dimensional semantics for *wh*-words of Ramchand 1997; Beck 2006; Kotek 2014, 2019: *Wh*-words denote sets of alternatives (as a Roothian focus-semantic value) which can be taken to stand for (short) possible answers to the corresponding question, but lack a defined ordinary value. This is illustrated for *what* in (16), where I assume that the contextually relevant individuals in the domain are Moby Dick, War and Peace, Oliver Twist:

(16) **The semantics of *what*:**

    <u>ordinary value</u>: $[\![what]\!]^o$ is undefined
    <u>alternatives</u>: $[\![what]\!]^f = \left\{\, x \in D_e : x \text{ is not human} \,\right\}$
                       $=_c \left\{\, \text{Moby Dick, War \& Peace, Oliver Twist} \,\right\}$

Consider the (simplified) LF representation for the *wh*-in-situ pseudo-English question "Hanako bought *what*?" in (18), a parallel to the Japanese example in (5a) above, repeated here as (17):[8]

(17) **A Japanese question:**   (= 5a)

   ✓ Hanako-ga   *nani-o*   yon-da-no?
     Hanako-NOM what-ACC read-PAST-Q
     'What did Hanako read?'

This LF does not involve any (overt or covert) *wh*-movement, and hence the non-movement mode of composition is used to interpret the question: Rooth-Hamblin alternative computation.

(18) **Focus alternatives compose point-wise in a simple question:**
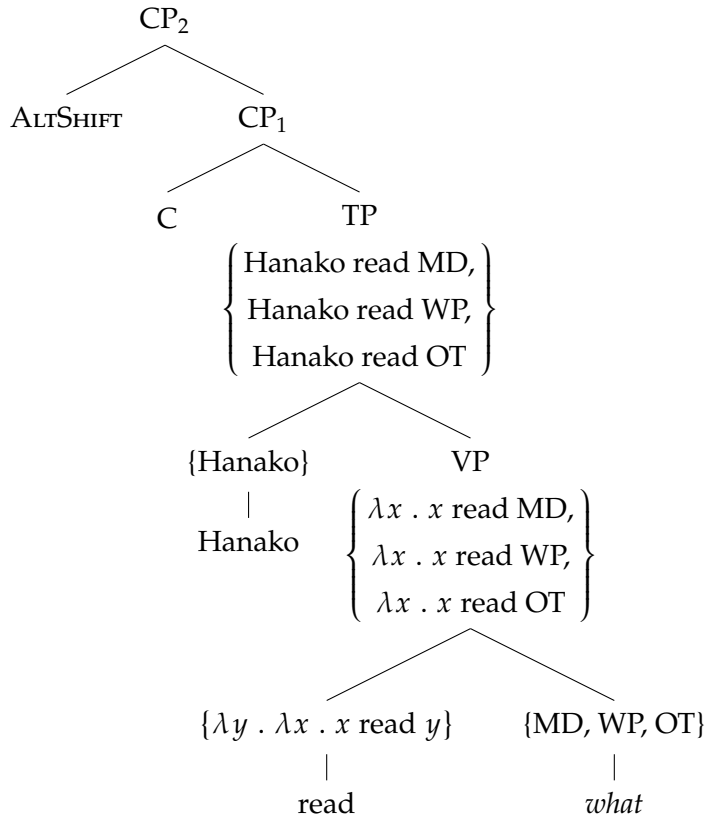
Notice that in (18), the *wh*-phrase *what* has a focus-semantic value corresponding to contextually relevant individuals in its domain — here, the individuals Moby Dick, War and Peace, Oliver Twist. The focus-semantic values of the other terminal nodes correspond to the singleton set containing their ordinary value (Rooth 1985, 1992). These alternatives compose pointwise at each non-terminal node, resulting in the complement of the interrogative C having a set of propositions as its focus-semantic value. This set of alternative propositions then serves as the input to the adjoined ALTSHIFT

---

[8]This structure is simplified in many ways; notably, the full-fledged structure will have to be intensionalized.

operator, the interrogative operator, which returns these alternative propositions as the *ordinary* meaning of the question (Kotek 2014, 2019, see also Shimoyama 2001; Beck and Kim 2006).

(19) **The semantics of the question operator:**

     a. $[\![\text{AltShift } \alpha_\sigma]\!]^o = [\![\alpha_\sigma]\!]^f$

     b. $[\![\text{AltShift } \alpha_\sigma]\!]^f = \left\{ [\![\text{AltShift } \alpha_\sigma]\!]^o \right\}$

This procedure of pointwise composition of focus alternatives proceeds in parallel to the computation of ordinary semantic values for each node in the LF. Because *what* lacks an ordinary semantic value, any node that composes with it also lacks an ordinary value. This undefinedness is inherited by the structure up to node CP_1, (20a–c). AltShift corrects this problem by taking the focus-semantic value of CP_1 and turning it into the ordinary value of the question, (20d).

(20) **Ordinary semantic values in (18):**

     a. $[\![\text{VP}]\!]^o$ is undefined

     b. $[\![\text{TP}]\!]^o$ is undefined

     c. $[\![\text{CP}_1]\!]^o$ is undefined

     d. $[\![\text{CP}_2]\!]^o = [\![\text{CP}_1]\!]^f = \left\{ \lambda w.\ \text{Hanako read } x \text{ in } w : x \text{ is not human} \right\}$

               $= \left\{ \text{Hanako read MD in } w, \text{Hanako read WP in } w, \text{Hanako read OT in } w \right\}$

     e. $[\![\text{CP}_2]\!]^f = \left\{ \left\{ \text{Hanako read MD in } w, \text{Hanako read WP in } w, \text{Hanako read OT in } w \right\} \right\}$

The end result, then, is that these alternative propositions correspond to possible (weak) answers to the question (Hamblin 1973; Karttunen 1977). Once the ordinary value of CP is set using AltShift, we adopt the assumption from Rooth 1985, 1992 that the focus-semantic value of CP is a singleton set containing its ordinary value (20e).

The question operator AltShift is the only operator that is able to take a complement which *lacks* an ordinary value, and "fix" this missing piece in the derivation.[9] It does so by turning the focus-semantic value of the question into its ordinary value. See Kotek 2019 for discussion of the distribution of AltShift cross-linguistically, and Uegaki 2018 for a proposal that the Japanese question particle *-ka* is a spellout of this AltShift operator. In the absence of this alternative-resetting step, the question is predicted to be ungrammatical, a consequence of the Principle of Interpretability in (21). This point will become important in section 5.1.

---

[9]I follow Kotek 2014, 2019 in assuming that the interrogative complementizer C is semantically inert: It simple takes the denotation of its sister and returns it as the denotation of its mother, unchanged. I note that the denotation I adopt here for AltShift has been attributed to interrogative C in Beck 2006; Beck and Kim 2006. However, separating C from the AltShift operator allows us to apply AltShift multiply in a single clause to yield pair-list (family of question) meanings for multiple questions, as shown below.

(21) **The Principle of Interpretability (Beck 2006, p. 16):**
An LF must have an ordinary semantic value.

This same type of mechanism is also able to model multiple *wh*-questions. For a question such as *which book did which student read?*, I adopt an LF as in (14b). Here, *which book* has moved to Spec,CP, and *which student* remains in-situ and is interpreted by projecting Rooth-Hamblin alternatives which are interpreted by AltShift. I follow Kotek 2014, 2019 in assuming that the pair-list reading of a multiple question is modeled as a family of questions (Roberts 1996; Hagstrom 1998; Krifka 2001; Büring 2003; Willis 2008; Fox 2012; Nicolae 2013; Constant 2014, a.o.). This is achieved by allowing multiple AltShift operators in the derivation, as shown in (22):

(22) **A simplified LF for a superiority-violating question with a pair-list reading:** (= 14b)
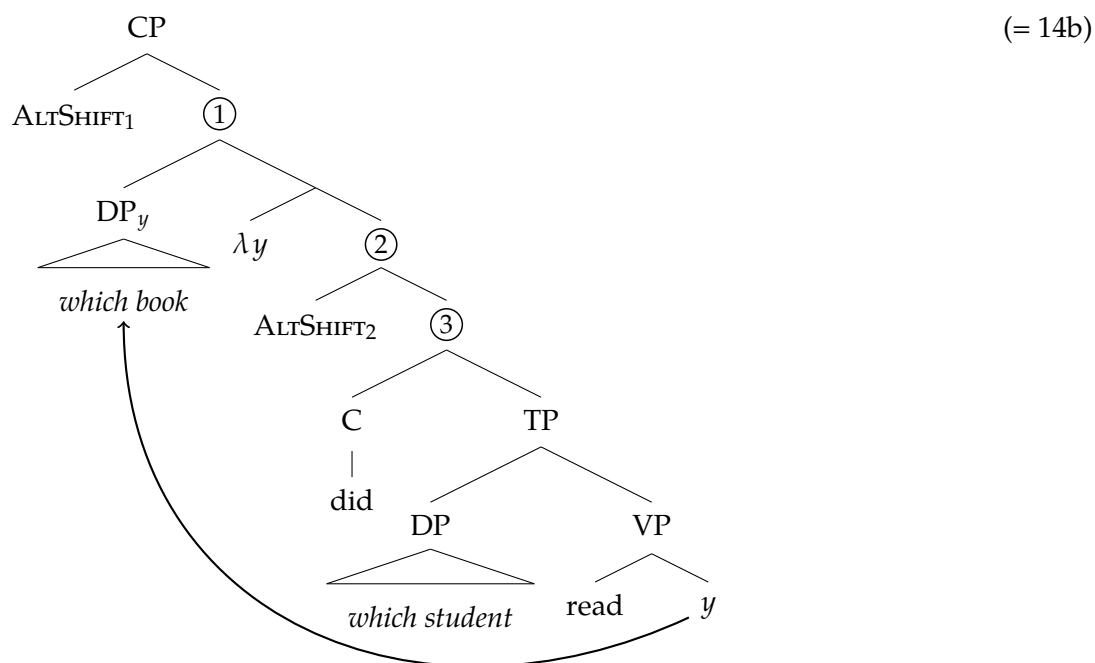
I illustrate key parts of the derivation in (23), assuming as above a small domain for the *wh*-phrases, for purposes of illustation.[10] This LF yields a family of questions denotation sorted by the higher *wh*-phrase, *book*. Spelling this out for our small context, the result is in (23f).[11]

---

[10]For illustrations for a superiority-obeying question and for the single-pair reading of both types of questions, I refer the reader to Kotek 2014, 2019.

[11]I will explicitly discuss the abstraction step between steps ② and ① after introducing my proposal in section 3. For present purposes it suffices to know that this step is not problematic in this derivation. I explain why in (32) below.

(23) **Key parts of the derivation of (22):**

a. $[\![\text{which student}]\!]^o$ is undefined
$[\![\text{which student}]\!]^f = [\![\text{student}]\!]^o = \big\{ \text{Mary, Dana, Lynn} \big\}$

b. $[\![\text{which book}]\!]^o$ is undefined
$[\![\text{which book}]\!]^f = [\![\text{book}]\!]^o = \big\{ \text{Moby Dick, War \& Peace, Oliver Twist} \big\}$

c. $[\![\text{③}]\!]^o$ is undefined
$[\![\text{③}]\!]^f = \big\{ \lambda w.\ x \text{ read } y \text{ in } w : x \in \text{student} \big\}$

d. $[\![\text{②}]\!]^o = [\![\text{③}]\!]^f = \big\{ \lambda w.\ x \text{ read } y \text{ in } w : x \in \text{student} \big\}$ AʟᴛSʜɪꜰᴛ$_2$ applied
$[\![\text{②}]\!]^f = \big\{ \big\{ \lambda w.\ x \text{ read } y \text{ in } w : x \in \text{student} \big\} \big\}$

e. $[\![\text{①}]\!]^o$ is undefined
$[\![\text{①}]\!]^f = \big\{ \big\{ \lambda w.\ x \text{ read } y \text{ in } w: x \in \text{student} \big\} : y \in \text{book} \big\}$

f. $[\![\text{CP}]\!]^o = [\![\text{①}]\!]^f = \big\{ \big\{ \lambda w.\ x \text{ read } y \text{ in } w: x \in \text{student} \big\} : y \in \text{book} \big\}$ AʟᴛSʜɪꜰᴛ$_1$ applied

$$= \left\{ \left\{ \begin{array}{c} \text{Mary read MD} \\ \text{Dana read MD} \\ \text{Lynn read MD} \end{array} \right\}, \left\{ \begin{array}{c} \text{Mary read WP} \\ \text{Dana read WP} \\ \text{Lynn read WP} \end{array} \right\}, \left\{ \begin{array}{c} \text{Mary read OT} \\ \text{Dana read OT} \\ \text{Lynn read OT} \end{array} \right\} \right\}$$

To conclude this section, the Rooth-Hamblin alternatives mechanism yields the desired question semantics without establishing a syntactically local (movement) relationship between a *wh*-phrase and C. It is precisely this mechanism that is subject to intervention effects, as we will see below. Throughout, I will continue to use the squiggly arrow notation to indicate that Rooth-Hamblin alternatives project from an in-situ *wh*-phrase and pointwise compose up the structure, leading to a derivation that could be subject to intervention effects. That is, the LF in (24) is equivalent to the one in (18):[12]

(24) **A squiggly arrow marks the part(s) of structure where alternatives are projected:**
C Hanako read what?   (= 18)

---

[12]To simplify my LFs, throughout I omit the AʟᴛSʜɪꜰᴛ operator and only illustrate C wherever it is not directly relevant to the discussion.

3   Proposal: Intervention as movement into focus alternatives

In the remainder of this paper I defend the idea that intervention is the result of scope-taking across alternatives. The generalized intervention schema is as in (25):

(25)   **Intervention as a crossing dependency between movement and focus alternatives:**

   * <u>LF:</u> [$_{CP}$ C ... **DP** λx ... *wh* ... ***x***]

This proposal builds on the ideas in Kim (2002); Beck (2006); Beck and Kim (2006); Kotek (2014, 2019) that intervention is related to focus interpretation. However, these previous authors propose that interveners themselves are focus-sensitive operators; interveners cause intervention by virtue of being the first operator to interpret the alternatives projected by *wh*-in-situ, blocking interpretation by the interrogative complementizer or AʟᴛSʜɪꜰᴛ, and leading to semantic incompatibility diagnosed as an intervention effect. As a result, these authors predict a stable set of interveners: those operators that associate with focus. This provides a handy explanation for why *only* and *even* act as interveners, but struggles with interveners like *every*, *no one*, and *never*, as well as with the observed cross-linguistic variability in the set of interveners, discussed most recently in works such as Erlewine and Kotek 2018c; Beck 2019; Howell, Hohaus, Berezovskaya, Braun, Sachs, Durmaz, and Beck 2019. See also Eilam 2008 and Branan 2017b on the absence of intervention effects in Amharic and Egyptian Arabic, respectively, as well as Haida and Repp 2013 on the status of *also* as an intervener in German, and the discussion in section 4.3.

Instead, I propose that the cause of intervention is rooted in a much more fundamental fact about the nature of Grammar: going back to Rooth (1985), with the very inception of the theory of Association with Focus, it has been known that Predicate Abstraction is not well defined over non-singleton sets of alternatives in simple, static semantic models.

3.1   Predicate Abstraction

Predicate Abstraction is often used in a derivation to facilitate binding of a variable with its antecedent. Such a relation is often established through syntactic movement. In a simple example such as (26), the *wh*-word *who* is fronted in the process of question formation. A binder is introduced below the landing site of movement, which is then co-indexed with the trace of the moved *wh*-word.

(26) **Movement and abstraction in a simple example:**
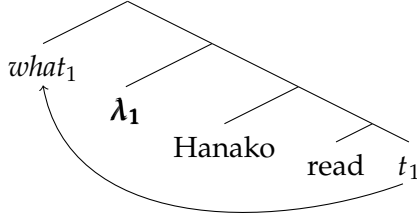
The Predicate Abstraction rule then facilitates a change to the assignment function g, such that the index introduced by the binder is updated to point to the variable being bound. This ensures that movement and quantification yield their expected meanings.

(27) **Predicate Abstraction (PA, Heim and Kratzer 1998: 186):**
Let α be a branching node with daughters β and γ, where β dominates only a numerical index i. Then, for any assignment g, $[\![\alpha]\!]^g = \lambda x . [\![\gamma]\!]^{g[x/i]}$.

3.2 The problem of Predicate Abstraction across alternatives

Returning to the issue of Predicate Abstraction across alternatives, it has been observed that in cases with non-singleton sets of alternatives, PA cannot be defined to yield the desired bound-variable interpretation (Poesio 1996; Hagstrom 1998; Kratzer and Shimoyama 2002; Shan 2004; Novel and Romero 2009; Yatsushiro 2009; Charlow 2015; Beck 2016; Ciardelli et al. 2017). The crux of the matter is that there is no way to correctly define the focus-semantic value of predicate-abstracted nodes. In what follows I describe this problem in brief, following the presentation in Shan 2004. I provide a more detailed discussion in the Appendix.

First, consider the question *Who saw nobody?*, where $[\![who]\!]^f = \{$ Mary, Dana, Lynn $\}$, and assuming (as is standard) QR of the quantified object *nobody* (May 1977, 1985), (28a). Our goal is to apply PA to the set $\{$ Mary saw t_i, Dana saw t_i, Lynn saw t_i $\}$, binding the trace and composing the moved quantifier above. PA over a set of propositional alternatives should intuitively apply *pointwise*, yielding *a set of functions*. However, because the input to PA is an assignment-sensitive set of propositions, PA yields instead *a function returning a set of propositions*, which is of an incorrect type, (28b).

(28) **A naive application of Predicate Abstraction which doesn't work:**

a. <u>LF:</u> nobody$_i$ λ_i *who* saw t_i?

b. λx . {Mary saw $[\![t_i]\!]^{w,g^{x/i}}$, Dana saw $[\![t_i]\!]^{w,g^{x/i}}$, Lynn saw $[\![t_i]\!]^{w,g^{x/i}}$}   ☺ $\langle e, \langle st, t \rangle \rangle$

To facilitate composition above the set in (28b), the result of PA must be transposed from a function into sets, of type $\langle e, \langle st, t \rangle \rangle$, into a set of functions, of type $\langle \langle e, st \rangle, t \rangle$. Such a rule can be

16

explicitly stated, as in (29):

(29) **A type-shifter for turning type $\langle e, \langle \tau, t \rangle \rangle$ functions into type $\langle \langle e, \tau \rangle, t \rangle$ functions:**

$$\lambda Q_{\langle e, \langle \tau, t \rangle \rangle}. \ \left\{ f_{\langle e, \tau \rangle} : \forall x_e. f(x) \in Q(x) \right\}$$

However, such a rule over-generates: it yields the desired "uniform" functions, (30a), as well as "non-uniform" ones, (30b). Non-uniform functions as in (30b) predict sentence meanings that are not attested in natural language, and are therefore undesirable.

(30) **Uniform and non-uniform functions are both generated by (29):**

a. $\left\{ \begin{bmatrix} x_1 \mapsto \text{Mary saw } x_1 \\ x_2 \mapsto \text{Mary saw } x_2 \\ x_3 \mapsto \text{Mary saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Dana saw } x_1 \\ x_2 \mapsto \text{Dana saw } x_2 \\ x_3 \mapsto \text{Dana saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Lynn saw } x_1 \\ x_2 \mapsto \text{Lynn saw } x_2 \\ x_3 \mapsto \text{Lynn saw } x_3 \end{bmatrix}, \ldots \right\}$

b. $\left\{ \begin{bmatrix} x_1 \mapsto \text{Mary saw } x_1 \\ x_2 \mapsto \text{Lynn saw } x_2 \\ x_3 \mapsto \text{Dana saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Dana saw } x_1 \\ x_2 \mapsto \text{Mary saw } x_2 \\ x_3 \mapsto \text{Lynn saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Lynn saw } x_1 \\ x_2 \mapsto \text{Dana saw } x_2 \\ x_3 \mapsto \text{Mary saw } x_3 \end{bmatrix}, \ldots \right\}$

There is no way of "pruning" the undesirable functions, as in (30b), keeping only the uniform ones, as in (30a). As a result, there is no way to correctly define PA in a *static* semantic system with simple semantic types and with movement alongside focus-alternatives. I refer the reader to the Appendix, as well as to Rooth (1985: 45–59), Shan (2004) and Novel and Romero (2009) for a more detailed illustration of this problem.

Although this issue has largely been put aside in the past, it has recently attracted the attention of several authors. Shan (2004) argues that this problem cannot be overcome, and hence motivates the adoption of a variable-free semantics without any movement.[13] Beck (2016), instead, develops a solution which changes the nature of the computation of focus-alternatives, where focus uses distinguished variables (Kratzer 1991; Wold 1996) instead of being unselective (Rooth 1985, 1992).[14] Novel and Romero (2009) show yet a third solution, involving type-lifting the entire semantic types system, taking assignment functions to be a part of the denotations of all lexical items (see also Charlow 2017; Ciardelli et al. 2017 for solutions along similar lines, as well as the discussion in Rooth 1985).[15] I entertain this final proposal in more detail in section 5.5.4.

---

[13]Shan also points out problems for solutions proposed in Poesio (1996) and Kratzer and Shimoyama (2002).

[14]Rooth's theory of focus is regulated solely by the ~ operator. For Beck (2016), it is crucial that some focus operators are *unselective*, while others are *selective*. See section 5.1 for additional details.

[15]Under this approach, for example, individuals are no longer objects of type e but instead they are a function of type $a \to e$, where a is the type of assignment functions.

3.3 Proposal: Intervention results from attempted PA over alternatives

I propose that none of these amendments to the standard static semantic system should be adopted wholesale. Instead, intervention effects arise precisely when we attempt to Predicate Abstract over alternatives.[16] A dynamic "fix" as in Charlow 2017 may be available in some limited cases only, which I discuss in section 5.5.4.

(31) **Intervention effects reflect scope-taking via movement into alternatives**:
Intervention is the result of movement into a part of structure where non-trivial alternatives are being computed — because Predicate Abstraction, necessary to interpret the movement step, is not well-defined in such cases.

The emphasis on *non-trivial* alternatives in (31) is crucial: the problem illustrated in 3.2 only arises when we attempt to simultaneously bind a variable in a uniform fashion while allowing multiple values for an alternative-generating phrase in the same step of the derivation. This only happens when the focus-semantic value of the phrase being abstracted over is a *non-singleton* set. This point becomes particularly important when we consider the denotation of multiple questions, where — as we have already seen — intervention effects are observed in English. To illustrate this, let us spell out the missing step in the derivation of (23): the step of Predicate Abstraction that must occur between nodes ② and ①, marked as ⋆ in the LF below. I repeat the relevant steps from (23), and spell out the missing step in (32c–d).

(32) **Abstracting over a singleton set does not lead to a problem:**
$[_{CP}$ AltShift$_1$ $[_①$ *which book* $[_⋆ \lambda y$ $[_②$ AltShift$_2$ $[_③$ did $[_{TP}$ *which student* $[_{VP}$ read y $]]]]]]]$
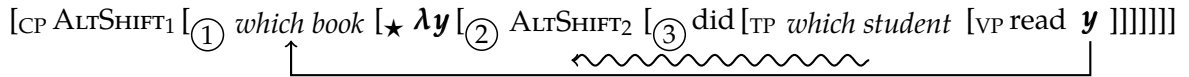
a. $\llbracket$which book$\rrbracket^o$ is undefined
$\llbracket$which book$\rrbracket^f = \llbracket$book$\rrbracket^o = \big\{$ Moby Dick, War & Peace, Oliver Twist $\big\}$ (= 23b)

b. $\llbracket②\rrbracket^o = \llbracket$AltShift$_2$ ③$\rrbracket^o = \big\{$ λw . x read y in $w : x \in$ student $\big\}$
$\llbracket②\rrbracket^f = \Big\{$ $\big\{$ λw . x read y in $w : x \in$ student $\big\}$ $\Big\}$ (= 23d)

---

[16] A precursor to this idea is in Kratzer 2005, footnote 14: "There is a question about the correctness of the definition for Predicate Abstraction. It does not quite deliver the expected set of functions. As far as I can see, however, no wrong predictions are actually made, as long as we only use the definition for generating propositional alternatives. There may in fact be interesting constraints to explore. Shan (2003) shows, for example, that Kratzer and Shimoyama's Hamblin semantics would produce the wrong alternative set for sentences like *Who$_i$ thought everyone$_j$ showed which paper by his$_i$ advisor to her$_j$ mother*. Shan's sentence is a classical example of an intervention effect (Beck 1996), however, and we would want to rule it out as ungrammatical. On Kratzer and Shimoyama's account it would be ruled out on the assumption that the nuclear scope of quantifiers like *everyone* is existentially closed (Heim 1982), hence the lower *wh*-phrase is stuck within the scope of a non-matching operator."

c. $[\![\star]\!]^o = \lambda y . [\![②]\!]^o = \lambda y . \{ \lambda w. \; x \text{ read } y \text{ in } w : x \in \text{student} \}$ Predicate Abstraction

    Applying the type-shifter in (29) pointwise:

$$[\![\star]\!]^o = \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \}$$

$$[\![\star]\!]^f = \{ \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \} \}$$

d. $[\![①]\!]^o = [\![\star]\!]^o ([\![\text{which book}]\!]^o)$ is undefined

    $[\![①]\!]^f = [\![\star]\!]^f ([\![\text{which book}]\!]^f)$ Function Application

$$= \{ \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \} \} (\{ \text{MD, WP, OT} \})$$

$$= \left\{ \begin{array}{l} \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \} \, (\text{MB}), \\ \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \} \, (\text{WP}), \\ \{ \lambda y . \lambda w . \; x \text{ read } y \text{ in } w : x \in \text{student} \} \, (\text{OT}) \end{array} \right\} \quad \text{pointwise FA}$$

$$= \left\{ \begin{array}{l} \{ \lambda w . \; x \text{ read MB in } w : x \in \text{student} \}, \\ \{ \lambda w . \; x \text{ read WP in } w : x \in \text{student} \}, \\ \{ \lambda w . \; x \text{ read OT in } w : x \in \text{student} \} \end{array} \right\} \quad \beta \text{ conversion}$$

e. $[\![①]\!]^f = \{ \{ \lambda w. \; x \text{ read } y \text{ in } w: x \in \text{student} \} : y \in \text{book} \}$ (= 23e)

f. $[\![\text{CP}]\!]^o = [\![\textsc{AltShift}_1 ①]\!]^o = \{ \{ \lambda w. \; x \text{ read } y \text{ in } w: x \in \text{student} \} : y \in \text{book} \}$ (= 23f)

$$= \left\{ \left\{ \begin{array}{l} \text{Mary read MD} \\ \text{Dana read MD} \\ \text{Lynn read MD} \end{array} \right\}, \left\{ \begin{array}{l} \text{Mary read WP} \\ \text{Dana read WP} \\ \text{Lynn read WP} \end{array} \right\}, \left\{ \begin{array}{l} \text{Mary read OT} \\ \text{Dana read OT} \\ \text{Lynn read OT} \end{array} \right\} \right\}$$

As steps (32c–d) illustrate, Predicate Abstraction over a singleton set of alternatives can lead to a well-defined result, as in (32e). This is because there is no way to create the kind of non-uniform functions that caused a problem in (30b) — we only encounter a problem when a non-singleton set is under consideration.

The proposal in (31) leads to two predictions, which I will substantiate below: (a) we should observe intervention effects in more environments than identified in previous literature, since movement is used in many corners of the grammar, and (b) we should find more interveners than previously recognized in the literature — because intervention is caused by *moved material* leading to the configuration in (3). Interveners are *not* a predetermined set that shares a certain characteristic. To test these predictions, below I will concentrate on showing that we can 'turn on' and 'turn off' intervention behavior by forcing items to take scope via movement or through other means, correlating with the presence or absence of an intervention effect. This result will be problematic for all previous accounts of intervention, which all predict a stable and limited (albeit distinct across accounts) set of interveners.

As discussed in section 2.1, judgments concerning intervention effects are quite delicate. To ensure that all the questions presented below were judged with respect to the pair-list reading, to mitigate interference from a potential single-pair reading, these questions were all presented to speakers in contexts supporting a pair-list interpretation. I will present some contexts below, but in the interest of space, I will omit some others.

A * judgment next to a question which exhibits an intervention effect is meant to indicate the loss of the pair-list reading of the question, judged in a supportive context.[17] I use the * notation here to indicate a contrastive judgment, such that the intervention-sentence is degraded compared to its non-intervention counterpart. It is not meant as a comment on the strength of the judgment. Because of the complex nature of some of the examples, some judgments are easier for some speakers to perceive than others. However, this variation aside, each data point I report below has been confirmed with over a dozen speakers over multiple sessions.

4   Intervention is the result of scope-taking across alternatives

In this section I return to the nature of intervention effects in *wh*-questions. Recall that in section 2.1, I presented data from Pesetsky (2000), where *only NP*, *no one*, *never*, *very few*, and sentential negation acted as interveners in English questions, (8), (9–12). We furthermore observed a correlation between superiority and intervention effects in English questions, such that only superiority-violating questions were subject to intervention. This led Pesetsky to propose underlyingly distinct LFs for superiority-obeying and superiority-violating questions, which I introduced in section 2.2:

(33) **LF representations of superiority-obeying and superiority-violating questions:**

a. $[_{CP}$ *wh$_1$ wh$_2$* $[$ C $[_{TP}$ ... t_1 ... t_2 $]]]$ *superiority-obeying*

b. $[_{CP}$ *wh$_2$* $[$ C $[_{TP}$ ... *wh$_1$* ... t_2 $]]]$ *superiority-violating*

In this section I show that although we correctly predict that, in general, superiority-obeying questions are immune from intervention effects and superiority-violating questions are subject to such effects — exceptions can be found. In particular, Kotek (2014, 2016a, 2019) shows that in the case of English superiority-obeying questions, the covert movement step associated with the phonologically in-situ *wh*-phrase can potentially target non-interrogative intermediate CPs as final

---

[17]Almost without exception, unless this is pointed out to speakers, the single-pair reading also becomes unavailable. However, in some cases discussed, the single-pair reading seems more readily available. I leave this observation as an open avenue for future research.

landing sites. The *wh*-phrase is then interpreted using Rooth-Hamblin alternatives between its (covert) landing site and the edge of the clause:

(34) **Covert *wh*-movement in superiority-obeying questions can be partial:**

$$[_{CP} \; wh_1 \; C \; \ldots \; wh_2 \; [_{VP} \; \ldots \; t_1 \; \ldots \; t_2 \;]]$$
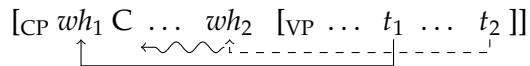
As a consequence, even in a superiority-obeying question, a region susceptible to intervention effects can be formed. Whenever we can clearly diagnose the highest possible LF position of wh_2 in (34) and block movement to C, we predict intervention effects above this landing site in superiority-obeying questions. Conversely, when wh_1 is given wide scope through non-interrogative movement, or when an intervener is moved out of the way in structures as in (33b), intervention can be avoided in superiority-violating questions.

I show evidence in support of the generalization that intervention happens when movement into a region of focus-alternative computation is forced, and is avoided otherwise — regardless of intervention but in support of the idea that scope-taking across regions of (non-singleton) alternative computation is key:

(3) **Intervention as a crossing dependency between movement and focus alternatives:**
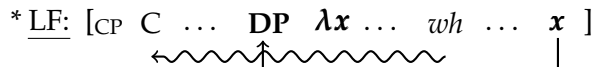
$$* \; \underline{\text{LF:}} \; [_{CP} \; C \; \ldots \; \textbf{DP} \; \boldsymbol{\lambda x} \; \ldots \; wh \; \ldots \; \boldsymbol{x} \;]$$

(4) **Intervention is the result of Predicate Abstraction over alternatives:**
Scope-taking via movement into regions of focus alternatives computation leads to ungrammaticality at LF.

4.1 Intervention and movement in English

I begin by addressing the question of the set of interveners. As discussed above, there is disagreement about the correct characterization of this set (e.g. Beck 1996, 2006; Grohmann 2006; Tomioka 2007b; Haida 2007; Mayr 2014). A point of agreement across all previous accounts of intervention, however, is that certain elements — indefinites, bare plurals, existentials, and definite descriptions — never act as interveners.[18] In what follows, I show that in fact such elements *do* trigger intervention, when they are forced to take scope through movement.

To show that non-interveners can be 'turned into' interveners, I consider the behavior of English subjects. Under the proposal I sketched above, subjects — which by assumption undergo A-movement from vP to TP — should always lead to intervention in superiority-violating questions.

---

[18]At least under collective interpretations. See Mayr (2010, 2014) for a discussion of distributivity and distributivity operators as causes of intervention.

The reason they do not appear to do so, I propose, is due to the fact that under normal circumstances, subjects are able to reconstruct into their base positions, avoiding intervention. I show next that this prediction is borne out.

(35) **Subjects and intervention:**
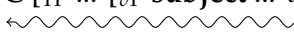
    a. Predicted intervention configuration, given (3):

        * [$_{CP}$ C [$_{TP}$ **subject** λx ... [$_{vP}$ x ... *wh* ...]]]

    b. Avoided through reconstruction at LF:

        ✓ [$_{CP}$ C [$_{TP}$ ... [$_{vP}$ **subject** ... *wh* ...]]]

The relevant test cases are presented in examples (36a–b). These examples contain a raising predicate, which, all things being equal, should allow the matrix subject to reconstruct to a lower base position. However, this reconstruction step can be blocked by binding from the subject into a bindee along the path of reconstruction. This introduces impossible requirements on the subject: either it reconstructs, avoiding intervention but undoing the binding relation, or it does not, preserving the binding relation but creating an intervention configuration. Either way, the example in (36b) shows that this leads to ungrammaticality. Example (36a) provides a baseline of similar complexity lacking the binding configuration, which is judged by speakers as quite complex, but acceptable.

(36) **Intervention caused by blocking of subject-reconstruction through binding:**
Context: The lawyers are likely to appeal different decisions to different courts. Tell me,

    a. ✓ *Which court* did **the lawyers** seem to the reporters to be likely to appeal *which decision*
to ___?   *superiority-violating, reconstruction possible*

    b. * *Which court* did **the lawyers**$_i$ seem to each other$_i$ to be likely to appeal *which decision*
to ___?   *superiority-violating, reconstruction impossible*

The proposed LFs for (36a–b) are given in (37a–b), assuming that the binding relation in (36b) is maintained. Maintaining this relation requires a movement step into a region of focus-alternatives computation, with the *wh*-phrase *which decision* interpreted in-situ at LF, since this is a superiority-violating question. The result is the intervention configuration, (3), leading to ungrammaticality.

(37) **Proposed LFs for (36a–b):**

    a. ✓ LF for (36a): *Which court* did [$_{TP}$ [$_{vP}$ seem to the reporters to [$_{vP}$ be likely **the lawyers**
to appeal *which decision* to ___]]]?   *full reconstruction possible*

b. * <u>LF for (36b)</u>: *Which court* did [$_{\text{TP}}$ **the lawyers**$_i$ $\boldsymbol{\lambda x}$ [$_{v\text{P}}$ seem to each other$_i$ [$_{v\text{P}}$ to be likely $\boldsymbol{x}$ to appeal *which decision* to ___]]]?   *reconstruction blocked by binding*

An alternative LF to (37b) where the subject reconstructs into its base position would solve the intervention problem but would break the binding relation, also predicting ungrammaticality.

We thus see that definite descriptions can cause intervention effects in English multiple questions. These are elements that can normally be interpreted without movement, or whose A-movement can be reconstructed, avoiding intervention. However, when full reconstruction becomes unavailable, we observe a degradation in the grammaticality of the superiority-violating question. This is also the case with indefinites and bare numerals, other traditional non-interveners.

(38) **Intervention with indefinites and bare numerals:**

a. ✓ *Which court* did **{some, four} lawyers** seem to the reporters to be likely to appeal *which decision* to ___ ?   *superiority-violating, reconstruction possible*

b. * *Which court* did **{some, four} lawyers**$_i$ seem to each other$_i$ to be likely to appeal *which decision* to ___ ?   *superiority-violating, reconstruction impossible*

4.2   Intervention does not correlate with superiority in English

Next I show that the correlation between intervention effects and superiority in English is epiphenomenal (Pesetsky 2000; Beck 2006). The crucial property predicting the presence or absence of intervention in a structure is whether an intervener has moved above a *wh*-phrase that is interpreted in-situ at LF, or whether such a configuration can be avoided in some way.

4.2.1   English superiority-obeying questions

We begin by considering superiority-obeying questions, which, as we have seen, are usually immune from intervention effects. However, we observe intervention effects in superiority-obeying questions when covert *wh*-movement is restricted in some way.

Here I illustrate two ways to restrict covert movement. The first involves binding, following a logic very similar to the one employed in (36) above: a bindee cannot move out of the scope of a binder. Hence, by introducing a binding relationship into a sentence, we mark the highest possible movement position of the bindee. Examples (39a–b) provide baselines, with a reflexive (*herself* or *himself*) bound by a binder (*daughter* and *Obama*, respectively). The higher binder in (39a) predicts a higher possible landing site for covert *wh*-movement in this example compared to (39b). Recall from (34) that covert *wh*-movement need not target interrogative C; in (39b), this movement would be extremely local, if it happens at all, remaining below *Obama* to maintain the

binding relation. In (39a), on the other hand, movement can target the *v*P edge or any position below it. The *wh*-phrase is then interpreted via Rooth-Hamblin alternatives between this landing site and AʟᴛSʜɪꜰᴛ, predicting a region of structure where intervention effects should be observable.

(39) **Baselines, with binders underlined:**[19]

    a.   *Which daughter* showed Obama *which picture of herself*?

    b.   *Which daughter* showed Obama *which picture of himself*?

Next, we add an intervener (here: *only*) into the sentence, to create a possible intervention configuration. We observe an intervention effect in (40b), where *which picture of himself* must be interpreted using alternative computation below the scope-taking position of the intervener *only Obama*. On the other hand, there is no intervention effect in (40a), where there is a possible landing site of *wh*-movement above the intervener but below the binder, leading to a converging LF.

(40) **Intervention in superiority-obeying question (Bob Frank, p.c.):**

    a.   ? *Which daughter* showed **only** Obama *which picture of herself*?

    b.   * *Which daughter* showed **only** Obama *which picture of himself*?

The next argument comes from the behavior of Association with Focus (Rooth 1985, 1992, a.o.), and is based on data from the existing literature. The interpretation of focus-sensitive operators such as *only* depends on the presence of an F-marked constituent within the scope of the operator. F-marking that occurs outside the scope of the operator does not contribute to the evaluation of that operator. This is explained through the *Principle of Lexical Association* (PLA): An operator like *only* must be associated with a constituent in its c-command domain at LF (Tancredi 1990 p. 30, Aoun and Li 1993; see also Erlewine 2014).

Evidence motivating this structural restriction on Association with Focus is shown in (41): The topicalization example in (41a) is ungrammatical with the intended interpretation, but the corresponding example with in-situ focus is grammatical, (41b).

(41) **F-marked constituents may not move out the scope of *only*:**

    a.   * Mary$_F$, John **only** likes ___.

            Intended: 'As for Mary, John only likes her$_F$ (and no one else).'

    b.   ✓ John **only** likes Mary$_F$.

Next we use the PLA to restrict covert *wh*-movement, by introducing F-marking into *wh*-in-situ, with the focus operator also serving as the intervener. Example (42a) provides a baseline,

---

[19]Recall that Barack Obama has two daughters; we are interested in the pair-list reading of these questions.

superiority-obeying multiple question that is able to receive a pair-list interpretation. Example (42b) shows that intervention effects are observed when F-marking is introduced inside the in-situ *wh*-phrase in this question, as predicted (Erlewine 2014).[20]

(42) **The PLA restricts covert movement of *wh*-in-situ, causing an intervention effect:**

    a. <u>Baseline:</u> I can tell you *which* student read *which* book.

    b. <u>Context:</u> The students in the class were each supposed to read one book *and* one article about syntax, and write a paper about them. However, everyone got confused and read one book *or* one article. I've been reading everyone's papers. I've finished all the ones about books, so:

        *I can tell you *which* student **only** read [*which* <u>book</u>$_F$ (about syntax)].

Other means of restricting the highest landing site of movement include NPI licensing and syntactic islands. I refer the reader to Kotek (2016a, 2017) for such examples. The results parallel the ones shown here: when covert *wh*-movement is restricted, so that *wh*-in-situ must be interpreted using Rooth-Hamblin alternatives, we observe intervention in superiority-obeying questions when an intervener takes scope along the path of alternatives. When movement is not restricted, or if the intervener is allowed to take scope in a position that isn't along the path of alternatives, intervention is avoided.

4.2.2 English superiority-violating questions

Next, I briefly discuss the status of intervention effects in superiority-violating questions. Following the analysis adopted in section 2.2 above, intervention effects occur in superiority-violating questions because *wh* is truly LF-in-situ in such structures. However, there are three ways of undoing the intervention configuration in such cases — by allowing the intervener to scope above the question or reconstruct below *wh*-in-situ, or by allowing *wh* to take wide scope above an intervener through non-interrogative movement:

(43) **Ways of undoing the intervention configuration in superiority-violating questions:**

    a. ✓ LF: **intervener** [$_{CP}$ C ... intervener ... *wh*]   QR

    b. ✓ LF: [$_{CP}$ C ... intervener ... *wh* ... **intervener**]   reconstruction

    c. ✓ LF: [$_{CP}$ C ... *wh* **intervener** ... ___]   non-interrogative movement

---

[20]This example is slightly modified from Erlewine (2014): Erlewine reports that this question retains its single-pair reading but loses its pair-list reading. I have added a baseline and a context to sharpen this judgment.

Wide scope for intervener

The first case of evading intervention, by scoping an intervener out of the question, has already been observed in the existing literature. Pesetsky (2000) shows the following data for multiple questions with the intervener *everyone*. In a superiority-obeying question containing a universal quantifier, the question may have a list of triples reading, obtained by allowing *everyone* to scope out of the question and quantify-in (see e.g. Karttunen and Peters 1980; Comorovski 1989, 1996; Krifka 2001), (44a). This question has a second reading, requiring a list of pairs, which is obtained by allowing *everyone* to take scope in its pronounced position (44b).

(44) **Superiority-obeying question with *every* is ambiguous:**
Which newspaper did **everyone** write to ___ about *which* book?

    a. Wide-scope answering pattern (list of triples):
       Bill wrote to the New York Times about book X, Mary wrote to the Boston Globe about book Y, and Tom wrote to the Maquoketa Sentinel about book Z.

    b. Narrow-scope answering pattern (list of pairs):
       Everyone wrote to the New York Times about book X, everyone wrote to the Boston Globe about book Y, and everyone wrote to the Maquoketa Sentinel about book Z.

The superiority-violating question (45), on the other hand, only has one available reading, corresponding to the list-of-triples reading. The list-of-pairs reading is unavailable. Under the current proposal, this is because in such a case, *everyone* is taking scope inside a region of Rooth-Hamblin alternatives computation. The available list-of-triples reading, on the other hand, allows *everyone* to take scope above C and not along the path of alternatives, despite its pronounced position. Hence, this reading does not lead to an intervention configuration at LF.[21]

(45) **Superiority-violating question with *every* is unambiguous:**
Which book did **everyone** write to *which* newspaper about ___?
Only has answer pattern (a), but not (b).

Pesetsky (2000) furthermore shows that if the universal quantifier is trapped and is unable to scope out of the question, the superiority-obeying question becomes unambiguous and only has a narrow scope reading for the quantifier. The superiority-violating question loses its only reading and becomes ungrammatical. Pesetsky illustrates this point using Quantifier Float, which disallows QR of a quantifier out of the question. For example, (46a) below allows inverse scope of ∀ above *at least*, but (46b), where the quantifier is floated, only allows surface scope.

---

[21]See Beck (1996: §3.1) for similar observations for German multiple questions.

(46)   **Floated quantifiers are restricted in scope to their surface positions:**

    a.   At least one teacher made **each student** sing the national anthem.

    b.   At least one teacher made the students **each** sing the national anthem.

$$\forall > at\ least \text{ possible in (a) but not (b).}$$

In a superiority-obeying multiple question such as (47), (47a) may ask for adult-kid-book triples, such that the kid will persuade the adult to read the book (wide scope reading), or for adult-book pairs, such that each kid in the group will persuade the adult to read the book (narrow scope reading). Example (47b) only permits the list-of-pairs reading. That is, only a narrow-scope reading of the quantifier is available:

(47)   **Quantifier float restricts QR; superiority-obeying question becomes unambiguous:**

    a.   Tell me *which* adult **each kid** will try to persuade ___ to read *which* book.

    b.   Tell me *which* adult the kids will **each** try to persuade ___ to read *which* book.

In the same configuration, a superiority-violating question (48a) is unambiguous, only permitting a wide-scope interpretation of the quantifier, resulting in the list of triples reading of the question. Once the quantifier is floated, as in (48b), the inability of the quantifier to QR out of the question leaves it with no available interpretation:

(48)   **Quantifier float restricts QR; superiority-violating question becomes ungrammatical:**

    a.   Tell me *which* book **each kid** will try to persuade *which* adult to read ___.

    b.   * Tell me *which* book the kids will **each** try to persuade *which* adult to read ___.

Finally, Pesetsky (2000) shows one other way of keeping *every* from scoping out of the question, through modification with *almost*.[22] As in the previous examples, the wide-scope reading of the question is blocked, leading to an unambiguous (narrow-scope) interpretation of the superiority-obeying question. In the superiority-violating question, the narrow-scope reading leads to an intervention configuration and hence to ungrammaticality.

(49)   **Intervention effect with *almost every*:**

    a.   *Which* newspaper did **almost everyone** write to ___ about *which* book?   *obeying*

    b.   * *Which* book did **almost everyone** write to *which* newspaper about ___?   *violating*

---

[22]See Pesetsky's discussion of "unaskable questions:" Scoping *almost everyone* out of the question does not allow for a proper pair-list interpretation.

Reconstructing the intervener

Moving on to the second case of rescuing an intervention configuration in a superiority-violating question, notice that if we are able to reconstruct an intervener *below* the LF position of an in-situ *wh*-phrase, intervention should be avoided, (43b).

(43) **Ways of undoing the intervention configuration in superiority-violating questions:**

    b. ✓ LF: [$_{CP}$ C ... **intervener** ... *wh* ... **intervener**]   reconstruction

This prediction can be tested using universal quantifiers.[23] As we have seen, universal quantifiers are able to receive wide scope, a list-of-triples interpretation. Here, however, we will be interested in the *narrow scope*, list-of-pairs reading. I illustrate this first with the baseline in (50), where *all of the students* is pronounced in its intended scope position.

(50) **Baseline: Superiority-violating question with a raising predicate and low *all*:**
    <u>Context</u>: The first-year students took several classes this past semester, taught by different professors. Each professor thought that the students particularly enjoyed one topic that she taught. Tell me,
    ✓ *Which* topic did it seem to *which* professor that **all of the students** enjoyed ___?

Next, notice that in a syntactic environment as in (50), raised quantifiers can in principle reconstruct into a lower base position. This is shown in (51), where the universal quantifier is pronounced in a high position, but is able to reconstruct it into its base position, where it takes scope below the existential. Therefore, this environment should allow us to test our prediction.

(51) *All* **can reconstruct into base position; inverse scope is available:**
    <u>Context</u>: The first-year students took several classes this past semester, taught by different professors. As their TA, I know that:
    [**All of the students**]$_1$ seemed to *some* professor t_1 to have enjoyed learning about binding.
                                               ✓ $\forall > \exists$, ✓ $\exists > \forall$

Example (52) provides the test-case. The question is judged as grammatical in the given context (which supports a list-of-pairs interpretation, parallel to (50) above), despite the (surface) intervening position of the quantifier:

---

[23] In general, this prediction can only be tested with a subset of the known interveners—namely those that allow A-reconstruction. Interveners such as sentential negation or adverbials such as *always, often* or *never* will not be appropriate candidates for this test. Furthermore, as it has been argued that negative DPs do not undergo A-reconstruction (see e.g. Lasnik 1999, as well as Iatridou and Sichel 2011), this prediction also cannot be tested with interveners such as *no one*.

(52) **Superiority-violating question with raised *all* can have reconstructed reading:**

Context: The first-year students took several classes this past semester, taught by different professors. Each professor thought that the students particularly enjoyed one topic that she taught. Tell me,

✓ *Which* topic did **all** of the students seem to *which* professor to have enjoyed ___?

Furthermore, as shown above, if the quantifier is floated along the path of alternatives, reconstruction is blocked, and intervention is observed. On the other hand, if the quantifier is floated *below* the position of *wh*-in-situ, the question is grammatical and only allows the list-of-pairs interpretation.

(53) **Intervention effects reemerge when *all* is floated along the path of alternatives:**

a. * *Which* topic did the students **all** seem to *which* professor to have enjoyed ___?

b. ✓ *Which* topic did the students seem to *which* professor to have **all** enjoyed ___?

We conclude, therefore, that it is the scope position of the quantifier at LF that is important for the purposes of intervention effects, and not its pronounced position.

Moving the *wh* out of the way

Finally, moving to the last case of rescuing an intervention configuration in a superiority-violating question, we predict that intervention can be avoided by giving the in-situ *wh*-phrase wide scope above an intervener, (43c). Given the assumptions adopted in section 2.2, covert *wh*-movement should not be available to *wh*-in-situ in superiority-violating questions, but other — non-interrogative — movements may still be available.

(43) **Ways of undoing the intervention configuration in superiority-violating questions:**

c. ✓ LF: [$_{CP}$ C ... *wh* **intervener** ... ___] non-interrogative movement

Here I illustrate this prediction using Right-Node Raising (RNR). It is well known that RNR allows exceptional *wh*-movement out of certain islands (Bachrach and Katzir 2009, a.o.). Example (54a) illustrates a canonical relative clause island, which is dramatically improved in (54b), when fed by RNR.[24]

---

[24]For notational convenience, I illustrate the base positions of the shared material in each conjunct with ___, and the shared RNR-ed position (which feeds *wh*-movement) with *t*(race).

(54) **RNR allows exceptional *wh*-movement out of islands (Bachrach and Katzir 2009):**

    a.   * *Which* book did John meet the man who wrote *t* ?

    b.   ✓ *Which* book did [John meet the man who wrote ___], and [Mary meet the man who published ___] *t*?

Building on this observation, we predict that RNR should give *wh*-in-situ in a multiple question exceptionally wide scope, allowing it to evade intervention despite being in a superiority-violating structure. This is indeed the case: Example (55a) is a classic intervention example modeled after Pesetsky's original examples (cf 9). Example (55b) adds a RNR configuration, and the result is much improved and is no longer subject to intervention.

(55) **No intervention in superiority-violating question with RNR:**

    a.   * *Which* book did **only Sue** allow *which* student to read ___?

    b.   ✓ *Which* book did [**only Sue** allow ___], and [**only Mary** require ___], *which* student to read *t*?

See Branan (2017a) for two other cases of exceptionally wide scope for *wh*-in-situ in English superiority-violating questions achieved through non-interrogative movement: extraposition and high attachment of a parasitic gap. Just like in the cases here, when *wh*-in-situ is given wide scope, intervention effects disappear.

We conclude, then, that the crucial factors governing intervention effects are the *LF (scope) positions* of the intervener and of the in-situ *wh*-phrase in the question. Superiority is only important in that it normally allows *wh*-in-situ to covertly move out of the way in superiority-obeying questions. However, the generalization argued for above obtains: intervention effects are observed when material is forced to move into a part of structure in which alternatives are projected from a lower *wh*-in-situ, and avoided otherwise.

4.3   Intervention tracks scope rigidity in Japanese

Finally, I provide additional evidence in support of the proposal argued for above with data from Japanese, drawn from ongoing co-authored work (Erlewine and Kotek 2017a,b, 2018c). This work argues for the following generalization:

(56) **Generalization: Intervention correlates with scope-taking in Japanese**
    Scope-rigid quantifiers above an in-situ *wh* cause intervention. Quantifiers that allow scope ambiguities — i.e., those that allow reconstruction below *wh* — do not.

Our starting point is an observation in Shibata (2015a) that the scope of different disjunctors correlates with their status as interveners, (57–58). *Ka*-disjunction is scope-rigid with respect to negation, and acts as an intervener. At the same time, *naishi*-disjunction leads to scope ambiguities and is not an intervener.[25]

(57) ***ka*-disjunction is scope-rigid; *naishi* is not:**

    a. [Taro-**ka** Jiro]-ga ko-**nak**-atta.

       Taro-or Jiro-ɴᴏᴍ come-ɴᴇɢ-ᴘᴀsᴛ   (Shibata 2015a: 23)

       'Taro or Jiro didn't come.'   ✓or > not, *not > or

    b. [Taro-**naishi** Jiro]-ga ko-**nak**-atta.

       Taro-or   Jiro-ɴᴏᴍ come-ɴᴇɢ-ᴘᴀsᴛ   (Shibata 2015a: 96)

       'Taro or Jiro didn't come.'   ✓or > not, ✓not > or

(58) ***ka* is an intervener; *naishi* is not:**

    a. ??? [Taro-**ka** Jiro]-ga *nani*-o   yon-da-no?

       Taro-or Jiro-ɴᴏᴍ *what*-ᴀᴄᴄ read-ᴘᴀsᴛ-Q   (Hoji 1985:264)

    b. ✓ [Taro-**naishi** Jiro]-ga *nani*-o   yon-da-no?

       Taro-or   Jiro-ɴᴏᴍ what-ᴀᴄᴄ read-ᴘᴀsᴛ-Q

       '*What* did [Taro or Jiro] read?'   (Shibata 2015a: 98)

In current co-authored work in progress (Erlewine and Kotek), we show that this correlation holds across a wide range of quantificational expressions, including universal quantifiers, *only*, *even*, *also*, modified numerals, *wh*-indefinites, and *wh*-NPIs. Here I illustrate just two additional data points in support of the generalization above from this ongoing work.[26]

First, consider another pair of quantifiers with identical meanings — *wh-mo* universal quantifiers[27] and *subete* 'all' — which vary in their scope-rigidity with respect to negation and concomitantly in their status as interveners. Like with disjunction, only the scope-rigid quantifier is an intervener. This is shown in (59–60).

---

[25]In all intervention examples here, scrambling the *wh*-word above the intervener rescues the structure, as shown in (5) above. See e.g. Hoji 1985; Hagstrom 1998; Kim 2002; Beck 2006; Tomioka 2007b for additional examples.

[26]Novel data in this section has been verified with five different Japanese speakers.

[27]As has been widely noted, there are two, superficially similar *wh-mo* forms in Japanese: the universal quantifier series and the NPI/n-word series. However, these forms are easily distinguishable as (a) universal *wh-mo* but not the NPI series preserve original pitch accents on the *wh*-word and (b) universal *wh-mo* but not the NPI series allow case markers; see e.g. Aoyagi and Ishii (1994). On both counts, the form here is a universal *wh-mo*. (The ' indicates that the first syllable of *da're-mo* bears the pitch accent in (59a), echoing the pitch accent on the bare *wh*-word *da're*.)

The judgment here is predicted by the generalization that the universal *wh-mo* takes scope in the pronounced position

(59) *wh-mo* **universal quantifier is scope-rigid;** *subete* **is not:**

    a. **Da're**-o-**mo** tsukamae-**nak**-atta.
       who-ACC-MO catch-NEG-PAST

       '*pro* did not catch anyone.'   ✓every > not, *not > every

    b. [**Subete**-no mondai]-o   toka-**nak**-atta.
        all-GEN   problem-ACC solve-NEG-PAST   (Mogi 2000:59)

       '*pro* did not solve every problem.'   ✓every > not, ✓not > every

(60) *wh-mo* **is an intervener;** *subete* **is not:**[28]

    a. ?? **Da're-mo**-ga *nani*-o   kai-mashi-ta-ka?
       who-MO-NOM what-ACC buy-POLITE-PAST-Q
       Intended: 'What did everyone buy?'   (Hoji 1985:270)

    b. ✓[**Subete**-no gakusei]-ga *dono-mondai*-o   toi-ta-no?
        all-GEN   student-NOM which-problem-ACC solve-PAST-Q
       'Which problem(s) did every student solve?'

Further supporting data comes from the position of 'only' *-dake*. *-dake* can occur outside or inside a postposition: DP-P-*dake* or DP-*dake*-P. Considering their scope with respect to modals, Futagi (2004) show that 'only' in *-P-dake* is scope-rigid, whereas 'only' in *-dake-P* leads to scope ambiguities. Here I show this effect with negation, (61):

(61) **-P-*dake*** **is scope-rigid; -*dake*-P is not:**

    a. Taro-wa Hanako-to-**dake**   hanashi-tei-**nai**.
       Taro-TOP Hanako-with-only talk-PERF-NEG

       lit. 'Taro hasn't talked only with H.'   ✓only > not, *not > only

    b. Taro-wa Hanako-**dake**-to   hanashi-tei-**nai**.
       Taro-TOP Hanako-only-with talk-PERF-NEG

       lit. 'Taro hasn't talked with only H.'   ✓only > not, ✓not > only

This difference in scope again correlates with the two *only*'s status as interveners, (62).

---

of the particle *mo* and cannot reconstruct into a *v*P-internal base position (Yatsushiro 2009), and therefore cannot scope under negation.

[28]Tomioka (2007b:1574) states "...*subete-no-*/*zenbu-no*-NP are not interveners and can c-command *wh*-phrases at S-structure without making the sentence deviant," but does not show the relevant data.

(62) **-P-*dake* is an intervener; *-dake*-P is not:**

a. $^{???}$ Taro-wa Hanako-to-**dake** *nani*-o   tabe-ta-no?
   Taro-TOP Hanako-with-only what-ACC eat-PAST-Q

b. $^{\checkmark}$Taro-wa Hanako-**dake**-to *nani*-o   tabe-ta-no?
   Taro-TOP Hanako-only-with what-ACC eat-PAST-Q
   '*What* did Taro eat (only) with (only) Hanako?'

We conclude, then, that movement and the ability of quantifiers to reconstruct predicts whether or not they will lead to intervention effects. Note that another important conclusion to draw from this data is that intervention cannot be predicted by the semantics of the quantificational elements alone, since the two disjunctors, two universal quantifiers, and two *only*s have equivalent denotations, differing only in their possible scopes at LF. Instead, the nature of intervention must be attributed to the syntax, namely the scope position of the intervener at LF.

We propose to understand the patterns above as follows: Based on scope interactions between different quantificational objects and negation, Shibata (2015a,b) argues that all (DP) objects in Japanese move overtly out of *v*P and above NegP (which Shibata argues has a fixed position just above *v*P), if present. We assume the *v*P-internal subject hypothesis (see e.g. Fukui 1986; Kitagawa 1986; Kuroda 1988), and conclude that all (DP) arguments evacuate *v*P in Japanese. These assumptions are illustrated schematically in (63a).

Quantifiers then vary with respect to their ability to reconstruct: those which cannot reconstruct have obligatory wide-scope with respect to negation (63b), whereas those which can reconstruct lead to scope ambiguities with respect to negation, allowing the LFs in (63b) or (63c).

(63) **Scope-rigidity in Japanese (Shibata 2015a,b):**

a. All arguments move out of *v*P:
   [$_{CP}$ ... DP ... [$_{vP}$ ... *t* ... V]]

b. LF interpretation in surface position leads to wide scope over negation:
   LF: [$_{CP}$ ... DP λx ... [$_{NegP}$ [$_{vP}$ ... x ... V] Neg]]   DP > Neg

c. Some (not all) quantifiers reconstruct into *v*P, allowing narrow scope:
   LF: [$_{CP}$ ...   [$_{NegP}$ [$_{vP}$ ... DP ... V] Neg]]   Neg > DP

Next consider a surface structure where the DP could lead to an intervention configuration (64a). (Movement of the *wh*-phrase to its surface position is not illustrated. The interpreting complementizer is at the left edge of CP for illustration purposes only.) We assume that *wh*-phrases are interpreted in-situ at LF by introducing Rooth-Hamblin alternatives which compose pointwise and will be interpreted by the interrogative complementizer (see section 2.2.2).

If a quantifier is scope-rigid, it has no choice but to lead to the LF configuration in (64b). This is an intervention configuration, (3): the calculation of Rooth-Hamblin alternatives must cross an instance of Predicate Abstraction (λx, in bold), which cannot be defined. But if a quantifier is not scope-rigid — i.e. it can reconstruct at LF — the LF in (64c) will also be available. Alternatively, scrambling the *wh*-word above the potential intervener also avoids intervention (64d) without requiring the DP to reconstruct (see (5) above).

(64) **Predicting an intervention configuration in Japanese:**

    a.   Potential intervener (DP) above *wh*:

        [$_{CP}$ C ... DP ... *wh* ... [$_{vP}$ ... *t* ... V]]

    b.   *LF interpretation in surface position lead to intervention!*

        * LF: [$_{CP}$ C ... DP $\boldsymbol{\lambda x}$ ... *wh* ... [$_{vP}$ ... $\boldsymbol{x}$ ... V]]

    c.   Reconstruction avoids the intervention configuration:

        ✓ LF: [$_{CP}$ C ... *wh* ... [$_{vP}$ ... DP ... V]]

    d.   Scrambling *wh* above also avoids intervention:

        ✓ LF: [$_{CP}$ C ... *wh* λy ... DP $\boldsymbol{\lambda x}$ ... y ... [$_{vP}$ ... $\boldsymbol{x}$ ... V]]

Finally, we note that this proposal leads to the prediction that an otherwise ambiguous quantifiers will become unambiguous in a question, to avoid an intervention effect. Recall that (61b) above showed that the *only* particle *dake* inside a postposition (DP-*dake*-P) can take scope above or below sentential negation, and at the same time is descriptively a non-intervener. Now consider example (65) below. The quantificational PP 'with only Hanako' *Hanako-dake-to* is in a higher position than the *wh*-word in the surface structure, and therefore we predict that it will be forced to reconstruct into its *v*P-internal base position, which will necessarily be below negation.

(65) **DP-*dake*-P must reconstruct below *wh*; *only* > *not* reading is not possible:**

Taro-wa Hanako-**dake**-to *nani*-o   tabe-**nai**-no?
Taro-TOP Hanako-only-with what-ACC eat-NEG-Q

    a.   * 'What does Taro only not eat with Hanako$_F$?'   only > not

        Answer: Squid ink pasta (because he gets embarrassed)

    b.   ? 'What does Taro not eat with only Hanako$_F$?'   not > only

        Answer: Dimsum (because it's better with more people)

The two potential readings are illustrated by the potential expected answers and respective contexts: what is x such that, just when he is with Hanako, Taro won't eat x (wide scope for *only*

over negation), *vs* what is x such that Taro does not eat x only with Hanako (narrow scope for *only*). While both readings are plausible in appropriate supporting contexts, and *-dake*-P can generally scope above or below negation, only (65b) is possible here. This is as predicted by the reconstruction account of non-intervention, illustrated in (64c) above.

Note further that, as expected, scrambling the *wh*-word above *Hanako-dake-to* makes both readings available again. See the LF schema in (64d).

(66) **When *wh* scrambles above intervener, both scope readings become available:**

Taro-wa *nani*-o   Hanako-**dake**-to   ___ tabe-**nai**-no?
Taro-TOP what-ACC Hanako-only-with   eat-NEG-Q

  a. $^?$ 'What does Taro only not eat with Hanako$_F$?'   only > not

  b. $^?$ 'What does Taro not eat with only Hanako$_F$?'   not > only

5   Some implications

I have argued for the generalization in (3–4) — intervention effects in *wh*-questions result from movement into a part of structure in which (non-singleton) Rooth-Hamblin alternatives are computed:

(3) **Intervention as a crossing dependency between movement and focus alternatives:**

    * <u>LF:</u> [$_{CP}$ C … **DP** λx … *wh* … x]

(4) **Intervention is the result of Predicate Abstraction over alternatives:**
    Scope-taking via movement into regions of focus alternatives computation leads to ungrammaticality at LF.

This intervention schema in (3) leads to a variety of consequences and predictions — since λ-binding is used in multiple domains for various phenomena in grammar. In this section I discuss several implications of my proposal: for the representation of focus, movement, and intensionality. I discuss the compatibility of my proposal with existing theories of intervention, and in particular the influential proposal in Beck 2006. I also address a remaining question concerning the status of sentential negation as an intervener. Finally, I briefly discuss two possible exceptions to the proposal I have made here. I sketch thoughts on how the strong claim in (3–4) might be altered to accommodate these exceptions.

5.1 Focus

5.1.1 Beck (2006)

An important question at this point concerns the space of data that the proposal in this paper is meant to account for. In particular, an influential account in Beck 2006 proposes that intervention arises whenever a focus-sensitive operator separates an in-situ *wh*-phrase from the interrogative complementizer that is meant to interpret it:

(67) **Intervention in Beck (2006):**
$$*[_{CP} \text{ C } ... \text{ \textbf{Focus-Op}} ... \text{ } wh \text{ }]$$

This analysis rests on two assumptions, both compatible with the assumptions I have adopted in this paper. First, Beck assumes a semantics for *wh*-phrases as I have adopted in (16), repeated here: *wh*-elements denote Hamblin sets as their alternative value but have an undefined ordinary value (see also Ramchand 1997).

(16) **The semantics of *what*:**
ordinary value: $[\![what]\!]^o$ is undefined
alternatives: $[\![what]\!]^f = \left\{ x \in D_e : x \text{ is not human} \right\}$
$=_c \left\{ \text{Moby Dick, War \& Peace, Oliver Twist} \right\}$

Second, the question operator is assumed to be the only operator that is able to interpret a structure with defined alternatives but an undefined ordinary value.[29] The problem arises when a focus-sensitive operator other than the interrogative operator is the first one to apply to *wh*-alternatives in a structure; such an operator will, by definition, require both the *ordinary* and the *alternative* values of its prejacent in order to make its contribution to the interpretation. However, the ordinary value of a structure containing *wh*-phrases is undefined. This undefinedness will be inherited by the rest of the structure, leading to uninterpretability, described as an intervention effect.

In general, I see no reason why Beck's (2006) theory can't be adopted alongside my own. Such a proposal could account for some cases of intervention, explaining why focus operators are robust cross-linguistic interveners and why judgments with such operators are sometimes described as sharper than with other interveners — the reason would be that such derivations are ill formed both for the reasons spelled out by Beck's proposal and the ones in my proposal.

However, I argue that Beck's theory cannot be adopted wholesale to explain all cases of intervention, in lieu of my own proposal here. This theory suffers from two weaknesses. First, it

---

[29]This is AʟᴛSʜɪꜰᴛ in my proposal, and interrogative C in Beck's. For Cable (2007, 2010), the Q-morpheme and C are the only such operators.

must define all interveners in terms of focus-sensitivity: if some element intervenes, then it must associate with focus. This is a natural description of interveners such as *only* and *even*, but it is not a good description of interveners such as *every, few*, and *no one*, and certainly not definites and indefinites, which I have shown can intervene. This weakens the predictive power of the theory: any operator that shows intervention behavior is assumed to associate with focus, regardless of whether or not there is independent evidence that this is indeed the case. Second, like other theories of intervention effects (discussed in §5.2 below), this proposal cannot predict the correlation between intervener-hood and movement into a region of alternatives computation, which I have shown to be crucial. I conclude that while the Beck 2006 proposal may be correct for some cases of intervention, it cannot be the full story for all such cases.

Given this discussion, a question may arise concerning the intervener *only*. The standard analysis of *only* takes it to associate with in-situ focus, without movement (e.g. Rooth 1985). If this is correct, we would not predict *only* to intervene under the proposal in (3–4), as there is no scope-taking through movement in such constructions. As a result, many of the examples illustrated in this paper will remain unexplained. However, the correct predictions are made if the analysis in Beck (2006) is assumed to be the relevant problem in this case. Alternatively, correct predictions are also made if sentential *only* is assumed to associate with focus through covert movement with pied-piping (Drubig 1994; Tancredi 1997/2008, 2004; Krifka 2006; Wagner 2006; Erlewine and Kotek 2014, 2018a,b), and constituent *only* must be late-merged in derived positions (Shibata 2015a).

5.1.2 Generalized intervention

A question already raised in Beck 2006 concerns intervention with alternatives generated by non-*wh*-elements. Beck refers to this as the Generalized Minimality Effect:

(68) **The Generalized Minimality Effect (Beck 2006):**
      * Op_1 ... $\boldsymbol{Op_2}$ ... XP_F

If Beck's proposal is correct, then intervention should be observed not only with alternatives projected from a *wh*-phrase, but also with ones projected from a focused phrase in cases of in-situ Association with Focus. As the schema in (68) shows, we predict that in sentences with multiple focus association relations between a focus operator and an F-marked constituent, these dependencies cannot be crossing.

However, such examples can be constructed, as Beck notes. Given the context in (69a), example (69b) instantiates the configuration of crossing focus associations predicted to be ungrammatical.

In particular, the *only* in (69b) is predicted to block the proper interpretation of the F-marked *Bob* by the focus operator *also*. However, example (69b) is judged to be grammatical with its intended interpretation.[30] Notice that this prediction crucially relies on the assumption that the focused constituents are interpreted *in-situ* via focus alternatives computation as in Rooth 1985.

(69) **Crossing focus dependencies (Rooth 1996, as cited in Beck 2006):**

    a. I *only* introduced [MARILYN]$_F$ to John Kennedy.

    b. I *also* **only** introduced [Marilyn]$_F$ to [BOB]$_F$ Kennedy.

The fact that this prediction of Beck's (2006) theory of focus intervention is not borne out must mean that (a) Beck's (2006) logic of focus intervention is not correct and/or (b) the assumption that focused constituents as in (69) are interpreted *in-situ* is not correct. I refer the reader to Erlewine and Kotek (2014) for arguments that Beck's (2006) logic of focus intervention is indeed correct, and focus intervention effects *do* affect focus constructions.[31] Instead, the assumption that the associate of *only* is interpreted *in-situ* is the faulty one. Evidence for this conclusion comes from overt focus movement in English *it*-cleft constructions, as well as from focus association with VP-level focus operators, where covert focus movement with pied-piping is shown to correctly predict the distribution of intervention effects in such structures.

5.2 Intervention, topichood, and prosody

As noted at the beginning of this paper, intervention effects have been attributed in the past not only to focus, but also to other factors. Grohmann 2006 and Tomioka 2007a,b, considering data sets in German and Japanese, respectively, attribute intervention to a problem with topichood: interveners are elements that are forced to occur in a position that is associated with topichood, despite not making appropriate topics.[32] At the same time, the problem of intervention has also been attributed to the prosody forced by such structures (Tomioka 2007a,b; Branan 2017b), leading to conflicting requirements on the question and eventually to a crash at the PF level. Yet other proposals attribute intervention to a logical crash resulting from a type-mismatch (Li and

---

[30]The F-marked *Marilyn* in (69b) is clearly interpreted as the semantic focus associate of *only*, but it seems to lack a pitch accent. This is referred to as Second Occurrence Focus (SOF) and is licensed by the preceding context (69a), where it is introduced with a pitch accent. It is possible that *Marilyn* here being SOF is precisely what makes (69b) grammatical. See Tomioka 2012 who proposes that SOF is selective, unlike novel focus associations, which are unselective.

[31]See Krifka (2006) for evidence that multiple association examples such as (69) are sensitive to syntactic islands in a way that is predicted if their derivation involves covert movement.

[32]For example, resisting *-wa* topic-marking in Japanese.

Law 2016), or from the monotonicity properties of interveners (Mayr 2010, 2014, cf Szabolcsi and Zwarts 1993). It goes beyond the scope of this paper to argue for or against each one of these conceptions of intervention. As with the discussion of Beck 2006 above, it is possible that some cases of *wh*-intervention could also be attributed to problems like the ones described in these theories.

However, an important problem faced by all of these approaches (albeit in different ways, depending on the theory) is the fact that they all predict a stable set of interveners. These approaches are therefore all unable to predict or explain the data I have shown in this paper, where intervener-hood crucially correlates with scope-taking via *movement* in a position where focus alternatives are being computed and is not limited to a certain subset of quantifiers. Another dataset that would be left unexplained by these approaches was shown in section 4.3: In Japanese, quantifiers with identical meanings and surface positions act as interveners as a function of whether or not they can reconstruct (and hence scope below *wh*-in-situ) at LF. To my knowledge, the proposal put forth in this paper is the only one that is able to capture this apparent flexibility of intervention effects.

5.3 Negation

Another remaining issue concerns the status of negation as an intervener. Recall the example of intervention effects from Pesetsky 2000, repeated here:

(8) **Intervention effect caused by sentential negation:**
    a.   *Which student* **didn't** ___ read *which book*?   *obeying*
    b.   * *Which book* **didn't** *which student* read ___?   *violating*
        (cf *Which book* did *which student* **not** read ___?)

Here, sentential negation appears to give rise to an intervention effect like the one described in the rest of the paper. But there is no obvious movement that would cause an intervention effect under the current proposal.

One possible solution to this puzzle is that negation undergoes head movement, introducing a λ-binder which could be responsible for causing intervention. This would crucially rely on head movement being an LF operation, a contested issue (see e.g. Travis 1984; Chomsky 1986, 1995, 2000; Baker 1988; Pollock 1989; Brody 2000; Matushansky 2006; Lechner 2006; Hartman 2011; Matyiku 2017 for discussion).

Alternatively, it may be that another account of the data in (8) is necessary. This seems to be a likely possibility, in light of the fact that very similar sentences to the one above, varying only in the nature of the auxiliary hosting the negation, lead to dramatic improvement in the status of the examples. A clue may be furnished by the fact that all of the auxiliaries below (other than *didn't*)

introduce pluralities of events or times. An alternative account may be that the added functional material allows the negation to be interpreted in a different position than its surface position. Whatever the correct analysis, the problem can't simply be with sentential negation, and the data in (8) must fit into a more complex bigger picture. I leave this as an open issue.[33]

(70) **Intervention effects greatly ameliorated with different choice of Aux:**

    a.   *Which student* **couldn't** ___ read *which book*?   *obeying*

    b.   ? *Which book* **couldn't** *which student* read ___?   *violating*

(71) a.   *Which student* **hasn't** ___ read *which book*?   *obeying*

    b.   ? *Which book* **hasn't** *which student* read ___?   *violating*

(72) a.   *Which student* **wouldn't** ___ read *which book*?   *obeying*

    b.   ? *Which book* **wouldn't** *which student* read ___?   *violating*

5.4 Modals

All known interveners, including the new interveners presented in this paper, quantify over individuals. Quantification over world variables does not lead to intervention, nor have any of the examples presented here led to the conclusion that tense, mood, or aspect are relevant for intervention. The examples below show pairs of superiority-obeying and violating questions, where we would otherwise expect — but do not find — a contrast such that the (b) examples, which are superiority-violating, are degraded compared to their (a) counterparts, which are superiority-obeying. (Recall also the data in (70–72) above).

(73) **Modals do not cause intervention effects:**

    a. ✓ *Which abstract* **should** Grace assign ___ to *which reviewer*?

    b. ✓ *Which reviewer* **should** Grace assign *which abstract* to ___?

(74) a. ✓ *Which paper* did Grace **have to** read ___ for *which class*?

    b. ✓ *Which class* did Grace **have to** read *which paper* for ___?

(75) a. ✓ *Which abstract* were you **forced** to assign ___ to *which reviewer*?

    b. ✓ *Which reviewer* were you **forced** to assign *which abstract* to ___?

(76) a. ✓ Which abstract did you **make** Grace assign ___ to *which reviewer*?

    b. ✓ Which reviewer did you **make** Grace assign *which abstract* to ___?

(77) a. ✓ *Which paper* was it **necessary** for you to assign ___ to *which reviewer*?

---

[33]Another potential avenue for an explanation may relate these facts to the behavior of weak islands (Szabolcsi and Zwarts 1993) or to negative islands. See also Mayr 2014 on additivity.

     b. ✓ *Which reviewer* was it **necessary** for you to assign *which paper* to ___?

(78) a. ✓ *Which paper* **may** Grace read ___ for *which class*?

     b. ✓ *Which class* **may** Grace read *which paper* for ___?

(79) a. ✓ *Which paper* **must** Grace read ___ for *which class*?

     b. ✓ *Which class* **must** Grace read *which paper* for ___?

This fact could be taken to call into question whether the problem is with abstraction in general, or with movement and abstraction over individuals in particular. On the other hand, the literature provides various theories of mood/tense/aspect that use indices instead of abstraction for variable binding, and this evidence may provide another argument in their favor (see e.g. Keshet 2008).

5.5 Movement and abstraction at phase edges

Finally, I discuss consequences predicted by the proposal put forth in this paper for the representation of movement. As we have already seen, we must allow covert *wh*-movement to target positions other than interrogative C in order to model the data we have seen here. In the following section I discuss additional consequences for movement and for reconstruction.

5.5.1 Successive-cyclicity and intermediate landing sites

The assumptions adopted in this paper lead to the conclusion that intermediate landing sites of movement must be treated differently than final landing sites. To see this, consider example (80):

(80) **Simple multiple question with embedding and no intervener:**
    Which book λ_i C did Mary think that [$_{CP}$ t_i **λ_j** *which kid* read t_j]?

This is a multiple *wh*-question which does not contain an intervener and is judged by speakers as grammatical. The *wh*-phrase occupying the matrix Spec,CP position has moved from an embedded clause. Under standard assumptions, it undergoes successive-cyclic movement, stopping off at the edge of the embedded CP.[34] Again, under standard assumptions, movement leaves behind a trace, together with a corresponding a λ-binder. The question in (80) is additionally superiority-violating, and hence involves a *wh*-phrase which is interpreted via Rooth-Hamblin alternatives at LF. The resulting structure, then, is an intervention configuration (3). We would hence expect the question to be ungrammatical due to an intervention effect, contrary to fact.

For questions such as (80) to be grammatical, we must admit the possibility that intermediate landing sites of movement behave differently than final landing sites. In particular, notice that

---

[34]And perhaps also at the edge of *v*P, but it suffices that it moves through CP for the purposes of this illustration.

nothing goes wrong if the λ-binder introduced in the intermediate landing site is eliminated from the structure along with the intermediate trace — the trace corresponding to the base position of the moved *wh*-phrase will be bound by the higher λ-binder, introduced below the final landing site of *which book*. Once we have this structure, the in-situ *which kid* can be successfully interpreted using Rooth-Hamblin alternatives, without creating an intervention configuration.[35]

(81) **Relevant LF of a question with embedding for the purposes of intervention:**

<u>LF</u>: $^{\checkmark}$*Which book* $\boldsymbol{\lambda_i}$ C did Mary think that [$_{CP}$ *which kid* read $\boldsymbol{t_i}$]?

The idea that intermediate landing sites of movement should be removed from the derivation has independently gained some traction in recent literature in computational linguistics. For example, Graf, Aksënova, and De Santo (2016) show that intermediate movement can be removed from derivation trees without changing their meaning, leading to computational efficiency and simpler models. Graf and Heinz (2015) show that the complexity of derivation trees without intermediate landing sites of movement is lower than that of derivation trees with such landing sites. Moreover, Stabler (2013), who shows how to implement incremental top-down parsers with Minimalist grammars, does so without appealing to intermediate movements at all. Graf, Monette, and Zhang (2017) show that various syntactic processing effects can be modeled using this parser, and the results are a good fit for the data only when intermediate landing sites of movement are ignored.[36]

5.5.2   Reconstruction

A related conclusion concerning the nature of movement that emerges from the above results is that reconstruction must be viewed as *total*, in the sense that the higher copy of movement and its λ-binder must again not be visible in the derivation at some relevant level of representation. This was required in order to explain the A-movement data in section 4.1, as well as the reconstruction-related data in section 4.2.2 and the Japanese data in section 4.3. In all of the examples shown in these sections, it had to be the case that the higher copy (or copies) of movement is entirely ignored for the purposes of intervention calculation, for much the same reasons as illustrated above for intermediate copies of movement. Only the *scope position* of the (potential) intervener is present at LF.

It follows that proposals that view syntactic reconstruction as a copy-theoretic process in which the *higher* copy of a movement chain is Trace-Converted into a definite description, rather than the

---

[35]I am not committed to the claim that this intermediate trace is never generated in the first place. I am arguing here that at some level of representation relevant to the calculation of intervention, this trace is not visible or is eliminated from the derivation.

[36]I thank Thomas Graf (p.c.) for discussing this literature with me.

lower copy (as in normal cases of movement, see Rullmann and Beck 1998; Fox 2002), will make incorrect predictions. See Erlewine (2014: §7.3) for an explicit proposal for such a mechanism, potential uses, and also potential issues raised by it. I leave aside here the open debate in the literature for the needs for syntactic reconstruction alongside semantic reconstruction.

5.5.3 Relativization in *wh*-questions

A third issue concerns relativization in *wh*-questions. If abstraction is impossible across alternatives, we might predict that questions with a truly in-situ *wh*-phrase cannot contain a relative clause, since the latter involves abstraction as part of its formation. This may be too strong a prediction.[37] Consider the examples in (82):

(82) **Relativization of a structure containing a *wh*-in-situ:**

    a.   *Who* believed [$_{DP}$ the rumor that Mary read *what*]?

    b.   *Who* bought [$_{DP}$ the book that Mary saw *where*]?

We know that the DPs in (82a–b) are islands for extraction, as shown below. Let us assume that this fact is as relevant for covert movement as it is for overt movement.

(83) **Extraction out of a relative clause is impossible:**

    a.   * *What* did you believe [$_{DP}$ the rumor that Mary read *t*]?

    b.   * *Where* did you buy [$_{DP}$ the book that Mary saw *t*]?
            Intended: "Where x is such that you bought the book that Mary saw at place x?"[38]

As a result, the in-situ *wh*-phrase must be interpreted using Rooth-Hamblin alternatives. However, this *wh*-phrase occurs inside a relative clause which, following standard assumptions, is derived through movement of the head or a null operator in the structure to the edge of the relative clause, with abstraction creating a derived property of type $\langle e, t \rangle$ (e.g. Heim and Kratzer 1998, chapter 5). This would therefore be predicted to lead to an ungrammatical result, as alternatives would have to cross a λ-binder, contrary to fact. Alternatively, to save such structures, it may be that *wh* moves above the relative clause, but not outside of the island, thus eschewing the problem.

---

[37]Thanks to Chris Tancredi (p.c.) and to Michael Yoshitaka Erlewine (p.c.) for asking me about such structures.

[38]Cf the grammatical "Where x is such that you bought at place x the book that Mary saw (somewhere)", with *where* interpreted in the matrix, without being generated in, and moved out of, the embedded clause.

5.5.4 Relativized Abstraction

Although it may be possible to explain each potential exception through different means, as I have suggested above, I conclude this section by briefly entertaining the idea that these data points may teach us something deeper about Grammar, if taken seriously.

First, it may be necessary to develop a notion of abstraction that is relativized to the type of variable that is being abstracted over.[39] That is, perhaps abstraction over type e individuals is semantically distinct from abstraction over non-type e variables, including for example world and degree variables.

Second, perhaps we should treat some positions in the derivation as privileged. Phase edges suggest themselves as such positions: perhaps PA over individual alternatives in the alternative set is only well-defined at phase edges. Adopting, therefore, the proposed solution to the PA problem from Novel and Romero (2009) and others discussed above, we exceptionally allow type-raising and updating of the assignment function at these privileged positions, but not at others.[40] This would be implemented in the framework developed here by adopting the type-shifter proposed in Charlow 2017, but allowing it to dynamically update the assignment function only at phase edges, and not at each and every point in the derivation, contrary to its use in Charlow's work. I leave the implementation of this proposal to future work.

6 Conclusion

This paper argues that intervention effects in *wh*-questions arise whenever movement must target a landing site inside a region of structure where Rooth-Hamblin alternatives are computed at LF. Evidence in support of this proposal came from the behavior of English multiple *wh*-questions as well as the behavior of Japanese *wh*-questions. It was shown that intervener-hood correlates with potential interveners' scope position at LF, and not with their semantics or pronounced position. The paper furthermore established the importance of movement and scope-taking in derived positions: intervention occurs when an element moves into regions of alternative calculation, and is absent if this configuration can be avoided in some way at LF: by scoping the intervener above the question or below *wh*, by moving the *wh* out of the way, or by using a non-movement strategy for interpreting the intervener.

The paper proposes to explain these results in terms of a problem with Predicate Abstraction.

---

[39]Perhaps along the lines of Relativized Minimality (Rizzi 1990), which affects both probing and movement operations in the syntax. See Szabolcsi and Zwarts (1993) for the idea that Relativized Minimality may also be relevant for scope-taking for individuals vs non-individuals. I thank Ivona Kučrova (p.c.) for discussing this idea with me.

[40]I thank Michael Yoshitaka Erlewine (p.c.) for pointing this out to me and suggesting this solution.

Given standard assumptions about the nature of movement, adopting a simple, static system of types, with alternatives computed as in Rooth (1985, 1992), Predicate Abstraction cannot be properly defined to yield the desired results when abstracting over non-singleton sets of alternatives. Previous authors who have noticed this problem have sought to correct it — by abandoning movement (Shan 2004), by changing the types system (Poesio 1996; Novel and Romero 2009, cf Charlow 2015, 2017; Ciardelli et al. 2017), or by changing the focus system (Beck 2016).

Instead, this paper argued that none of these amendments to the theory should be adopted. The proposal here builds on a standard syntax of probes and goals, allowing for both A- and $\overline{\text{A}}$-movement. To interpret the resulting structures, we adopt a Heim and Kratzer (1998)-style semantics with simple basic types, in which Rooth-Hamblin alternatives exist alongside movement. *Wh*-phrases can be interpreted both via movement and via alternative computation in different syntactic structures, as needed. That is, we must adopt a system with an inherent flaw, and we must not fix the flaw. The badness of abstraction over alternatives is a feature, not a bug. Intervention effects occur precisely when we attempt to ignore this prohibition.

This strongest version of the proposal emerged as a rhetoric device useful for generating predictions and probing the grammar. As noted above, λ-binders are used in quite a few additional areas of grammar beside movement for scope-taking, and with more types than just individuals. Several consequences were spelled out for the nature of movement and focus, and special attention was paid to two possible remaining exceptions — concerning abstraction over non-individuals and abstraction in privileged (phase-edge) positions. The paper briefly sketched ways in which these exceptions may eventually restrict and modify the strongest claim in systematic ways, to inform a more nuanced theory of movement, focus, and binding. This full proposal is left for future work.

Appendix

This appendix provides a more detailed explanation of the problem of Predicate Abstraction over alternatives. Our goal is to add Roothian focus alternatives to a static semantic system, such as the one in Heim and Kratzer (1998). (The discussion below is based on the presentation of this problem in Novel and Romero 2009.)

As a first pass, it's possible to define the Terminal Nodes rule, Pronounces and Traces rule, and Function Application, as in (84):

(84) **A recursive definition for computing focus-semantic values:**
Terminal nodes (TN):

a. $[\![\alpha_\tau]\!]^f = \begin{cases} \{[\![\alpha_\tau]\!]^o\} & \text{if } \alpha \text{ not F-marked} \\ \text{a subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$

b. Pronouns and traces rule:

$[\![\alpha_i]\!]^f = \begin{cases} g(i) & \text{if } \alpha \text{ not F-marked} \\ \{[\![\alpha_i]\!]^o\} & \text{if } \alpha \text{ F-marked} \end{cases}$

c. Functional application (FA):

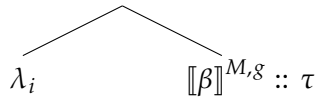$\left[\!\!\left[\begin{array}{c} \alpha_\tau \\ \diagup\diagdown \\ \beta_{\langle\sigma,\tau\rangle} \quad \gamma_\sigma \end{array} \right]\!\!\right]^f = \begin{cases} \{b(d) \mid b \in [\![\beta]\!]^f, d \in [\![\gamma]\!]^f\} & \text{if } \alpha \text{ not F-marked} \\ \text{a contextually-determined subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$

However, how should Predicate Abstraction be defined? A solution is given in (85), alongside a short derivation in (86) to illustrate how this rule is used:[41]

(85) a. Alice saw nobody

b. Nobody λ_i Alice saw t_i

$\lambda x. [\![\beta]\!]^{M,g^{x/i}} :: \langle e, \tau \rangle$

$\diagup\diagdown$

$\lambda_i \qquad\qquad [\![\beta]\!]^{M,g} :: \tau$

(86) a. $[\![t_i]\!]^{M,g} = g(i)$

b. $[\![saw]\!]^{M,g} = \lambda x.\ \lambda y.\ y$ saw x

c. $[\![Alice]\!]^{M,g} = $ Alice

d. $[\![Alice\ saw\ t_i]\!]^{M,g} = 1$ iff Alice saw $g(i)$

e. $[\![\lambda\ Alice\ saw\ t_i]\!]^{M,g} = \lambda x.$ Alice saw $g^{x/i}(i)$
    $= \lambda x.$ Alice saw x

f. $[\![Alice\ saw\ nobody]\!]^{f,M,g} = 1$ iff $\neg\exists x[$Alice saw x$]$

---

[41]Note that in trees here, an expression is given on the left of the "::" and its type on the right.

Next, consider a sentence such as (87), as it would be interpreted in a *wh*-in-situ language:[42]

(87)   a. Who saw nobody?

    b. Nobody λ_i who saw t_i?

Given that the QRed quantifier abstracts over a sister that contains a *wh*-in-situ — interpreted, following our standard assumptions, as a Hamblin set — our goal is to create an abstraction rule over *sets of alternatives*. The derivation in (89) shows how the LF and derivation will be constructed up to the Predicate Abstraction step:

(88) λ_i who saw t_i:: ???

            λ_i who saw t_i:: $\langle t, t \rangle$

        who :: $\langle e, t \rangle$ saw t_i:: $\langle et, t \rangle$

      saw :: $\langle \langle et, t \rangle, t \rangle$ t_i:: $\langle e, t \rangle$

(89)   a. $[\![t_i]\!]^{f,M,g} = \left\{ g(i) \right\}$

    b. $[\![\text{saw}]\!]^{f,M,g} = \left\{ \lambda x.\ \lambda y.\ y \text{ saw } x \right\}$

    c. $[\![\text{saw } t_i]\!]^{f,M,g} = \left\{ \lambda y.\ y \text{ saw } g(i) \right\}$

    d. $[\![\text{who}]\!]^{f,M,g} = \left\{ \text{Alice, Barbara, Carol} \right\}$

    e. $[\![\text{who saw } t_i]\!]^{f,M,g} =$
      $\left\{ \text{Alice saw } g(i), \text{ Barbara saw } g(i), \text{ Carol saw } g(i) \right\}$

    f. $[\![\lambda \text{ Alice saw } t_i]\!]^{f,M,g} = $???

To define PA over alternatives, we begin by adding a λ-operator outside the set arrived at in step (89e) above, as in (90). This mimics the step assumed in (85) above:

(90) $\lambda x.\ [\![\beta]\!]^{M,g^{x/i}} :: \langle e, \langle \tau, t \rangle \rangle$

        λ_i $[\![\beta]\!]^{M,g} :: \langle \tau, t \rangle$

However, this leads to a result which is of the wrong type to be the argument of *nobody*. *Nobody*, defined in (91), expects to take as sister a set of $\langle e, t \rangle$ expressions — type $\langle \langle e, t \rangle, t \rangle$. But the expression in (92) is not of that type. Instead, we require as input a set that looks as in (93).

(91)   **The denotation of *nobody*:**
    $[\![\text{Nobody}]\!]^{M,g} = \left\{ \lambda Q_{\langle e, t \rangle}.\ \neg \exists x_e [Q(x)] \right\}$

(92)   **What we get isn't what we want:**
    $\lambda x.\ \left\{ \text{Alice saw } g^{x/i}(i), \text{ Barbara saw } g^{x/i}(i), \text{ Carol saw } g^{x/i}(i) \right\}$

(93)   **What we want to get:**
    $\left\{ \lambda x.\ \text{Alice saw } g^{x/i}(i),\ \lambda x.\ \text{Barbara saw } g^{x/i}(i),\ \lambda x.\ \text{Carol saw } g^{x/i}(i) \right\}$

---

[42]That is, using Rooth-Hamblin alternatives instead of movement.

To yield a set as in (93), we require a type-shifting rule from type $\langle e, \langle \tau, t \rangle \rangle$ into type $\langle \langle e, \tau \rangle, t \rangle$:[43]

(94) **A procedure for converting [a function into a set of τ-alternatives] to [a set of functions into τ-alternatives]:**

$$\lambda Q_{\langle e, \langle \tau, t \rangle \rangle}. \left\{ f_{\langle e, \tau \rangle} : \forall x_e. f(x) \in Q(x) \right\}$$

But as Shan (2004) shows, a function into sets carries less information than a set of functions. By using the type-shifting rule (94) in the derivation in (88), we end up with a set that contains both *constant* $\langle e, t \rangle$-functions (95) and non-constant $\langle e, t \rangle$-functions (96). The former describe properties like "to be seen by Alice/Barbara/Carol," which are desirable. The latter have no meaning in our system, and should be excluded.

(95) **Constant $\langle e, t \rangle$-functions (desired):**

$$\left\{ \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Alice saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Barbara saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{bmatrix} \right\}$$

(96) **Non-constant $\langle e, t \rangle$-functions (undesirable):**

$$\left\{ \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{bmatrix} \right\}$$

As discussed in section 3, there is no way to fix this problem while holding on to the standard assumptions about movement, types, and alternatives. Several proposals attempt to alter one of the above assumptions in order to fix this problem, but this paper instead argues that this problem should not be fixed, as it is the source of intervention effects. I refer the reader to Shan (2004) and Novel and Romero (2009) for additional discussion.

---

[43]Hagstrom (1998); Kratzer and Shimoyama (2002) and Yatsushiro (2009) define rules along the lines of (94), and thus over-generate. See also Rooth (1985).

References

Aoun, Joseph, and Yen-hui Audrey Li. 1993. *Wh*-elements in situ: Syntax or LF? *Linguistic Inquiry* 24:199–238.

Aoyagi, Hiroshi, and Toru Ishii. 1994. On agreement-inducing vs. non-agreement-inducing NPIs. In *Proceedings of NELS 24*, 1–15.

Bachrach, Asaf, and Roni Katzir. 2009. Right-node raising and delayed spellout. In *Interphases: Phase-theoretic investigations of linguistic interfaces*, ed. Kleanthes K. Grohmann. Oxford, UK: Oxford University Press.

Baker, Mark. 1988. *Incorporation: A theory of grammatical function changing*. Chicago: Chicago University Press.

Beck, Sigrid. 1996. Quantified structures as barriers for LF movement. *Natural Language Semantics* 4:1–56.

Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14:1–56.

Beck, Sigrid. 2016. Focus sensitive operators. In *Oxford handbook of information structure*, ed. Caroline Fery and Shinichiro Ishihara, 227–250. Oxford, UK: Oxford University Press.

Beck, Sigrid. 2019. Crosslinguistic study on intervention effects. Handout from Approaches to *wh*-intervention.

Beck, Sigrid, and Shin-Sook Kim. 2006. Intervention effects in alternative questions. *Journal of Comparative German Linguistics* 9:165–208.

Branan, Kenyon. 2017a. In-situ *wh*-phrases in superiority violating contexts don't have to be in-situ. In *A pesky set: Papers for David Pesetsky*, ed. Claire Halpert, Hadas Kotek, and Coppe van Urk, volume 80, 353–359. Cambridge, MA: MITWPL.

Branan, Kenyon. 2017b. Prosodic intervention. Manuscript, MIT.

Brody, Michael. 2000. Mirror theory: syntactic representation in perfect syntax. *Linguistic Inquiry* 31:29–56.

Büring, Daniel. 2003. On D-trees, beans, and B-accents. *Linguistics and Philosophy* 26:511–545.

Cable, Seth. 2007. The grammar of Q. Doctoral Dissertation, Massachusetts Institute of Technology.

Cable, Seth. 2010. *The grammar of Q: Q-particles, wh-movement, and pied-piping*. Oxford, UK: Oxford University Press.

Charlow, Simon. 2015. Alternatives via scope. Class handout, Rutgers University.

Charlow, Simon. 2017. The scope of alternatives: Indefiniteness and islands. Manuscript, Rutgers.

Chomsky, Noam. 1986. *Barriers*. Linguistic Inquiry Monographs. MIT Press.

Chomsky, Noam. 1995. *The minimalist program*. Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: the framework. In *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, 89–155. MIT Press.

Ciardelli, Ivano, Floris Roelofsen, and Nadine Theiler. 2017. Composing alternatives. *Linguistics and Philosophy* 40:1–36.

Comorovski, Ileana. 1989. Discourse and the syntax of multiple constituent questions. Doctoral Dissertation, Cornell University.

Comorovski, Ileana. 1996. *Interrogative phrases and the syntax-semantics interface*. Dordrecht: Kluwer.

Constant, Noah. 2014. Contrastive topic: meanings and realizations. Doctoral Dissertation, University of Massachusetts Amherst.

Drubig, Hans B. 1994. Island constraints and the syntactic nature of focus and association with focus. *Arbeitspapiere des Sonderforschungsbereichs 340: Sprachtheoretische Grundlagen der Computerlinguistik* 51.

É Kiss, Katalin. 1986. Against the LF-movement of *wh*-phrases. Ms., Hungarian Academy of Sciences, Budapest.

Eilam, Aviad. 2008. Intervention effects: Why Amharic patterns differently. In *Proceedings of WCCFL 27*, ed. Natasha Abner and Jason Bishop, 141–149. Somerville, MA: Cascadilla Proceedings Project.

Erlewine, Michael Yoshitaka. 2014. Movement Out of Focus. Doctoral Dissertation, Massachusetts Institute of Technology.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2014. Intervention in focus pied-piping. In *Proceedings of NELS 43*, ed. Hsin-Lun Huang, Ethan Poole, and Amanda Rysling, volume 1, 117–130. Amherst: GLSA.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2017a. Intervention tracks scope-rigidity in Japanese. In *Proceedings of LENLS 14*.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2017b. Movement and alternatives don't mix: Evidence from Japanese. In *Proceedings of the Amsterdam Colloquium*, ed. Alexandre Cremers, Thom van Gessel, and Floris Roelofsen, 245–255.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2018a. Focus association by movement: Evidence from binding and parasitic gaps. In *Proceedings of Sinn und Bedeutung 21*, ed. Robert Truswell, Chris Cummins, Caroline Heycock, and Hannah Rohde, 399–407.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2018b. Focus association through movement: Evidence from Tanglewood. *Linguistic Inquiry* 49:441–463.

Erlewine, Michael Yoshitaka, and Hadas Kotek. 2018c. Intervention tracks scope-rigidity in Japanese. Manuscript.

Fox, Danny. 2002. Antecedent-contained deletion and the copy theory of movement. *Linguistic*

Inquiry 33:63–96.

Fox, Danny. 2012. More on questions. Class notes, MIT seminar.

Fukui, Naoki. 1986. A theory of category projection and its application. Doctoral Dissertation, Massachusetts Institute of Technology.

Futagi, Yoko. 2004. Japanese focus particles at the syntax-semantics interface. Doctoral Dissertation, Rutgers, The State University of New Jersey.

Graf, Thomas, Alëna Aksënova, and Aniello De Santo. 2016. A single movement normal form for minimalist grammars. In *Formal grammar: 20th and 21st international conferences*, ed. Annie Foret, Glyn Morrill, Reinhard Muskens, Rainer Osswald, and Sylvain Pogodalla, 200–215. Berlin, Heidelberg: Springer.

Graf, Thomas, and Jeffrey Heinz. 2015. Commonality in disparity: The computational view of syntax and phonology. Talk given at GLOW 2015, April 2015.

Graf, Thomas, James Monette, and Chong Zhang. 2017. Relative clauses as a benchmark for Minimalist parsing. *Journal of Language Modelling* 5:57–106.

Grohmann, Kleanthes K. 2006. Top issues in questions: Topics—topicalization—topicalizability. In *Wh-movement: Moving on*, ed. Lisa Lai-Shen Cheng and Norbert Corver. Cambridge, MA: MIT Press.

Hagstrom, Paul. 1998. Decomposing questions. Doctoral Dissertation, Massachusetts Institute of Technology.

Haida, Andreas. 2007. The indefiniteness and focusing of *wh*-words. Doctoral Dissertation, Humboldt University Berlin.

Haida, Andreas, and Sophie Repp. 2013. Focus alternatives or indefinite alternatives? experimental evidence. In *Proceedings of the 19th Amsterdam Colloquium*, ed. Maria Aloni, Michael Franke, and Floris Roelofsen, 131–138.

Hamblin, Charles. 1973. Questions in Montague English. *Foundations of Language* 10:41–53.

Hartman, Jeremy. 2011. The semantic uniformity of traces: Evidence from ellipsis parallelism. *Linguistic Inquiry* 42. Massachusetts Institute of Technology.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Blackwell.

Hoji, Hajime. 1985. Logical Form constraints and configurational structures in Japanese. Doctoral Dissertation, University of Washington.

Howell, Anna, Vera Hohaus, Polina Berezovskaya, Julia Braun, Konstantin Sachs, Sehriban Durmaz, and Sigrid Beck. 2019. (no) variation in the grammar of alternatives. Manuscript, Universität Tübingen.

Iatridou, Sabine, and Ivy Sichel. 2011. Negative DPs, A-movement, and scope diminishment. *Linguistic Inquiry* 42.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1:3–44.

Karttunen, Lauri, and Stanley Peters. 1980. Interrogative quantifiers. In *Time, tense, and quantifiers*, ed. Christian Rohrer, 181–205. Niemeyer.

Keshet, Ezra. 2008. Good intensions: paving two roads to a theory of the *de re/de dicto* distinction. Doctoral Dissertation, Massachusetts Institute of Technology.

Kim, Shin-Sook. 2002. Intervention effects are focus effects. In *Proceedings of Japanese/Korean Linguistics 10*, 615–628.

Kitagawa, Yoshihisa. 1986. Subjects in Japanese and English. Doctoral Dissertation, University of Massachusetts Amherst.

Kitagawa, Yoshihisa, Katsuo Tamaoka, and Satoshi Tomioka. 2013. Prosodic matters in intervention effects in Japanese: An experimental study. *Lingua* 124:41–63.

Kotek, Hadas. 2014. Composing questions. Doctoral Dissertation, Massachusetts Institute of Technology.

Kotek, Hadas. 2016a. Covert partial *wh*-movement and the nature of derivations. *Glossa* 1(1):1–19.

Kotek, Hadas. 2016b. On the semantics of *wh*-questions. In *Proceedings of Sinn und Bedeutung 20*.

Kotek, Hadas. 2017. Dissociating intervention effects from superiority in English *wh*-questions. *The Linguistic Review* 34:397–417.

Kotek, Hadas. 2019. *Composing questions*. Cambridge, MA: MIT Press.

Kotek, Hadas, and Michael Yoshitaka Erlewine. 2016. Intervention effects in relative pronoun pied-piping: experimental evidence. In *Proceedings of Sinn und Bedeutung 20*.

Kratzer, Angelika. 1991. The representation of focus. In *Semantik/semantics: An international handbook of contemporary research*, ed. Arnim von Stechow and Dieter Wunderlich, 825–834. Berlin: Mouton de Gruyter.

Kratzer, Angelika. 2005. Indefinites and the operators they depend on: From Japanese to Salish. In *Reference and quantification: the Partee effect*, ed. Gregory Carlson and Francis Pelletier. CSLI.

Kratzer, Angelika, and Junko Shimoyama. 2002. Indeterminate pronouns: the view from Japanese. In *Proceedings of the 3rd Tokyo conference on psycholinguistics*, 1–25.

Krifka, Manfred. 2001. Quantifying into question acts. *Natural Language Semantics* 9:1–40.

Krifka, Manfred. 2006. Association with focus phrases. In *The architecture of focus*, 105–136. Mouton de Gruyter.

Kuno, Susumu, and Jane Robinson. 1972. Multiple *wh* questions. *Linguistic Inquiry* 3.

Kuroda, Sige-Yuki. 1988. Whether we agree or not: a comparative syntax of English and Japanese. *Linguisticæ Investigations* 12:1–47.

Lasnik, Howard. 1999. Chains of arguments. In *Working minimalism*, ed. Sam Epstein and Norbert Hornstein, 189–215. Cambridge, MA: MIT Press.

Lechner, Winfred. 2006. An interpretive effect of head movement. In *Phases of interpretation*. Walter de Gruyter.

Li, Haoze, and Jess Law. 2016. Alternatives in different dimensions: A case study of focus intervention. *Linguistics and Philosophy* 39:201–245.

Matushansky, Ora. 2006. Head movement in linguistic theory. *Linguistic Inquiry* 37:69–109.

Matyiku, Sabina Maria. 2017. Semantic effects of head movement: Evidence from negative auxiliary inversion. Doctoral Dissertation, Yale University.

May, Robert. 1977. The grammar of quantification. Doctoral Dissertation, Massachusetts Institute of Technology.

May, Robert. 1985. *Logical Form: Its structure and derivation*. MIT Press.

Mayr, Clemens. 2010. The role of alternatives and strength in grammar. Doctoral Dissertation, Harvard University.

Mayr, Clemens. 2014. Intervention effects and additivity. *Journal of Semantics* 31:513–554.

Mogi, Toshinobu. 2000. Toritate-shi-no kaisosei-ni tsuite [on the layeredness of focus particles]. In *Proceedings of the Fall 2000 meeting of the Society for Japanese Linguistics*, 54–61.

Nicolae, Andreea. 2013. Any questions? Doctoral Dissertation, Harvard University.

Nissenbaum, Jon. 2000. Investigations of covert phrase movement. Doctoral Dissertation, Massachusetts Institute of Technology.

Novel, Marc, and Maribel Romero. 2009. Movement, variables, and Hamblin alternatives. In *Proceedings of Sinn und Bedeutung 14*.

Pesetsky, David. 1987. *Wh*-in-situ: movement and unselective binding. In *The representation of (in)definiteness*. MIT Press.

Pesetsky, David. 2000. *Phrasal movement and its kin*. Cambridge, MA: MIT Press.

Poesio, Massimo. 1996. Semantic ambiguity and perceived ambiguity. In *Semantic ambiguity and underspecification*, ed. Kees van Deemter and Stanley Peters, 159–201. Chicago, IL: CSLI.

Pollock, Jean-Yves. 1989. Verb movement, universal grammar, and the structure of IP. *Linguistic Inquiry* 20:365–424.

Ramchand, Gillian. 1997. Questions, polarity and alternative semantics. In *Proceedings of NELS 27*, 383–396.

Reinhart, Tanya. 1997. Quantifier scope: How labour is divided between QR and choice functions. *Linguistics and Philosophy* 20:335–397.

Reinhart, Tanya. 1998. *Wh*-in-situ in the framework of the Minimalist Program. *Natural Language Semantics* 6:29–56.

Richards, Norvin. 1997. What moves where when in which language? Doctoral Dissertation, Massachusetts Institute of Technology.

Rizzi, Luigi. 1990. *Relativized minimality*. Cambridge, MA: MIT Press.

Roberts, Craige. 1996. Information structure: Towards an integrated formal theory of pragmatics. In *OSU working papers in linguistics: Papers in semantics*, ed. J.H Yoon and A. Kathol, volume 49, 91–136. The Ohio State University Department of Linguistics.

Rooth, Mats. 1985. Association with focus. Doctoral Dissertation, University of Massachusetts, Amherst.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1:75–116.

Rooth, Mats. 1996. On the interface principles for intonational focus. In *Proceedings of SALT 6*, 202–226.

Ross, John Robert. 1967. Constraints on variables in syntax. Doctoral Dissertation, Massachusetts Institute of Technology.

Rullmann, Hotze, and Sigrid Beck. 1998. Reconstruction and the interpretation of *which*-phrases. In *Proceedings of the 1997 Tübingen Workshop*, ed. G. Katz, S.-S Kim, and H. Winhart.

Sag, Ivan Andrew. 1976. Deletion and Logical Form. Doctoral Dissertation, Massachusetts Institute of Technology.

Shan, Chung-chieh. 2004. Binding alongside Hamblin alternatives calls for variable-free semantics. In *Proceedings of SALT 16*.

Shibata, Yoshiyuki. 2015a. Exploring syntax from the interfaces. Doctoral Dissertation, University of Connecticut.

Shibata, Yoshiyuki. 2015b. Negative structure and object movement in Japanese. *Journal of East Asian Linguistics* 24:217–269.

Shimoyama, Junko. 2001. *Wh*-constructions in Japanese. Doctoral Dissertation, University of Massachusetts Amherst.

Shimoyama, Junko. 2008. Indeterminate NPIs and scope. In *Proceedings of SALT 18*.

Stabler, Edward P. 2013. Two models of minimalist, incremental syntactic analysis. *Topics in Cognitive Science* 5:611–633.

Szabolcsi, Anna, and Frans Zwarts. 1993. Weak islands and an algebraic semantics for scope taking. *Natural Language Semantics* 1:235–284.

Tancredi, Chris. 1990. Not only EVEN, but even ONLY. Manuscript, MIT.

Tancredi, Christopher. 1997/2008. Focus, focus types, and associative operators. 1997 manuscript, printed in *Reports of the Keio Institute of Cultural and Linguistic Studies* 39:1–62, 2008.

Tancredi, Christopher. 2004. Associative operators. *Gengo Kenkyu* 125:31–82.

Tomioka, Satoshi. 2007a. Intervention effects in focus: From a Japanese point of view. In *Proceedings of the 2nd Workshop on Prosody, Syntax, and Information Structure (WPSI 2)*, ed. Shinichiro Ishihara, 97–117. Potsdam: Potsdam University Press.

Tomioka, Satoshi. 2007b. Pragmatics of LF intervention effects: Japanese and Korean interrogatives. *Journal of Pragmatics* 39:1570–1590.

Tomioka, Satoshi. 2012. Focus matters in neo-Hamblin semantics. Presented at GLOW 35 Workshop on Association with Focus, May 2012.

Tomioka, Satoshi. 2019. Intervention effects: More questions than answers. Handout from Approaches to *wh*-intervention.

Travis, Lisa. 1984. Parameters and effects of word order variation. Doctoral Dissertation, Massachusetts Institute of Technology.

Uegaki, Wataru. 2018. A unified semantics for the Japanese Q-particle *ka* in indefinites, questions and disjunctions. *Glossa: a journal of general linguistics* 3(1).

Wagner, Michael. 2006. Association by movement: evidence from NPI-licensing. *Natural Language Semantics* 14:297–324.

Willis, Paul. 2008. The role of topic-hood in multiple-*wh* question semantics. In *Proceedings of WCCFL 27*, 87–95.

Wold, Dag. 1996. Long distance selective binding: the case of focus. In *Proceedings of SALT 6*, ed. Teresa Galloway and Justin Spence, 311–328.

Yatsushiro, Kazuko. 2009. The distribution of quantificational suffixes in Japanese. *Natural Language Semantics* 17:141–173.