Covert partial *wh*-movement and the nature of derivations

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Wh-movement is commonly thought to be caused by a syntactic probing operation, initiated by an interrogative probe on C, and triggering subsequent movement to the specifier of C. In this paper I argue that at least covert *wh*-movement cannot be described in these terms. I argue instead that covert movement can optionally target positions other than interrogative C, and that movement is triggered by the interpretational needs of the *wh*-phrase itself. Evidence will come from the interaction of English multiple *wh*-questions with *intervention effects*: I document a pattern of intervention effects that is explained only if English in-situ *wh*-phrases are interpreted neither in their base-generated positions nor at interrogative C, but in non-interrogative intermediate positions.

Keywords: multiple *wh*-questions, *wh*-in-situ, intervention effects, covert movement, probing, top-down and bottom-up derivations, Economy

1 Introduction

Question formation in English involves at least two steps. First, a structure is formed in which a *wh*-phrase is produced as the argument of a verb or as an adjunct. Second, this *wh*-phrase is fronted to the left edge of the sentence. Such movement is commonly thought to be caused by an Agree/Attract operation triggered by an interrogative probe on C (Chomsky, 1995, 2000, and much other work), as illustrated in the two-step procedure in (1).

(1) **The Agree/Attract model of *wh*-movement**

a. [$_{CP}$ C$_{+wh}$ did [$_{TP}$ Fred introduce *Which student* to Mary?]] *Agree*

b. [$_{CP}$ *Which student* C$_{+wh}$ did [$_{TP}$ Fred introduce ____ to Mary?]] *Attract*

This paper investigates the behavior of English multiple *wh*-questions. In a multiple question, only one *wh*-phrase is pronounced at the left edge, with all remaining *wh*-phrases pronounced in-situ, in their base-generated positions, (2a). Recent research on English multiple questions suggests that the (phonologically) in-situ *wh*-phrase in such questions undergoes *covert wh-movement* to a position near the overtly fronted one (Richards, 1997; Pesetsky, 2000; Nissenbaum, 2000; Beck, 2006; Cable, 2007, 2010), (2b).[1]

[1]It is important here that we are dealing with a superiority-obeying question. The authors cited above treat *wh*-in-situ in superiority-violating questions such as (i) differently—namely, they argue that *wh*-in-situ in these questions is fully in-situ and does not undergo any covert movement. Here I will concentrate only on superiority-obeying questions and will not comment on superiority violations any further. See also footnote 7 below.

(i) *Which professor* did Mary introduce *which student* to ____?

(2) **The formation of a multiple question**[2,3]

a. *Which student* did Mary introduce to *which professor*?

b. LF: [$_{CP}$ *Which student which professor* C$_{+wh}$ [$_{TP}$ Fred introduced ____ to ____]]

Upon first glance, it is possible to assume that covert *wh*-movement is triggered by the same mechanism that triggers overt movement in English. This is indeed what the proposals cited above assume. This is most explicitly spelled out in Richards (1997) and Pesetsky (2000): the *wh* probe on C probes the structure more than once, until all phrases with *wh*-features have been found and Agreed with. The following step-by-step derivation is assumed for (2):

(3) **The Agree/Attract model of covert *wh*-movement**

a. Step 1: the interrogative probe on C probes its c-command domain.
The *wh*-phrase base-generated higher, *which student*, is found.
[$_{CP}$ C$_{+wh}$ [$_{TP}$ did Fred introduce *Which student* to *which professor*?]]

b. Step 2: *Which student* is attracted to interrogative Spec,CP.
[$_{CP}$ *Which student* C$_{+wh}$ [$_{TP}$ did Fred introduce ____ to *which professor*?]]

c. Step 3: the interrogative probe on C again probes its c-command domain.
The *wh*-phrase base-generated lower, *which professor*, is found.
[$_{CP}$ *Which student* C$_{+wh}$ [$_{TP}$ did Fred introduce ____ to *which professor*?]]

d. Step 4: *Which professor* is attracted to Spec,CP.
[$_{CP}$ *Which student which professor* C$_{+wh}$ [$_{TP}$ Fred introduced ____ to ____]]

However, upon closer inspection of the behavior of covert *wh*-movement in English, I will argue that the picture in (3) is untenable. In particular, I will argue that covert *wh*-movement can target positions other than interrogative C, in a pattern that is best explained if movement is triggered for the interpretational needs of the *wh*-phrase itself and not by an Attract operation triggered following Agreement between the interrogative probe and the *wh*.

The evidence will come from superiority-obeying multiple questions in which a (phonologically) in-situ *wh*-phrase occurs inside a syntactic island and their behavior with regard to *intervention effects*. I show that intervention happens when an intervener occurs *above* the island but not when it is *inside* the island. This constitutes a new pattern of intervention effects not previously documented in English, thus contributing to the correct characterization of intervention effects, and a new pattern of *wh*-movement in English, contributing to our understanding of interrogative syntax/semantics.

[2]Throughout: solid arrows indicate overt movement, dashed arrows indicate covert movement, and squiggly arrows indicate areas of focus-alternative computation.

[3]The movement here is shown with tucking-in (Richards, 1997), as standardly assumed in this literature. Nothing hinges on this choice, as we will see below.

The remainder of the paper is structured as follows: Section 2 provides the necessary background on the phenomenon of intervention effects and describes the context of multiple questions with islands, which will be the main testing ground for the feature-driven derivation of covert *wh*-movement. Section 3 will examine the interaction of multiple questions with syntactic islands with intervention effects, and motivate the generalization that *intervention effects occur above the island but not inside it*. Section 4 will argue that covert *wh*-movement is thus best explained as driven by the interpretational needs of *wh* and not by the traditional feature-driven probing mechanism. Section 5 is the conclusion.

2 Background

Before introducing the data that will be central to the discussion in this paper, I present a short introduction to the phenomenon of intervention effects and its use as a diagnostic for regions of covert movement vs. regions of in-situ interpretation.

2.1 Intervention effects

The term *intervention effect* describes a situation in which a question is rendered ungrammatical because an in-situ *wh*-phrase is c-commanded by an offending *intervener*—certain quantificational and negative elements, as well as focus-sensitive items—at LF.[4] Cross-linguistically, intervention effects have been found in *wh*-fronting languages as well as in *wh*-in-situ languages, and several competing theories have been proposed to explain the phenomenon (see e.g. Beck, 1996, 2006; Grohmann, 2006; Haida, 2007; Tomioka, 2007; Mayr, 2014; Li and Law, 2014). The effects of intervention are best observed in *wh*-in-situ languages such as Japanese. Although question formation in these languages generally does not require *wh*-fronting, in-situ *wh*-phrases must scramble above interveners, in order to avoid intervention effects. Example (4) shows this effect for Japanese.[5]

(4) **Intervention effects in Japanese** (data from Tomioka, 2007)

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

b. ?* **Dare-mo** *nani-o* yom-ana-katta-no?
no-one what-ACC read-NEG-PAST-Q

c. ✓ *Nani-o* **dare-mo** ___ yom-ana-katta-no?
what-ACC no-one read-NEG-PAST-Q
'What did no one read?'

[4]The precise characterization of the set of interveners is subject to debate in the current literature. Here I will not attempt to contribute to this literature.

[5]Throughout, interveners will be marked in boldface font.

A parallel effect can be observed in German, for *wh*-in-situ in multiple *wh*-questions: *wh*-words must scramble to avoid being c-commanded by an offending intervener, (5).

(5) **German: intervention above *wh*-in-situ** (data from Beck, 1996)

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

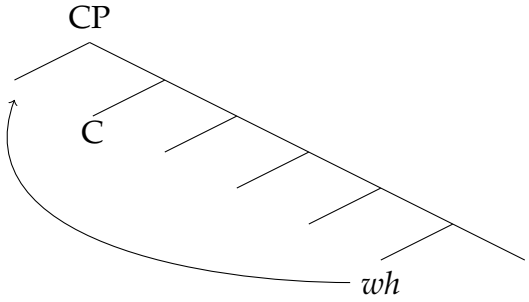
b. ?? *Wer* hat **niemanden** *wo* angetroffen?
who has no-one where met

c. ✓ *Wer* hat *wo* **niemanden** ___ angetroffen?
who has where no-one met
'Who met no one where'?

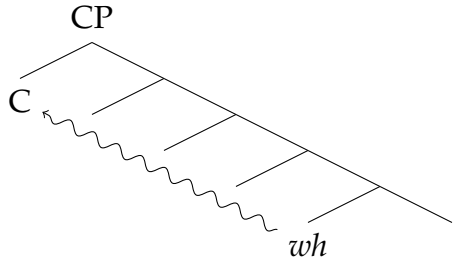
Recent theories of question syntax/semantics propose two strategies for the interpretation of in-situ *wh*-phrases: Covert movement (Karttunen 1977, a.o), and in-situ composition through the projection of focus alternatives (Hamblin 1973; Rooth 1985, 1992; Kratzer and Shimoyama 2002, a.o).

(6) **Two options for the interpretation of in-situ *wh***

a. Covert movement



b. Focus-alternatives

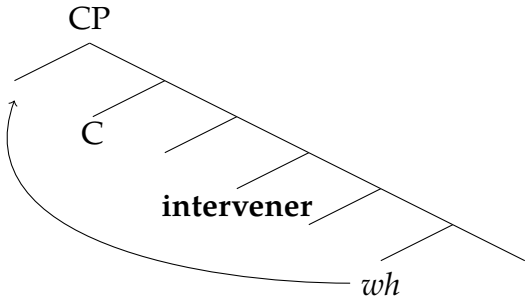


In an influential proposal, Beck (2006) argues that the in-situ strategy of interpreting *wh*-phrases is sensitive to intervention effects: if an intervener occurs between an in-situ *wh*-phrase projecting alternatives and the C that must interpret them, it will block the alternatives from reaching C, causing the derivation to crash, (7b).[6] The covert movement strategy of interpreting *wh*-phrases is immune to focus intervention effects: intervention only affects *wh*-phrases that are interpreted through focus-alternatives but not overt or covert *wh*-movement chains, (7a).

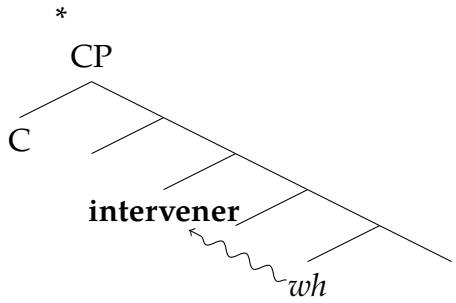
[6]The precise reasons for this crash need not concern us here. In a nutshell, Beck proposes that interveners are operators that make use of focus alternatives. If they are the first operator in the way of a *wh*-phrase, they will attempt to make use of the focus-alternatives projected from it. This causes two problems: first, the operator is unable to make correct use of these alternatives, as only interrogative C is able to interpret them correctly. Second, interrogative C does not have the right kind of sister that would allow it to assign the question an interrogative meaning.

(7) **Only the focus alternatives method is sensitive to intervention**

a. Covert movement:



b. Focus-alternatives:



In English, questions such as (8), parallel to (5) above, appear to be immune to intervention effects (É Kiss, 1986; Pesetsky, 2000), despite the fact that an intervener appears to be c-commanding an in-situ *wh*-phrase.

(8) **English questions are immune from intervention effects**
Which student did **no one** introduce ____ to *which professor*?

Following this logic, Pesetsky (2000)—and all work on English intervention effects following him—argues that English questions like (8) have an LF as in (9), where the (phonologically) in-situ *wh*-phrase is interpreted above the intervener, and therefore we correctly predict that intervention effects should not occur.[7]

(9) **Intervention in (8) is avoided via covert movement**
✓[$_{CP}$ *Which student which professor* C_{+wh} did [$_{TP}$ **no one** introduced ____ to ____]]

Below I use intervention effects as a diagnostic for whether or not covert *wh*-movement has occurred in the derivation of a question: the presence of an intervention effect will teach us that a (phonologically) in-situ *wh*-phrase must be interpreted in-situ via the projection

[7] The pattern of intervention effects in English is more complex than I present here. In particular, intervention effects appear to correlate with superiority. Pesetsky (2000) presents the pattern in (i): although it is generally possible to ask both superiority-obeying and superiority-violating multiple *wh*-questions with D-linked *wh*-phrases (ia-b), when an intervener (here: negation) occurs above the (phonologically) in-situ *wh*-phrase, we find that superiority-obeying questions are immune to intervention (ic), but superiority-violating questions become ungrammatical (id).

(i)	a.	*Which student*$_1$ read *which book*$_2$?	Superiority-obeying, no intervener
	b.	*Which book*$_2$ did *which student*$_1$ read?	Superiority-violating, no intervener
	c.	*Which student*$_1$ **didn't** read *which book*$_2$?	Superiority-obeying, intervener
	d.	* *Which book*$_2$ **didn't** *which student*$_1$ read?	Superiority-violating, intervener

Note that an intervention effect only affects the pair-list reading of a question: Pesetsky (2000, p. 60), citing Beck (p.c.), reports that at least for some speakers, questions in configurations as in (7b) do not become ungrammatical but rather lose their pair-list reading. See also Kotek (2014a,b) for relevant discussion.

of focus-alternatives, whereas the lack of an intervention effect will teach us that the *wh*-phrase must have covertly moved above the scope of the intervener. See also Kotek and Erlewine (to appear) and Erlewine and Kotek (2014) for other arguments motivating this diagnostic.

2.2 Multiple questions with islands

The crucial data for this paper will come from the interaction of intervention effects with English multiple questions in which the (phonologically) in-situ *wh*-phrase occurs inside a syntactic island. It is therefore important to note at the outset that I will not be taking as my starting point the often-cited claim by Dayal (2002) that questions such as (10), where the lower *wh* is inside an adjunct island, only have a single-pair reading (10a) and lack a pair-list reading (10b).[8]

(10) **Multiple question with island reportedly only allows single-pair reading:**
Which linguist will be offended if we invite *which philosopher*?
   a. ✓ Single pair: Professor Smith will be offended if we invite Professor Black.
   b. #/* Pair-list (Dayal 2002 judgment):
      Professor Smith will be offended if we invite Professor Black, and
      Professor King will be offended if we invite Professor Jones.

The judgment in (10) has recently been contested by Cheng and Demirdache (2010), citing Chris Tancredi (p.c.), who offers the context in (11) with the judgment that the pair-list answer (10b) is felicitous here and the single-pair answer (10a) is deviant.

(11) **Multiple question with island can also have a pair-list reading:**
Context: Each of two philosophers will be offended if we invite one of two linguists.
What I want to know is:
Which philosopher will be offended if we invite *which linguist*?
   a. ✓ Pair-list: Quine will be offended if we invite Chomsky, and
      Lewis will be offended if we invite Kayne.
   b. #/* Single pair (infelicitous due to context):
      Quine will be offended if we invite Chomsky.

In what follows I build on Cheng and Demirdache's (2010) conclusion that pair-list readings are indeed available across islands, in addition to the single-pair reading. This is important since—as noted above—it is specifically the pair-list reading of a multiple question that is sensitive to intervention effects. With a single exception,[9] I have found that native speakers of English find the target sentence in (11a) grammatical and felicitous in the context.

[8] Dayal (2002) credits an anonymous reviewer with providing this original judgment. See footnote 9.

[9] The judgments here have been confirmed with over 20 native speakers of North American English. The individual with exceptional judgments informs me that, in fact, they were the reviewer who provided the original judgment that is reported in Dayal (2002).

3 Intervention effects in multiple questions with islands

In this section I turn my attention to an investigation of the presence and extent of covert *wh*-movement in English multiple questions, and how this can shed light on the feature-driven analysis of *wh*-movement. As discussed in section 2.1, superiority-obeying multiple questions in English are generally exempt from intervention effects. The analysis of this fact proposed in the literature is schematized in (12): wh_2 is pronounced in-situ but covertly moves to C and is therefore not c-commanded by the intervener at LF.[10]

(12) **Schema of the pronounced and LF word-orders of superiority-obeying question**
Pronounced: $[_{CP}\ wh_1\ C_{+wh}\ [_{TP}\ ...\ \textbf{intervener}\ ...\ wh_2\ ...\ ]]$
LF: $[_{CP}\ wh_1\ wh_2\ C_{+wh}\ [_{TP}\ ...\ \textbf{intervener}\ ...\ t_2\ ...\ ]]$

Here I will focus on the interaction between intervention effects and multiple questions in which the (phonologically) in-situ *wh*-phrase occurs inside a syntactic island. Two structures will be relevant for the following investigation: a structure in which an intervener occurs *inside* the island and one in which an intervener occurs *above* the island. In both cases, the intervener c-commands the in-situ wh_2 on the surface.

(13) **The interaction between questions with islands and intervention effects**
a. Intervener *inside* the island:
$[_{CP}\ wh_1\ C_{+wh}\ [_{TP}\ ...\ [_{ISLAND}\ ...\ \textbf{intervener}\ ...\ wh_2\ ...\ ]]]$
b. Intervener *above* the island:
$[_{CP}\ wh_1\ C_{+wh}\ [_{TP}\ ...\ \textbf{intervener}\ ...\ [_{ISLAND}\ ...\ wh_2\ ...\ ]]]$

The intervention effect diagnostic introduced in section 2.1 will allow us to detect whether the in-situ *wh*-phrase is interpreted in-situ at LF via the projection of focus alternatives, or via covert movement: if the presence of an intervener in the structure leads to the loss of the pair-list reading of the question—an intervention effect—we know that covert movement must not have been able to target a position above the intervener, or no covert movement has taken place. If we do not detect an intervention effect, sufficient movement must have taken place in the structure. The intervention configuration is repeated in (14):

(14) **Intervention affects in-situ *wh* interpretation but can be avoided by movement**
a. ✓ $[_{CP}\ C\ ...\ wh\ ...\ \textbf{intervener}\ ...\ t\ ...\ ]$
b. * $[_{CP}\ C\ ...\ \textbf{intervener}\ ...\ wh\ ...\ ]$

Studying the structures in (13) will allow us to ask two related questions about covert *wh*-movement. First, **if covert *wh*-movement happens, must it target interrogative C?** This is standardly assumed in theories of interrogative semantics: the mechanism that interprets

[10] The label "1" indicates the *wh*-phrase base-generated higher and the label "2" indicates the one that is base-generated lower. The movement of wh_1 is not shown in order to simplify the schema.

questions through movement requires all *wh*-phrases to occupy positions local to interrogative C for them to be interpretable (Karttunen, 1977, and much subsequent work). If movement to this position is not possible, *wh* may be interpreted in-situ via an alternative mechanism of focus-alternative composition (Hamblin, 1973, and much subsequent work). This same all-or-nothing stance is often implicitly adopted in theories of interrogative syntax, including those which have been proposed for English multiple questions, cited in the text above.

Second, **is covert *wh*-movement sensitive to syntactic islands?** If movement is able to target positions other than interrogative C—as I will argue below—one way to show this is to restrict the possible landing sites of movement. In particular, syntactic islands are known to block overt movement out of them (Ross, 1967), and they have been argued to affect at least some instances of covert movement (e.g. Huang, 1982). If covert movement in English differs from overt movement only in the choice of which copy of the movement chain is pronounced (as in e.g. Bobaljik 1995, Chomsky 1995, 2000, or Pesetsky 2000), it should be similarly sensitive to islands.

These question may be answered in three different ways:

(a) If islands are a PF phenomenon, as often assumed for example in the literature on the amelioration of island effects through ellipsis (cf Ross, 1969; Merchant, 2001, among many others), then they should not restrict covert movement. Hence, *wh*-movement should be able to target interrogative C and we predict no intervention effects regardless of the position of the intervener in (13).

(b) If islands restrict covert movement, two results are possible: under the standard all-or-nothing approach to covert *wh*-movement, since movement can't target interrogative C, the *wh* stays completely in-situ and is interpreted through the projection of focus-alternatives. Since in-situ composition is sensitive to intervention, we predict intervention effects in (13) regardless of the position of the intervener. Alternatively, if movement can target positions other than interrogative C, we predict intervention effects to occur if an intervener is *above* the island (13b) but not if it is *inside* it (13a): *wh*-movement should be able to target a position above any intervener that occurs inside the island, but not positions above interveners that occur outside it.

(c) If islands can be covertly pied-piped to C, as has been proposed for Japanese (Nishigauchi, 1990; Richards, 2000), we predict no intervention effects for interveners occurring above the island (13b), as the island can scope above them at LF. Intervention effects may occur inside the island (13a) if covert *wh*-movement can't target intermediate positions but instead is an all-or-nothing operation that must target interrogative C. Alternatively, if movement can target other positions, then we predict no intervention inside the island.

With this background in mind, let us turn our attention to the data. To foreshadow, I will show that the following generalization holds:

(15) **Generalization: the interaction of intervention effects and islands**
Intervention occurs when an intervener is placed *above* an island containing a *wh*, but not when an intervener is placed *inside* the island.

First let us re-examine example (10) from Dayal (2002), repeated here as the slightly modified (16).[11] As we saw above, this question has two felicitous readings: a single-pair reading and a pair-list reading. Since in this section we are only interested in the presence or absence of the pair-list reading of a given question, I will restrict my attention to this reading alone. All the examples below have felicitous single-pair readings.[12]

(16) **Lower *wh* inside adjunct island: pair-list reading is available**
Context: The linguists at the conference are very picky about attending the conference dinner. However, each of them adores one philosopher and will certainly attend the dinner if that philosopher is invited. What I want to know is:
Q: *Which* linguist will come [if we invite *which* philosopher]?
A: Chomsky will come if we invite Quine,
Kayne will come if we invite Lewis,
Labov will come if we invite Russell, ...

Similarly, when the in-situ *wh*-phrase is inside a Complex NP (CNP) island, the resulting question can have both a single-pair reading and a pair-list reading.

(17) **Lower *wh* inside CNP island: pair-list reading is available**
Context: The linguists at the conference are very suspicious of rumors. However, each of them believed one of the rumors going around that we invited a particular famous philosopher to the conference party. What I want to know is:
Q: *Which* linguist believed the rumor [that we invited *which* philosopher]?
A: Chomsky believed the rumor that we invited Quine,
Kayne believed the rumor that we invited Lewis,
Labov believed the rumor that we invited Russell, ...

Examples (16) and (17) thus provide us with baselines for the crucial test cases. Next, we introduce interveners into these questions, (18)–(19). We find that an intervention effect, diagnosed by the loss of the pair-list reading, occurs when an intervener (here: *only* or negation, in bold) occurs above the island, but not when it is inside the island.

[11] In this example, I have replaced the predicate *be offended* with *come*, since native speakers report that it is easier to judge the question with the latter predicate than with the former. I use an *if*-adjunct in the text, but the facts remain the same if a *because*-adjunct is used instead.

[12] Some speakers struggle to detect the single-pair reading of the question in some cases and hence describe an intervention effect as the full ungrammaticality of the question. I believe that all these speakers can eventually detect this reading, if an appropriate context is provided. Crucially, all speakers agree on the loss of the pair-list reading.

(18) **Adjunct island: intervention *above* but not *inside* island**

a. Context: The linguists at the conference don't really want to attend the conference dinner. However, each of them adores one philosopher and has said that they will come just in case that phil. is invited. What I want to know is:
Q: *Which* linguist will **only** come [if we invite *which* philosopher]?
* A: Chomsky will only come if we invite Quine,
Kayne will only come if we invite Lewis,
Labov will only come if we invite Russell, ...

b. Context: The linguists at the conference are looking forward to the conference dinner. However, each of them dislikes all but one philosopher and will attend the dinner just in case that phil. alone is invited. What I want to know is:
Q: *Which* linguist will come [if we **only** invite *which* philosopher]?
✓ A: Chomsky will come if we only invite Quine,
Kayne will come if we only invite Lewis,
Labov will come if we only invite Russell, ...

(19) **CNP island: intervention *above* but not *inside* island**

a. Context: The linguists at the conference are very gullible and believe lots of rumors. However, each of them is suspicious of one rumor about a phil. that we supposedly invited to the conference party. What I want to know is:
Q: *Which* linguist **didn't** believe the rumor [that we invited *which* phil.]?
* A: Chomsky didn't believe the rumor that we invited Quine,
Kayne didn't believe the rumor that we invited Lewis,
Labov didn't believe the rumor that we invited Russell, ...

b. Context: The linguists at the conference are very suspicious of rumors. However, each of them believed the rumor that we failed to invite one philosopher to the conference party. What I want to know is:
Q: *Which* linguist believed the rumor [that we **didn't** invite *which* phil.]?
✓ A: Chomsky believed the rumor that we didn't invite Quine,
Kayne believed the rumor that we didn't invite Lewis,
Labov believed the rumor that we didn't invite Russell, ...

Some speakers report similar contrasts in questions with an in-situ *wh*-phrase inside the complement clause of a non-bridge verb, such as *dream* or *shout*. Such verbs have been argued to be islands for extraction (Zwicky, 1971; Erteschik-Shir, 1973, a.o.), and we therefore predict that interveners that occur above the complements to such verbs but not ones that occur inside them (20b) should cause an intervention effect, diagnosed by the lack a pair-list reading. This prediction is indeed borne out, as illustrated in (20a–b).

(20) **Complements to non-bridge verbs: intervention *above* but not *inside* island**[13]
   a. * *Which* protester **didn't** shout [that we invited *which* politician]?
   b. *Which* protester shouted [that we **didn't** invite *which* politician]?

Furthermore, configurations with three *wh*-phrases similar to those studies by Cheng and Demirdache (2010), where two *wh*-phrases are inside an island and one is outside, again exhibit intervention effects, diagnosed by the loss of the pair-list reading, when an intervener occurs above the island (21a) but not when it is inside it (21b). This is again predicted by the generalization in (15) and is consistent with the behavior of multiple questions that we have seen in (18)–(20).

(21) **Questions with three *wh* exhibit intervention *above* but not *inside* the island**
   a. * *Which* ling. **didn't** believe the rumor [that *which* student invited *which* phil.]?
   b. *Which* ling. believed the rumor [that *which* student **didn't** invite *which* phil.]?

Note that if two *wh*-phrases occur outside the island and only one *wh*-phrase is inside it, we predict a pair-list reading with the answer for the third *wh* held constant. This prediction is borne out:[14]

(22) **Questions with three *wh*: pair-list reading for *wh*s above the island**
Which linguist **didn't** tell *which* philosopher about the rumor [that *which* student had won a dissertation prize]?

Finally, I note that if the in-situ *wh*-phrase can be given exceptional wide scope, so that it occupies a position above the intervener at LF, we expect the question to become grammatical again. Here I will use extraposition, building on Williams' generalization and the extension of this logic in Fox and Nissenbaum (1999):

(23) **Williams' generalization (Williams, 1974, ch. 4):**
When an adjunct β is extraposed from a "source NP" α, the scope of α is at least as high as the attachment site of β (the extraposition site).

Given Williams' generalization, we expect extraposition of a relative clause containing an in-situ *wh* in examples like (19) to assign the *wh* wider scope than when it is not extraposed. The relevant example is given in (24) below. Example (24a), repeated from (19a), provides a baseline without extraposition.[15] When the relative clause is extraposed above the tem-

[13]Again, it is crucially the pair-list reading that is affected. The judgments I report here are different than judgments for very similar examples found in Dayal (2002): Dayal reports judgments provided by an LI anonymous reviewer, according to which both (20a) and (20b) are ungrammatical. I have been unable to find speakers who confirm Dayal's reported judgments. Instead, speakers consistently report the judgments that I illustrate here.

[14]I thank Anonymized (p.c.) for bringing this possibility to my attention.

[15]Following Fox's (1995; 2000) work on Scope Economy, I assume that covert movement of the relative clause is blocked, because it does not affect the semantic interpretation of the question. This economy principle is overridden in the case of overt extraposition, where movement has consequences for the pronunciation of the sentence.

poral adjunct *yesterday*, giving the relative clause exceptional wide scope, the sentence improves (24b).[16]

(24) **Extraposition allows exceptional wide scope for in-situ *wh*:**
   a. * *Which* philosopher **didn't** believe the rumor that we invited *which* linguist?
   b. ? *Which* philosopher **didn't** believe the rumor yesterday [that we invited *which* linguist]?

To summarize, the structural description of the configuration yielding intervention effects can be summarized as in (25), repeated from above:

(25) **Generalization: the interaction of intervention effects and islands**
Intervention occurs when an intervener is placed *above* an island containing a *wh*, but not when an intervener is placed *inside* the island.

The data presented here instantiates a novel pattern of intervention effects in superiority-obeying questions: intervention occurs in questions in which the lower *wh*-phrase is trapped inside an island if and only if an intervener is placed *above* the island but not *inside* it. This constitutes a counter-example to the generalization in Pesetsky (2000) and subsequent work that intervention effects in English correlate strictly with superiority, such that superiority-violating questions are sensitive to intervention effects while superiority-obeying questions are immune from such effects. Moreover, this finding has important implications for theories of interrogative syntax/semantics.

4 Covert movement and the nature of syntactic derivations

I began the discussion in section 3 by asking two related questions. First, if covert *wh*-movement happens, must it target interrogative C? Second, is covert *wh*-movement sensitive to syntactic islands? In this section I will argue that the finding that intervention effects occur *above* the island but not *inside* it teaches us that covert movement must take place in the questions we are examining, that it is sensitive to syntactic islands, and that it must be able to target positions other than interrogative C. Below I discuss the nature of this movement and how it should be derived, and show that very different predictions are made for bottom-up models of syntax as opposed to top-down ones.

As discussed in section 3, current theories of interrogative syntax/semantics assume that a *wh*-phrase must either covertly move to interrogative C or else stay in-situ and project focus-alternatives between its base position and C at LF. This type of derivation can be straightforwardly accommodated in a probe/goal feature-driven model of covert movement, illustrated in (26):

[16]The improvement may also be felt with high epistemic adverbs such as *fortunately*.

(26) **The Agree/Attract model of covert *wh*-movement**
Which linguist invited *which philosopher?*

a. Step 1: the interrogative probe on C probes its c-command domain.
The *wh*-phrase base-generated higher, *which student*, is found.
[$_{CP}$ C_{+wh} [$_{TP}$ *Which linguist* invited *which philosopher*?]]

b. Step 2: *Which linguist* is attracted to interrogative Spec,CP.
[$_{CP}$ *Which linguist* C_{+wh} [$_{TP}$ ____ invited *which philosopher*?]]

c. Step 3: the interrogative probe on C again probes its c-command domain.
The *wh*-phrase base-generated lower, *which philosopher*, is found.
[$_{CP}$ *Which linguist* C_{+wh} [$_{TP}$ ____ invited *which philosopher*?]]

d. Step 4: *Which philosopher* is attracted to Spec,CP.
[$_{CP}$ *Which linguist which philosopher* C_{+wh} [$_{TP}$ ____ invited ____]]

For questions in which the lower *wh*-phrase is trapped inside an island, a derivation as in (26) is blocked because covert movement cannot cross the island. Consider examples (27a–c), summarizing the pattern discovered in section 3.

(27) **Questions with islands are grammatical, if intervener inside island**

a. ✓ *Which linguist* believed the rumor [$_{ISLAND}$ that we invited *which philosopher*]?

b. ✓ *Which linguist* believed the rumor [$_{ISLAND}$ that we **didn't** invite *which phil.*]?

c. * *Which linguist* **didn't** believe the rumor [$_{ISLAND}$ that we invited *which phil.*]?

Example (27a) is consistent with a derivation involving no covert movement at all—that is, a derivation in which Step 4 in (26) is replaced with an in-situ interpretation step, involving projection of focus-alternatives between the base position of *which philosopher* and interrogative C (Hamblin, 1973; Rooth, 1985), (28). This type of derivation can be straightforwardly accommodated in the standard probe/goal model of covert movement: following Agreement with the *wh*-phrase that is base-generated lower, *which philosopher* (Step 3 in (26) above), no Attract operation is initiated and instead an in-situ mode of composition is used to interpreted the *wh*.

(28) **In-situ derivation for (27a), replacing Step 4 in (26)**
Step 4: *Which philosopher* is interpreted in-situ following Agreement with C.
[$_{CP}$ *Which ling.* C_{+wh} [$_{TP}$ ____ believed the rumor [$_{ISLAND}$ that we invited *which phil.*?]]

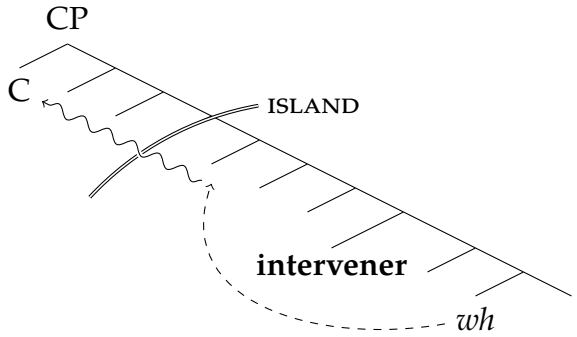
This type of derivation for questions with islands correctly predicts that (27c) will be ungrammatical, since, following Beck (2006) and other work, we know that the in-situ method of *wh*-interpretation is sensitive to intervention. However, because there are focus alternatives projected in the entire region between the base position of *which philosopher* and C, we predict that any intervener along the way—inside or outside the island—

should cause an intervention effect. We hence incorrectly predict that (27b) should also be ungrammatical.

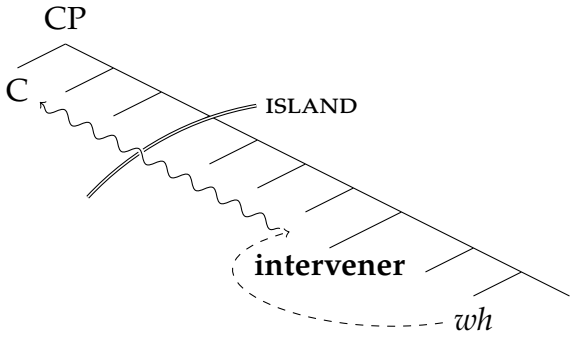
Instead, the derivation that would predict the full pattern in (27) is one involving **a *partial movement* step to a position above the intervener and possibly as high as the edge of the island**, followed by an in-situ interpretation step between the landing site of movement and C. This proposal provides support for a theory of interrogative syntax/semantics that contains both movement and focus-alternative computation within the derivation of a single multiple *wh*-question (cf. Pesetsky 2000; Beck 2006 for superiority; Cable 2010; Kotek and Erlewine to appear for pied piping). However, note that the two mechanisms are used here in a novel order of operations: first, a short movement step occurs. Then, the *wh* projects focus-alternatives, which are interpreted by C. See Kotek (2014a) for a semantic proposal that is able to interpret structures with the syntax that I am proposing here.

An immediate question arises as to the precise extent and nature of the covert *wh*-movement I propose here. Two states of affair are consistent with the findings of section 3: movement could be *maximal*, targeting the edge of the island regardless of the position of any interveners inside the island (29), or movement could be *minimal*, triggered only if there is an intervener in the island, and targeting a position immediately above the intervener (30). Both types of derivations would correctly predict that interveners occurring above an island would cause an intervention effect (27c), as covert movement can only target a position as high as the edge of the island but no higher. We also correctly predict that we should not find intervention effects inside the island, as covert movement is able to target a position above interveners that are inside the island.

(29) **Movement to edge of island**



(30) **Movement just above intervener**



These two possible configurations for covert *wh*-movement in English follow naturally from two different models of structure building in syntax: I will show here that a bottom-up model would predict maximal movement as in (29), while a top-down model would predict minimal movement as in (30). I discuss both of these options below.

4.1 Bottom-up derivations: English as covert Romanian

Consider first a bottom-up model of syntax. In such a model, *wh*-phrases carrying interrogative features enter the derivation in earlier cycles than the interrogative C that they

eventually Agree with.[17] *Wh*-phrases are then 'carried along' into higher phases using edge features (Chomsky, 2001, 2008, among others) or a similar mechanism, or through Greedy movement (Chomsky, 1995). In a question without islands, movement is thus predicted to terminate in interrogative Spec,CP, where *wh* and C can enter into a local relationship.

This view of covert *wh*-movement is standardly assumed in work on English questions, for example in Richards (1997); Pesetsky (2000), who propose to view English as a covert version of a multiple *wh*-fronting language, such as Bulgarian or Romanian. Bulgarian and Romanian require all *wh*-phrases in a question to overtly front to the specifiers of interrogative C. English question LFs are argued to have a similar structure, but there is a pronunciation rule that dictates that only one *wh*-phrase is pronounced in its moved position, with all other *wh*-phrases pronounced in their base-generated positions.[18]

If a barrier to movement such as an island is present, we may assume that it will restrict movement, so that the *wh*-phrase will move to the edge of the island but be unable to proceed any further. This will give rise to a structure as in (29), and correctly predict the observed generalization regarding intervention effects in English multiple questions, (25).

As noted by Cheng and Demirdache (2010), following Ratiu (2005, 2007), a derivation of this form is overtly exemplified in multiple *wh*-questions in Romanian. Romanian is a multiple *wh*-fronting language, normally requiring all *wh*-phrases in a multiple question to overtly front to specifiers of interrogative C. However, in the presence of an island we observe a different behavior: a *wh*-phrase cannot move outside an island, (31a), and it also cannot stay in its base-generated position, (31b). Instead the *wh*-phrase moves to the edge of the island, (31c).

(31) **Overt multiple fronting in Romanian questions** (Ratiu, 2005, 2007)

a. ***Wh* can't move out of the island:**

* [$_{CP}$ *cine*$_i$ ***ce***$_k$ [$_{IP}$ t$_i$ o cunoaşte pe studenta
who what CL.3.FS know PREP student

[$_{ISLAND}$ *căreia* i s-a dedicat t$_k$ ieri?]]]
which.DAT CL.DAT.3SG EXPL.AUX dedicated yesterday

b. ***Wh* can't stay in-situ:**

* [$_{CP}$ *cine*$_i$ [$_{IP}$ t$_i$ o cunoaşte pe studenta
who CL.3.FS know PREP student

[$_{ISLAND}$ *căreia* i s-a dedicat ***ce***$_k$ ieri?]]]
which.DAT CL.DAT.3SG EXPL.AUX dedicated what yesterday

[17] I assume here that *v*P and CP are phases. This is certainly true for the island-containing structures discussed in this paper.

[18] See Pesetsky (2000); Cable (2010) for details on such pronunciation rules.

c. ***Wh* moves to the edge of the island:**

✓[$_{CP}$ *cine*$_i$ [$_{IP}$ t$_i$ o cunoaşte pe studenta
who CL.3.FS know PREP student

[$_{ISLAND}$ *căreia* ***ce***$_k$ i s-a dedicat t$_k$ ieri?]]]
which.DAT what CL.DAT.3SG EXPL.AUX dedicated yesterday

'Who knows the student to whom was dedicated what yesterday?'

Cheng and Demirdache (2010) motivate a partial movement derivation for English questions with islands from this parallel with the overt behavior of Romanian, and in addition from a consideration of the readings of English questions with three *wh*-phrases where some *wh*-phrases are "trapped" inside an island. See Cheng and Demirdache (2010) for details.

This model of structure building is thus naturally consistent with a theory in which covert movement is *maximal*: in most cases, we will end up with a derivation in which covert movement targets interrogative Spec,CP, as in the traditional theory (Karttunen, 1977). However, notice that within this model, movement must be caused by the needs of the *wh*-phrase itself and not by the needs of interrogative C: if C required all *wh*-phrase to reach its edge, be it for syntactic or for semantic reasons, we would be unable to correctly predict any partial movement and hence be unable to model the pattern of intervention effects presented in section 3 of the paper. Specifically, in the case of questions with islands, we predict movement to the edge of the island and no further, and we require a semantic model that allows for a non-movement mechanism for the interpretation of *wh*-phrases in intermediate positions, as in Kotek (2014a).

Notice, however, that once a syntax and semantics are put in place that allow *wh*-phrases to be interpreted without requiring movement to interrogative C, the mechanisms of edge features and Greedy movement become conceptually more difficult to justify. Edge features may fail to Attract a *wh* across an island but not lead to a crash in the derivation (Preminger, 2011). Similarly, the Greedy movement mechanism pushes a *wh*-phrase as far as it can, but the derivation does not crash if the *wh* does not reach its destination. But why would we assume the existence of these mechanisms in the first place, if we independently must assume a syntax/semantics that is able to interpret *wh*-phrases partially or completely in-situ, in non-interrogative positions?

A more parsimonious syntax would not assume such syntactically-driven mechanisms as a general rule, and instead would model covert *wh*-movement as triggered only when necessary for the interpretational needs of question: here, *wh* cannot be interpreted if it is c-commanded by an intervener and hence the only convergent LF for such a structure must involve movement of the *wh* above the intervener. Out of considerations of Economy, such movement would, all things being equal, be predicted to be as short as possible, targeting a position immediately above the intervener. This, however, is not straightforwardly accommodated in a bottom-up model of syntax, involving probes and goals, edge features, or Greedy movement, without encountering a lookahead problem: how can we

know what is the lowest position at which the *wh* is interpretable before we know what the path between *wh* and C looks like—and specifically, where interveners occur, if any?

We may be able to predict that movement will target the lowest possible position in a bottom-up model through a theory of Economy that utilizes trans-derivational competition (e.g. Reinhart, 2006), but such approaches have recently fallen from grace. However, this movement is naturally predicted in a top-down model of syntax that does not require trans-derivational competition, as I will illustrate next.

4.2 Top-down derivations: English as covert German

Consider next a top-down, left-to-right model of syntax, often used to describe how parsing of natural language unfolds (Phillips, 1996, among others).[19] Under such a model, the parsing of a question is straightforward in English: the presence of an interrogative C heading a question is made explicit by the overt fronting of a *wh*-phrase to Spec,CP. It is now possible to keep track of any interveners and islands occurring inside this question. If a second *wh*-phrase is encountered—marking the fact that we are constructing a multiple question—it is immediately clear that this *wh*-phrase cannot occupy a position below an intervener, because the *wh* would not be interpretable in such a position. The lowest target position of covert movement is also immediately clear: it is the position immediately above the intervener.[20] If the *wh* is trapped inside an island, the extent of movement will be clearly limited by its presence, which would have already been encountered before the *wh*-phrase is encountered.

This model of structure building is thus naturally consistent with a theory in which covert movement is partial, minimal, and happens only when it is necessary for interpretability. Therefore no movement happens if no intervener is present in a question, and movement would target a position immediately above an intervener if one is present, to avoid an intervention effect. This will give rise to a structure as in (30). However, movement cannot escape an island, and hence interveners occurring outside the island lead to ungrammaticality.

This state of affairs is parallel to cases of overt scrambling observed in German multiple questions. As mentioned in section 2.1, in-situ *wh*-phrases in German scramble above any interveners in the structure in order to avoid ungrammaticality. The relevant data is repeated here from (5) above: although in-situ *wh*-phrases can normally be interpreted in their base-generated position (32a), they cannot be c-commanded by an intervener and instead must scramble above it (32b–c).

[19] A similar description could be given for a production model. For simplicity, I will only discuss parsing in the text.

[20] A longer movement step could be possible but may be ruled out by considerations of Economy (Chomsky, 1995; Fox, 1995, 2000).

(32) **German: intervention above *wh*-in-situ** (data from Beck, 1996)

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 met no one where'?

We can capitalize on this parallel by proposing that covert *wh*-movement in English is a more restricted, local operation than the unbounded dependency we normally conceive of for overt *wh*-movement. Specifically, it may be fruitful to think of covert *wh*-movement as a form of *covert scrambling*. If proposals such as Johnson and Tomioka (1997) are on the right track, Quantifier Raising in English should also be recast as covert scrambling. If so, English has exactly one covert scope-taking operation—scrambling—parallel to its overt counterpart in German. English, then, is not a covert version of Romanian, as often assumed in the literature, but instead a covert version of German.

Such a proposal may be advantageous from an acquisition point of view, as well as from general principles of parsimony. Proposals that assume long-distance covert movement alongside the more restricted QR in English may face more difficulty than theories that implement just one type of covert movement operation. Moreover, we can explain how the overt vs. covert nature of scrambling can be acquired by a child: there will be ample evidence in the input that German allows overt scrambling. If the lack of evidence for an overt variant of the operation signals to the child that the target language contains a covert variant of it, the child will acquire covert scrambling in English.

This state of affairs thus leads to the conclusion that overt *wh*-movement and covert *wh*-movement may be qualitatively different from one another. While overt *wh*-movement always targets one and the same position—the specifier of interrogative C—and happens without exception, covert movement may target different positions in the structure and may not occur at all in some cases.[21]

5 Conclusion

The behavior of superiority-obeying multiple *wh*-questions in which the lower *wh* is trapped inside an island with regard to intervention effects (Beck, 2006) sheds light on the syntax and semantics of *wh*-questions. I motivate the generalization that intervention effects occur *above* the island in such cases, but not *inside* it. This state of affairs requires a syntax

[21] See arguments in Pesetsky (2000) from intervention effects and from the resolution of Antecedent Contained Deletion that *wh*-in-situ in English superiority-violating questions do not undergo covert movement.

that allows for partial covert movement of *wh*-phrases to intermediate, non-interrogative positions in the derivation, followed by focus-alternative computation between the landing site of *wh* and C (Hamblin, 1973; Rooth, 1985).

This is not compatible a probe-goal approach to movement triggered by the needs of C, such that C requires the *wh*-phrase to occupy its specifier, nor is it compatible with semantic theories where *wh*-phrases must stand in a local relation with C in order to be interpretable, such as the influential Karttunen (1977) and subsequent work. I discuss the nature of bottom-up vs. top-down derivations for covert *wh*-movement, and show that they make different predictions with regard to the nature and extent of movement. Specifically, bottom-up derivations predict movement to be long-distance, targeting interrogative C unless it is blocked by a barrier along the way. As such, we may conceive of English as a covert version of Romanian. Alternatively, top-down derivations predict movement to be as short as possible and to be triggered only when necessary, akin to covert scrambling. Under this view, we can conceive of English as a covert version of German. I point out some conceptual difficulties with the bottom-up approach to the derivation of covert *wh*-movement, favoring the instead the top-down approach. Ultimately, however, I do not rule out either approach, and instead leave this issue open for future research.[22]

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[22] See Kotek and Hackl (2015) for an attempt that favors the minimal movement approach.

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