Glossa a journal of general linguistics

Kotek, Hadas. 2016. Covert partial *wh*-movement and the nature of derivations. *Glossa: a journal of general linguistics* 1(1): 25. 1–19, DOI: http://dx.doi.org/10.5334/gjgl.49

RESEARCH

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, which triggers subsequent movement to the specifier of C. In this paper I argue that at least English covert *wh*-movement cannot be described in these terms. I argue instead that covert movement can target positions other than interrogative C, and that this movement is triggered by the interpretational needs of the *wh*-phrase itself, rather than the formal needs of interrogative C. 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 can be interpreted at LF in non-interrogative intermediate positions.

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

1 Introduction

Wh-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):[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 of the clause, with all remaining *wh*-phrases pronounced *in-situ*, (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).[2]

[1] Here we set aside T-to-C movement, which is irrelevant for the purposes of this paper.
[2] It is important here that we are dealing with a superiority-obeying question. See below for how superiority-violating questions are treated. The focus of this paper will be on superiority-obeying questions.

(2) The formation of a multiple question:[3,4]
   a. *Which student* did Mary introduce to *which professor*?
   b. LF: [$_{CP}$ *Which stu. which prof.* 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 stu.* C$_{+wh}$ [$_{TP}$ did Fred introduce ____ to *which prof.*?]]
   c. *Step 3:* the interrogative probe 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 stu. which prof.* 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 show that covert *wh*-movement can target positions other than interrogative C, in a pattern similar to one that has been argued for recently for overt multiple fronting languages such as Romanian in Cheng & Demirdache (2010) (based on data from Ratiu 2005; 2007). I propose that this pattern 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 on C 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*. Intervention effects can be used to diagnose whether a *wh*-phrase is interpreted in-situ in a structure or through covert movement: we observe an intervention effect when *wh* is LF-in-situ, but not when *wh* moves (Beck 2006; Kotek & Erlewine in press a.o.). I show that intervention happens when an intervener occurs *above* an island but not *inside* it, a pattern consistent with covert movement inside the island to positions other than interrogative C, which cannot escape the island. This constitutes a new pattern of intervention effects not previously documented in English, thus also contributing to our understanding of the correct characterization of intervention effects more generally.

The remainder of the paper is structured as follows: Section 2 provides a brief background on intervention effects. Section 3 focuses on intervention effects in English multiple questions with syntactic islands, and shows that intervention effects occur above

[3] Throughout: solid arrows indicate overt movement and dashed arrows indicate covert movement.
[4] The movement here is shown with tucking-in (Richards 1997), as commonly assumed in this literature. Nothing hinges on this choice, as we will see below.

the island but not inside it. Section 4 argues that this data motivates a view of *wh*-in-situ involving covert movement to positions other than interrogative C, and proposes that this movement is 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: Intervention effects in English questions

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.[5]

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: (4a) is a canonical question, with a non-intervener subject and an in-situ *wh*-object. In (4b), this subject is replaced with the NPI intervener '*anyone*' without any other change to the question, and the result is ungrammaticality, described as an intervention effect.[6] (4c) shows that this structure can be rescued by scrambling the *wh* above the intervener, resulting in the desired interpretation.

(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?
anyone what-ACC read-NEG-PAST-Q

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

A parallel effect can be observed in German, for *wh*-in-situ in multiple *wh*-questions. Example (5a) provides a baseline for a multiple question in German. Here, a non-intervener object '*Luise*' c-commands the in-situ *wh* '*where*.' (5b) shows that if this non-intervener is replaced with the intervener '*no one*' without any other change to the structure of the question, the result is again an intervention effect. This ungrammaticality can be avoided by scrambling the in-situ *wh*, so that it is no longer c-commanded by the intervener, (5c).

(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'?

[5] 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 debate, but instead use known interveners identified in this previous literature for English.

[6] Throughout, interveners will be bolded.

Data such as the above lead to the following descriptive characterization of the intervention effect: an intervener cannot c-command a *wh*-phrase at LF (6a); to yield an interpretable structure, *wh* must move above the intervener (6b).

(6) The intervention configuration (Beck 2006)
a. *[$_{CP}$ C ... **intervener** ... *wh*]
b. ✓[$_{CP}$ C ... *wh* **intervener** ... *t*]

In English, a more complex pattern is observed. Pesetsky (2000) shows that intervention effects correlate with superiority: intervention is observed in *superiority-violating* questions but not in *superiority-obeying* ones. Importantly, at least for some speakers, the intervention effect may only affect the pair-list reading of the question, with a single-pair reading remaining available.[7] As a result, from this point on, I will use the notation *^{PL} to indicate this lack of a pair-list reading due to an intervention effect.[8]

(7) Intervention effects in English questions correlate with superiority (data from Pesetsky 2000)
a. ✓ *Which student* **didn't** ____ read *which* book? obeying
b. *^{PL} *Which* book **didn't** *which* student read ____ ? violating

(8) a. ✓ *Which* book did **only Mary** give ____ to *which* student? obeying
b. *^{PL} *Which* student did **only Mary** give *which* book to ____ ? violating

(9) a. ✓ *Which* picture did **very few children** want to show ____ to *which* teacher? obeying
b. *^{PL} *Which* teacher did **very few children** want to show *which* picture to ____ ? violating

This pattern led Pesetsky (2000) to argue that in English, *wh*-in-situ moves to C at LF in superiority-obeying questions, but remains LF-in-situ in superiority-violating ones:[9]

(10) English questions: The interaction of superiority and interveners at LF
a. Superiority-obeying questions: covert *wh*-movement, no intervention
✓[$_{CP}$ wh_1 wh_2 [C [$_{TP}$ ... **intervener** ... t_1 ... t_2]]]
b. Superiority-violating questions: *wh*-in-situ at LF, intervention effects
*^{PL} [$_{CP}$ wh_2 [C [$_{TP}$ ... intervener ... wh_1 ... t_2]]]

The syntax/semantics literature proposes several ways of interpreting in-situ *wh*-phrases that have not undergone covert movement. These include Alternative Semantics (Hamblin 1973; Rooth 1985; 1992), binding (Pesetsky 1987; Tsai 1994), and choice functions

[7] This is mentioned in footnotes in some previous work, e.g. Pesetsky (2000: 60), reporting on a conversation with Sigrid Beck as well as his own experience with data such as (7)–(9). Pesetsky uses the notation ?? to indicate this loss of the pair-list reading. For transparency, I use the notation *^{PL} instead. To my knowledge, this is not explained by any theory of intervention. See also Beck (1996); Kotek (2014) for discussion.

[8] Here and throughout, English examples use singular *which*-phrases. This is important to avoid an 'accidental' pair-list interpretation that could arise through the use of plural individuals, which are possible with the use of plural *which*-phrases but not singular ones. Examples such as (ia), for example, would have a possible answer as in (ib), involving the plural individuals *John* ⊕ *Mary and War and Peace* ⊕ *Moby Dick*. Such single-pair answers involving plurals are difficult to distinguish from true pair-list answers.

(i) a. *Which* students read *which* books?
b. John and Mary read War and Peace and Moby Dick.

[9] To arrive at this superiority-violating structure, Step 2 in the derivation in (3) above – attraction of the base-generated higher *wh*-phrase, following agreement with it – is skipped. The base-generated lower *wh* is thus allowed to move over the base-generated higher *wh*, yielding the desired structure. See Pesetsky (2000) for detailed derivations and discussion.

(Chierchia 1993; Dayal 1996; Reinhart 1998; Cheng & Demirdache 2010). Of these, only the Alternative Semantics approach has been used in current theories of intervention effects that account for the English data discussed in this paper (see Beck 2006; Kotek 2014).[10] However, in this paper I will leave aside the details of the semantic theory that explains intervention effects and instead concentrate on a distribution of these effects themselves.

3 Intervention effects in multiple questions with islands

Given this state of affairs described in section 2, we can use intervention effects as a diagnostic for whether or not covert *wh*-movement has taken place in the derivation of a question: the presence of an intervention effect teaches us that a (phonologically) in-situ *wh*-phrase must be interpreted in-situ, below the intervener, whereas the lack of an intervention effect teaches us that the *wh*-phrase must have covertly moved above the scope of the intervener. See also Kotek & Erlewine (in press) and Erlewine & Kotek (2014) for other arguments motivating this diagnostic. This will be the goal of section 3 of the paper.

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. I take as my starting point the fact that multiple questions with islands can have pair-list readings, as illustrated in example (11) from Cheng & Demirdache (2010), who attribute the context in (11) to Chris Tancredi (p.c.). This is contrary to a claim by Dayal (2002) that such questions do not have pair-list readings.[11]

(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.

This is important since it is specifically the pair-list reading of a multiple question that is sensitive to intervention effects. With a single exception, I have found that native speakers of English find the target sentence in (11a) grammatical and felicitous in the context. With this baseline established, we now turn to an investigation of the presence and extent of covert *wh*-movement in English multiple questions with islands.

As shown in section 2, superiority-obeying multiple questions in English are generally exempt from intervention effects. Focusing on questions with islands, we will 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 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). Alternatively, *wh* may be interpreted in-situ without movement (Hamblin 1973 and much subsequent work). This all-or-nothing stance is often implicitly adopted in theories of interrogative syntax, including those which have been proposed for English multiple questions, cited above. A third option, compatible with at least some

[10] A precursor to Beck is Kim (2002) (discussing non-English data), which uses Reinhart choice functions for *wh* but ends up simply stating as a generalization that focus operators cannot intervene. Beck (2006), building on the observation that focus operators cause intervention effects, offers a principled account of intervention in English (and other languages) within Rooth-Hamblin Alternative Semantics. No explanation of intervention has been developed for the choice function account.

[11] A single-pair reading of the question is also possible, given an appropriate context.

in-situ approaches to *wh*-in-situ, is to allow *wh* to be interpreted in positions that are not interrogative C nor fully in situ. This will be the view endorsed in this paper.

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 its possible landing sites. 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.

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

(12) 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 (11), repeated here as the slightly modified (13).[12] As shown above, this question has two felicitous readings: a single-pair 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.[13]

(13) 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.[14]

(14) 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, ...

[12] 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.

[13] Although the data tested in this section is quite complex, the over two dozen native speakers who I have consulted for this paper report that their judgments are very clear: all speakers who accept pair-list readings of baseline examples such as (11) also accept the pair-list reading of the baselines (13)–(14) and the *b* variants of (15)–(18), and detect a loss of that reading in the critical *a* variants of (15)–(18). Some speakers also struggle to detect the single-pair reading of these questions.

[14] A reviewer notes that they do not get the pair-list reading without the explicit contextual set-up. This is not surprising – grammaticality judgments of intended readings should be judged with different explicit contexts, to see whether the utterance is felicitous in that context; if an explicit context requiring the intended reading is not given, speakers may access other readings or have difficulty volunteering an appropriate context themselves. See Matthewson (2004) for relevant discussion.

Examples (13) and (14) thus provide us with baselines for the crucial test cases. Next, we introduce interveners into these questions, (15)–(16). 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.[15,16]

(15) 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 philosopher is invited. What I want to know is:
Q: *Which* linguist will **only** come [if we invite *which* philosopher]?
*[PL]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 philosopher 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, ...

(16) 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 philosopher 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* philosopher]?
*[PL]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* philosopher]?
✓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 of such verbs but not ones

[15] Example (15a) is equally ungrammatical under the pair-list reading if *only* follows *come*. I thank an anonymous reviewer for bringing this to my attention.

(i) *[PL] *Which* linguist will come **only** [if we invite *which* philosopher]?

[16] A reviewer points out that the question in (15b) degrades if it is embedded under *know*, as in (ia) below. I agree with this judgment, and note that, in fact, the question is degraded under other embeddings such as *want to know* (ib), as well. I suspect that this effect is due to properties of the embedding which are independent of intervention effects, but I leave this as an open issue for future research.

(i) a. # John knows *which* linguist will come [if we **only** invite *which* philosopher].
b. # John wants to know *which* linguist will come [if we **only** invite *which* philosopher].

that occur inside them (17b) should cause an intervention effect, diagnosed by the lack of a pair-list reading. This prediction is indeed borne out, as illustrated in (17a–b).

(17) Non-bridge verbs: intervention *above* but not *inside* island[17]
a. *[PL] *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 studied by Cheng & Demirdache (2010), where two *wh*-phrases are inside an island and one is outside, again exhibit intervention effects, diagnosed here by the loss of the list of triples reading, when an intervener occurs above the island (18a) but not when it is inside it (18b). This is again predicted by the generalization in (12) and is consistent with the behavior of multiple questions that we have seen in (15)–(17).

(18) Questions with three *wh*: intervention *above* but not *inside* the island
a. Q: *Which* linguist **didn't** believe the rumor [that *which* student invited *which* philosopher]?
*[PL]A: Chomsky didn't believe the rumor that Mary invited Quine,
Kayne didn't believe the rumor that Jane invited Lewis,
Labov didn't believe the rumor that Anya invited Russell, ...
b. Q: *Which* linguist believed the rumor [that *which* student **didn't** invite *which* philosopher]?
✓A: Chomsky believed the rumor that Mary didn't invite Quine,
Kayne believed the rumor that Jane didn't invite Lewis,
Labov believed the rumor that Anya didn't invite Russell, ...

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, as illustrated by the possible answer in (19a), where only the higher pair of *wh*-phrases vary and the third *wh* is held constant, as opposed to the unavailable answer in (19b), where all three *wh*-phrases vary simultaneously.[18]

(19) Questions with three *wh*: pair-list reading for whs above the island
Which linguist **didn't** tell *which* philosopher about the rumor [that *which* student had won a dissertation prize]?
a. *Possible answer: list of pairs (varying only the higher pair of whs)*
Chomsky didn't tell Quine about the rumor that Mary had won...,
Kayne didn't tell Lewis about the rumor that Mary had won...,
Labov didn't tell Russell about the rumor that Mary had won..., ...
b. *Impossible answer: list of triples (varying all whs at once)*
Chomsky didn't tell Quine about the rumor that Mary had won...,
Kayne didn't tell Lewis about the rumor that Jane had won...,
Labov didn't tell Russell about the rumor that Anya had won..., ...

Finally, I note that if the in-situ *wh*-phrase can be given exceptionally 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 & Nissenbaum (1999):

[17] Again, it is crucially the pair-list reading that is affected. The judgments I report here are different from judgments for very similar examples found in Dayal (2002). Dayal reports judgments provided by an LI anonymous reviewer, according to which both (17a) and (17b) are ungrammatical. I have been unable to find speakers who confirm Dayal's reported judgments. Instead, speakers consistently report the judgments that I note here.

[18] I thank David Pesetsky (p.c.) for bringing this possibility to my attention.

(20) 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 (16) to assign the *wh* wider scope than when it is not extraposed. The relevant example is given in (21) below. Example (21a), repeated from (16a), provides a baseline without extraposition, where the pair-list reading is blocked because of an intervention effect.[19] When the noun-complement clause is extraposed above the temporal adjunct yesterday, giving the clause exceptionally wide scope above the intervener, the pair-list reading then becomes available (21b).[20]

(21) Extraposition allows exceptional wide scope for in-situ *wh*:
a. $*^{PL}$ *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 (22), repeated from above:

(22) 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 previously undescribed pattern of intervention effects in English superiority-obeying questions. 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, which I explore in the next section.

4 Covert movement and the nature of syntactic derivations

I began 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 intervention pattern in (22) shows that covert movement must take place in the English questions discussed, that this movement is sensitive to syntactic islands, and that it must be able to target positions other than C.

As discussed in section 2, current theories of interrogative syntax/semantics assume that a *wh*-phrase must either covertly move to interrogative C or else be interpreted in-situ at LF.[21] For example, following Pesetsky (2000) and others, we may assume that superiority-obeying questions with interveners such as (23a) have derivations such as (23b). Here,

[19] Following Fox's (1995; 2000) Scope Economy, I assume that covert movement of the relative clause is blocked in (21a) because it does not affect the semantic interpretation of the question nor its linearization. This Economy principle is overridden in the case of overt extraposition, where movement has consequences for the pronunciation of the sentence.

[20] A similar result is also obtained with high epistemic adverbs such as *fortunately*. Note that here it is the entire extraposed clause containing the *wh* that takes scope above the intervener. The *wh* may not be able to leave the clause, because of freezing effects, making the extraposed clause an island for extraction (Wexler & Culicover 1980, a.o.).

[21] More precisely, in-situ approaches to question semantics do not require any movement for the interpretation of *wh*-phrases, and – all things being equal – would assume *wh* to occupy its base-generated position. Such theories are compatible with *wh* occupying other positions at LF.

the (phonologically) in-situ *wh*-phrase *which philosopher* covertly moves to C at LF, correctly predicting the lack of an intervention effect in that question.

(23) Covert movement is available: no intervention in superiority-obeying question
a. ✓ *Which* linguist **didn't** ____ invite *which* philosopher?
b. LF: [$_{CP}$*Which* linguist *which* philosopher [C [$_{TP}$ t_1 **didn't** invite t_2]]]

Next consider examples (24a–c), summarizing the pattern discovered in section 3. If we assume that covert movement is insensitive to islands, movement of *which philosopher* to C – along the lines of the derivation sketched in (23b) – should be possible for all of (24a–c). This clearly cannot derive the correct judgment pattern, and in particular the ungrammaticality of (24c). Hence, we conclude that **covert movement is sensitive to syntactic islands**.

(24) 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 philosopher*]?
c. *^{PL} *Which linguist* **didn't** believe the rumor [$_{ISLAND}$ that we invited *which philosopher*]?

This conclusion has consequences for our understanding of the nature of islands. First, the data in this paper is unexplained 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). Under such an approach, islands should not restrict covert movement, and we would hence expect no intervention effects in any of the questions in (24a–c), contrary to fact. Moreover, a theory in which islands can be covertly pied-piped to C, as has been proposed for Japanese (Nishigauchi 1990; Richards 2000), incorrectly predicts no intervention effects for interveners occurring above the island. Under such a theory, the entire island in (24c) would undergo massive pied-piping to the matrix interrogative Spec,CP, resulting in a structure in which *wh* is not c-commanded by the intervener and hence no intervention effect would be expected.[22]

Alternatively, we might imagine that in-situ *wh*-phrases never undergo covert movement – that is, an approach in which *which philosopher* is interpreted in-situ at LF. This type of derivation would correctly predict that (24a) is grammatical and that (24c) is ungrammatical, since it contains an in-situ *wh*-phrase c-commanded by an intervener. However, this type of derivation would incorrectly predict that (24b) should also be ungrammatical, because here too we would have an in-situ *wh*-phrase c-commanded by an intervener. Hence, *a derivation without any covert wh-movement is untenable*.

Instead, the derivation that would predict the full pattern in (24) 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 in-situ interpretation of the *wh* between the landing site of movement and C. This partial movement proposal lends support for a theory of interrogative syntax/semantics that involves both movement and in-situ interpretation within the derivation of a single *wh*-question (cf Pesetsky 2000; Beck 2006 for superiority; Cable 2010; Kotek &

[22] Inside the island, *wh* would be interpreted as it is interpreted in other cases of pied-piping: in-situ, using in-situ interpretation. See Cable (2007; 2010) and Kotek & Erlewine (in press) for a semantic theory of pied-piping that is compatible with the intervention facts discussed in this paper. Notice that under this view, we would also incorrectly predict that (24b) should be ungrammatical.

Erlewine in press for pied piping).[23] However, the two mechanisms are used here in a novel order of operations: first, a short movement step occurs. Then, the *wh* is interpreted in-situ between this landing site and C. See Kotek (2014) for a semantic proposal that is able to interpret structures with the syntax that I am proposing here. Two possible characterizations of partial movement are summarized in (25):

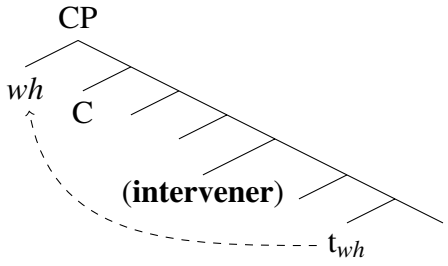
(25) Two ways to characterize partial movement:
   a. *Move as much as possible:*
      Move as close to interrogative C as possible in the derivation.
      In the absence of islands, move all the way to C. In the presence of an island, move to the edge of the island.
   b. *Move just as much as necessary:*
      Move only as far as necessary to render a structure interpretable.
      All things being equal, remain in-situ. In the presence of an intervener, move above it but no further.

Both characterizations of partial movement are able to derive the pattern of judgments in (24a–c), but they have different consequences. If movement targets a position as close to C as possible, the presence of an intervener is irrelevant as a trigger for movement. Lacking an island, we predict *wh*-movement to always target interrogative C. If an island is present, movement would always target its edge.

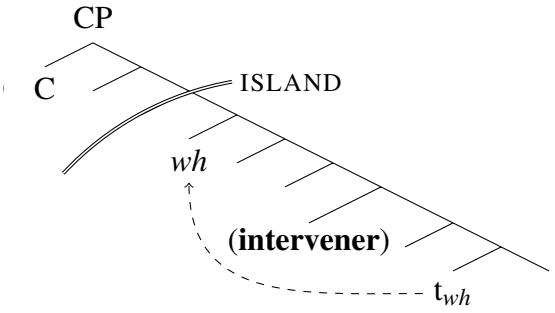
We would hence predict the derivation in (26a) for the question in (24a), which lacks an island. We predict the derivation in (26b) for the question in (24b), which has an intervener inside an island. And we predict ungrammaticality in the case of (24c), since an intervener occurs above the island, but movement can only target the edge of the island but no further.

(26) Derivations under the 'move as much as possible' view:

a. *No island: Move to Spec,CP*



b. *Island: Move to edge of island*



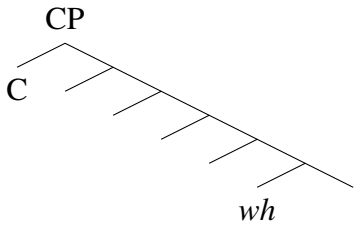
Alternatively, if covert movement takes place just when necessary and targets the first position that would yield an interpretable structure, interveners act as triggers for movement. In the absence of an intervener, all things being equal, we expect no movement to take place. If an intervener is present, movement would target a position immediately above the intervener, unless this movement is blocked by an island barrier.

We would hence predict a derivation without any movement for the question in (24a), which lacks an intervener (27a). We predict a derivation for the question in (24b) with *wh* moving just above the intervener inside the island, (27b). And we predict ungrammaticality in the case of (24c), since an intervener occurs above the island, but movement cannot escape the island.

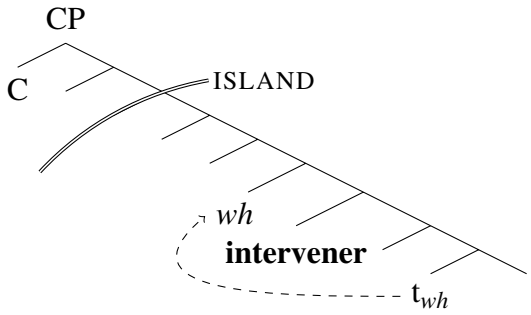
[23] Specifically, the theory of *wh*-in-situ used by Beck (2006), Cable (2010) and Kotek & Erlewine (in press) is Rooth-Hamblin alternative computation. Pesetsky (2000) is a purely syntactic proposal.

(27) Derivations under the 'move just as much as necessary' view:

a. *No intervener: No movement*



b. *Intervener: Move above intervener*



These two possible characterizations of partial movement follow naturally from two different models of structure building in syntax: I will show here that a bottom-up model would predict movement as in the 'move as much as possible' view, while a left-to-right, top-down model would predict movement as in the 'move just as much as necessary' view. I discuss both of these options in more detail 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 into the derivation in earlier cycles (phases) than the C that they eventually Agree with.[24] *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) and 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.[25]

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 (26b), and correctly predict the observed generalization regarding intervention effects in English multiple questions, (22).

As noted by Cheng & Demirdache (2010), citing 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: *wh* cannot move outside an island, (28a), and it also cannot stay in its base-generated position, (28b). Instead *wh* moves to the edge of the island, (28c).

[24] I assume here that vP and CP are phases. This characterization is certainly true for the island-containing structures discussed in this paper.

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

(28) 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 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 EXPL.AUX dedicated what yesterday

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 EXPL.AUX dedicated yesterday
'*Who* knows the student, to whom *what* was dedicated yesterday?'

Cheng & 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. The proposal in (26) is thus equivalent to Cheng and Demirdache's proposal. See Cheng & Demirdache (2010) for details.

This model of structure building is thus naturally consistent with a *move as much as possible* approach: 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, within this model, movement must be caused by the needs of the *wh* itself and not by the needs of C: if C required all *wh*-phrases 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.

However, 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?[26]

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 the question: here, *wh* cannot be interpreted if it is

[26] Under this view, overt movement is different from covert movement: in English, one *wh*-phrase *must* reach interrogative Spec,CP in order to form a (non-echo) *wh*-question. Given an appropriate semantics that allows for in-situ interpretation of *wh*-phrases, this obligatory overt movement step cannot be for the semantic interpretation of the question, since we have a mechanism in place that can interpret questions without requiring movement. An alternative motivation for this movement will have to be assumed – often, this is done through EPP features. See Pesetsky (2000) for a spelled-out version of this syntactic (EPP-based) view and Richards (2010; to appear) for a prosody-based account.

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?

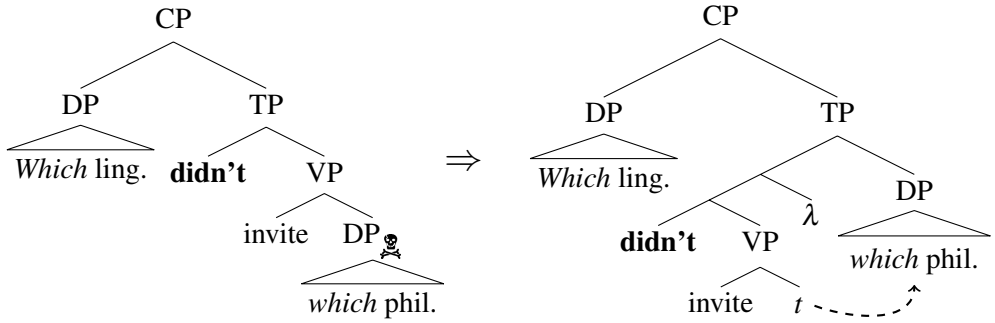
We may be able to predict that movement will target the lowest possible position in a bottom-up model through a theory of Economy that utilizes trans-derivational competition (e.g. Reinhart 2006), but such approaches have recently fallen from grace.[27,28] However, this movement is naturally predicted in a top-down model of syntax that does not require trans-derivational competition, as I will illustrate next.

4.2 Left-to-right, top-down derivations: English as covert German

Consider next a left-to-right, top-down model of syntax, often used to describe how parsing of natural language takes place (Phillips 1996, among others). 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 and T-to-C movement. 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.[29] If the *wh* is trapped inside an island, the extent of movement will be clearly limited by its presence, which would also have already been encountered before the *wh*-phrase is encountered.

For illustration purposes, it may be beneficial to think of the covert movement envisioned by this kind of approach as movement to the right, as in the (simplified) sketch below:[30]

(29) Covert *wh*-movement as movement to the right



[27] Such approaches have been argued to be computationally intractable, too powerful, and to make incorrect empirical predictions. See in particular Collins (1996), Sternefeld (1996), Johnson & Lappin (1999), Frampton & Gutman (1999), Potts (2001), and Gärtner (2002). Compare also Chomsky (1995; 2000; 2001) to earlier Minimalist work in Chomsky (1992; 1993), as discussed in Reinhart (2006: Ch.1). See Graf (2013) for recent arguments against these objections.

[28] For another approach which may derive partial movement without the need for transderivational constraints, see Heck & Mueller (2000).

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

[30] However, nothing hinges on this particular approach. But see Fox & Nissenbaum (1999) for an empirical argument for covert movement being rightward in this way.

The (phonologically) in-situ *wh*-phrase *which philosopher* cannot be integrated into the structure in-situ, as this would lead to an intervention effect because of the c-commanding sentential negation. As soon as this *wh*-phrase is encountered, the structure must undergo a *reanalysis* step, resulting in the integration of the *wh* in a position above the intervener. This reanalysis step is parallel to the reanalysis required in cases of garden-path sentences:

(30) A garden path sentence
I convinced her children are noisy.

Here, the structure undergoes reanalysis from an initial assumption by the parser that a DP *her children* should be constructed to a structure in which *her* alone acts as the first internal argument of *convince*, and *children are noisy* acts as the second argument.[31]

This model of structure building is thus naturally consistent with the *move just as much as necessary* approach, where movement 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. 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, 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 (31a), they cannot be c-commanded by an intervener and instead must scramble above it (31b–c).

(31) 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 & 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 (e.g. Richards 1997), but instead a covert version of German.[32]

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

[31] For experimental evidence for a reanalysis step in cases of covert movement in questions, universal quantification, and in degree constructions, see Kotek (2014: Ch. 5), Hackl et al. (2012), and Breakstone et al. (2011), respectively.

[32] Overt scrambling in German is also possible for other, information-structural, reasons. Such parallel movement may occur covertly in English; detecting whether this is in fact the case is left for future work.

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 the 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 must take place without exception, covert movement may target different positions in the structure and may not occur at all in some cases.

5 Conclusion

The behavior of English superiority-obeying multiple *wh*-questions in which the lower *wh* is trapped inside an island with regard to intervention effects 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 that allows for partial covert movement of *wh*-phrases to intermediate, non-interrogative positions in the derivation, followed by in-situ composition between the landing site of *wh* and C. This is not compatible with 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) analysis and subsequent work.

I discuss two possible characterizations of this covert partial *wh*-movement: *move as much as possible*, predicting frequent covert movement to C, and to the edge of an island if one is present; and *move just as much as necessary*, normally leading to no movement at all, and movement above interveners if they are present, unless there is an island which blocks this movement. I argue that these two characterizations are naturally accommodated in two different approaches to derivation in syntactic theory: bottom-up vs. left-to-right/top-down. Bottom-up derivations, driven by the traditional probe-goal model of syntax, predict intermediate movements through edge features as far as possible, moving all the way to 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, left-to-right, top-down derivations, based on parsing considerations, 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 instead the top-down approach. Ultimately, however, I do not rule out either approach, and instead leave the resolution of this issue open for future research.

Acknowledgments

For comments, discussions and support, I would like to thank David Pesetsky, Danny Fox, Michael Yoshitaka Erlewine, Martin Hackl, Irene Heim, and the audiences at the LSA 2013, NELS 44, DGfS 37 workshop: “What drives syntactic computation? Alternatives to formal features”, and GLOW 2015, as well as audiences at MIT and McGill. I would additionally like to thank the editors Dennis Ott and Radek Simik and two anonymous reviewers for their helpful feedback on this work. This research is based upon work supported by the National Science Foundation under Grant No. 1251717 and by the Mellon Foundation.

Competing Interests

The author declares that they have no competing interests.

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How to cite this article: Kotek, Hadas. 2016. Covert partial *wh*-movement and the nature of derivations. *Glossa: a journal of general linguistics* 1(1): 25. 1–19, DOI: http://dx.doi.org/10.5334/gjgl.49

Published: 28 July 2016