Diagnosing covert pied-piping
Michael Yoshitaka Erlewine & Hadas Kotek, MIT, {mitcho,hkotek}@mit.edu
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1 Introduction
Pied-piping is visible in overt movement:

(1) [In which class] C did you get a good grade?

In-situ wh-phrases move covertly:

(2) [Which student] which C got a good grade in which class?

Does covert movement trigger pied-piping?

Today:

1 We present new data on the distribution of focus intervention effects in wh-questions. We show that, assuming that intervention correlates with focus- 

alternatives computation (Beck, 2006) the data motivates the existence of covert wh-pied-piping.

2 Having established the use of focus intervention effects as a diagnostic for 

alternative computation and pied-piping, we discover focus intervention effects in Association with Focus constructions.

2 Background

2.1 Intervention in overt pied-piping

In overt pied-piping, the interrogative complementizer can attract different sized 

constituents containing the wh-word:

(3) Jim owns a picture of which president

a. [Which president] does Jim own a picture of?

b. [Of which president] does Jim own a picture?

c. [A picture of which president] does Jim own?

Sauerland and Heck (2003; Cable (2007) show that intervention effects occur inside 
pied-piped constituents:

(4) Cable (2007):

a. [A picture of which president] ___ hangs in Jim’s office?

b. * [No picture of which president] ___ hangs in Jim’s office?

c. * [Only [PICTURES of which president]] ___ hang in Jim’s office?

If an intervener is placed between the wh-word and the edge of its pied-piping con- 

stituent, it results in ungrammaticality.

This effect is due to the following structural configuration:

(5) Intervention in pied-piped constituents: (S&H, 2003; Cable, 2007)

\[ \text{pied-piping} \text{INTERVENABLE} \text{ wh } \ldots \text{ C } \ldots \]

Definition: a region is \text{INTERVENABLE} if, when a focus-sensitive operator occurs inside it, the structure becomes ungrammatical with the intended reading.

No intervention when intervener is inside pied-piping, but below wh: (Cable, 2007)

(6) [Which picture containing no presidents] ___ hangs behind Jim’s desk?

Intervention can be avoided by choice of pied-piping size: (Cable, 2007)

(7)  

a. * [No picture of which president] does Jim own ?

b. [Which president] does Jim own [no picture of ]?

2.2 Covert movement

Generally, all wh-words move to the complementizer (Karttunen, 1977; Huang, 

1982; Pesetsky, 1987, 2000; Richards, 1997; Beck, 2006; Cable, 2007, a.o.):

(8) Who ___ owns a picture of which president?

Subsequent movements tuck-in. Only the highest wh-phrase is pronounced at the 

head of its chain; other wh-words are pronounced in their base positions. These 
in-situ wh-phrases move “covertly.”

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3 Covert pied-piping

Does covert movement trigger pied-piping? And if so, how much?

(8) Who owns a picture of which president?
   a. [Who] [which president] C owns a picture of ...
   b. [Who] [of which president] C owns a picture ...
   c. [Who] [a picture of which president] C owns ...

Recall that overt pied-piping leads to intervention effects:

(5) Intervention in pied-piped constituents: (S&H, 2003; Cable, 2007)
   [pied-piping INTERVENABLE wh ...] C ...

Assuming intervention as in (5) is evaluated at LF (Beck, 2006), intervention effects can diagnose the size of covert pied-piping.

(9) Intervention in covert pied-piping:
   ... C ... [covert pied-piping INTERVENABLE wh ...]
   ...

Different amounts of covert pied-piping predict different INTERVENABLE regions:

(8) Who owns a picture of which president?
   a. Who owns a picture of covert pied-piping which president?
   b. Who owns a picture covert pied-piping of which president?
   c. Who owns covert pied-piping a picture of which president?

3.1 Core data

Contexts are provided here to satisfy the presuppositions of the multiple questions (Dayal, 1996). Note also that some speakers do not get intervention effects with single-pair readings of multiple questions (Pesetsky, 2000), so it is important that these examples have pair-list readings.

Baseline:

(10) Context: Over the break, every student read a book from a local library and submitted a book report. Each book report gave the title of the book and which library it was borrowed from.
    (11) * I know [which student read a book from which library].

No:

(12) Context: Over the break, the students were assigned to go read one book each from every library in the area and submit a book report. No student completed the entire assignment; every student went to all but one of the libraries.
    (13) * I know [which student read no book from which library].

A ratings study was conducted on Mechanical Turk to confirm this contrast. A summary is in the appendix.

Below is additional data with other potential interveners. Note that these contrasts do not track Szabolcsi’s (2006) findings for intervention effects in superiority-violating wh-questions. However, we believe that they show a clearer correlation with focus sensitivity.

Less than three:

(14) Context: Over the break, the students were assigned to go read three books each from every library in the area and submit a book report. No student completed the entire assignment; every student had one particular library, from which they failed to read three books.
    (15) * I know [which student read less than three books from which library].

Only:

(16) Context: At the flea market, a number of collectors are selling pictures and autographs of past presidents. For most presidents, they have successfully sold both pictures and autographs, but according to the records, every collector has one president for which they did not sell any autographs.
    (17) * I know [which collector sold only PICTURES of which president].

Very few:

(18) Context: We at McDonald’s are testing three new toppings for burgers: cranberries, jicama, and natto. As a pilot, they were offered at several branches around the world for one week only. At every branch, only two toppings sold thousands while the other sold about a hundred. Culinary tastes vary across the world, so there was no clear overall winner.
    (19) * I know [which branch sold very few burgers with which topping].
3.2 The diagnosis

What does this contrast between (11) and (13) tell us?

(11) 电流 I know [which student read a book from which library].
(13) 电流 I know [which student read no book from which library].

Note that higher negation does not cause such a contrast:

(20) 电流 I know [which student didn't read a book from which library].

Thus (13) is not a general negative island effect.
The effect only occurs if the intervener c-commands the wh-word.

(21) 电流 I know [which s. read which book containing no princesses].

\textit{The effect is limited to a particular region above and near the in-situ wh.}

This contrast teaches us that no in (13) is in an \underline{intervenable} region.

Moreover, smaller pied-piping options were not available:

(8) Which student read no book from which library?
   a. Which student read \underline{no} book from [pied-piping which library]?  \Rightarrow \text{predicts no intervention!}
   b. Which student read \underline{no} book [pied-piping from which library]? \Rightarrow \text{predicts no intervention!}
   c. Which student read [pied-piping \underline{no} book from which library]? \Rightarrow \text{predicts intervention!}

\textbf{Covert movement triggers pied-piping and chooses the largest pied-piping constituent possible.}

3.3 Pied-piping size and the interfaces

Recall that the size of overt pied-piping is variable, with a preference for \textit{smaller} pied-piping:

(3) Jim owns a picture of which president
   a. [Which president] does Jim own a picture of \underline{?}
   b. [Of which president] does Jim own a picture of \underline{?}
   c. [A picture of which president] does Jim own of \underline{?}

...but we have shown that covert pied-piping chooses the \textit{largest} among the options for overt pied-piping.

\textit{The preference for smaller pied-piping in overt movement is an artifact of PF constraints on wh-movement, not a general preference of the pied-piping mechanism itself.}

\textit{Wh-phrases prefer to be near the left edge when pied-piped (Horvath, 2007; Heck, 2008, 2009; Cable, ms, a.o.).} \Rightarrow \textit{A PF constraint!}

Data from Cable (ms):

(22) a. [ [[Whose brother]’s friend]’s father] did you see \underline{?}
   b. * [The father of whose brother’s friend] did you see \underline{?}

(23) a. [ [ How big ] a \underline{car} ] did Bill buy \underline{?}
   b. * [ A [ how big ] \underline{car} ] did Bill buy \underline{?} \hspace{1em} (cf Heck, 2008, 2009)

Overt movement feeds PF and LF, while covert movement only feeds LF.

\textit{The preference for pied-piping the largest possible constituent is the true preference of Core Syntax and LF.}

\textit{However, in cases where the movement feeds PF as well, the choice of pied-piping can be overridden by PF constraints.}
4 Theory of intervention and pied-piping

A question can be computed through movement and/or Rooth-Hamblin alternative computation (Hamblin, 1973; Karttunen, 1977; Rooth, 1985):

(24) a. Interpretation through movement:
   LF: wh C  ...  
   b. Interpretation through alternative computation:
   LF: C,  ...

Beck (2006): Computation of Rooth-Hamblin alternatives can be interrupted by focus interveners Op, such as only, even, focus-sensitive negation, etc.

(25) Intervener blocks interpretation of wh-alternatives by C:
   * LF: C,  Op  \sim  wh_i

Cable (2007) uses this mechanism to explain intervention inside wh-pied-piping constituents, within his theory of pied-piping as QP-movement. A Q-particle adjoins to a position above the wh-phrase. The complementizer attracts the QP.

(26) Jim owns (Q) a picture (Q) which president
   a. [QP Q Which president] does Jim own a picture of ?
   b. [QP Q Of which president] does Jim own a picture ?
   c. [QP Q A picture of which president] does Jim own ?

The wh-word inside the QP is interpreted through focus alternatives.

(27) [QP Q A picture of which president] \lambda x does Jim own x?

(28) Intervener blocks interpretation of wh-alt.'s by Q: (Cable, 2007)
   * LF: [QP Q Op  \sim  wh_i ...

(29) Intervention in pied-piped constituents: (Cable, 2007)
   [QP Q \eqqopname{\text{INTERVENABLE}} wh ...] C ...

   * [QP Q No picture of which president] hangs in Jim’s office?

Cable’s (2007) application of Beck’s (2006) theory to intervention within QPs predicts that, if covert pied-piping exists, it should be interveneable:

(9) Intervention in covert pied-piping:
   ... C ... [QP Q [\eqqopname{\text{INTERVENABLE}} wh ...]
   ... ?

(13) ‘I know [which student read [QP Q no book from which library]].
(20) ‘ I know [which student didn’t read [QP Q a book from which 1]].

This discussion theoretically grounds our use of focus intervention as a diagnostic for covert pied-piping.

5 Pied-piping in focus constructions

The Beck (2006) theory of focus intervention predicts intervention not just between wh and C/Q, but anywhere where Rooth-Hamblin alternatives are computed.

(29) Intervener blocks interpretation of wh-alternatives:
   * LF: C/Q,  Op  \sim  wh_i

(30) Intervener blocks interpretation of focus alternatives:
   * LF: Op,  Op  \sim  X_F

Beck (2006) discusses this prediction but fails to find concrete evidence for it. In this section, we will provide the missing data, by examining pied-piping in focus constructions.

5.1 Pied-piping in overt focus movement

The pivot in English it-clefts can be considered to be a form of pied-piping movement (Krička, 2006):

(31) Pied-piping in it-clefts:
   John read a book from THIS_F library.
   b. It’s [from THIS_F library] that John read a book 
   c. It’s [a book from THIS_F library] that John read 

The it-cleft associates with focus inside the pivot (Jackendoff, 1972; Krička, 2006). Therefore it-clefts are interpreted using both movement and alternative computation, much like wh-pied-piping:

(32) It’s [pied-piping a book from THIS_F library] \lambda x John read x.
Viewing cleft pivots in this light, Beck (2006) expects focus intervention inside the pivot. We argue that such intervention does occur:

(33) **Intervention in it-cleft pivots:**
   b. ‘It’s [ from THISF library] that John’s read no book — .
   c. ‘It’s [THIS library] that John’s read no book from — .

5.2 Pied-piping in in-situ Association with Focus

Rooth (1985, 1992): F-marked constituents stay in-situ and are interpreted through focus alternative computation.

(34) **In-situ Association with Focus:**
   I only * read a book from THISF library.

Under this approach to Association with Focus, Beck (2006) predicts that the entire region between only and the F-marked constituent is intervenable. However this is not the case:

(35) **Lack of intervention in in-situ focus constructions:**
   ‘I only didn’t read a book from THISF library.

Another approach to Association with Focus argues that it involves covert movement of the F-marked constituent with pied-piping (Drubig, 1994; Krifka, 2006; Wagner, 2006, cf Chomsky 1976).

(36) **Focus association through covert movement:**
   I ... only read a book from THISF library.

Moreover, the F-marked constituent is then interpreted through Rooth-Hamblin alternatives, inside the pied-piped constituent (Horvath, 2000; Krifka, 2006; Wagner, 2006). Under this view, we predict an intervenable region right above the F-marked constituent. We argue that is indeed the case.

(37) **Intervention in in-situ focus:**
   * I only read [covert pied-piping no book from THISF library].

The contrast in (38) shows that, like with wh-movement, the largest possible constituent is covertly pied-piped.

We provide the missing data point for Beck’s (2006) prediction that all regions of Rooth-Hamblin alternative computation are intervenable.

We have shown that intervention does occur in Association with Focus constructions: inside the pied-piping of covert focus movement.

(38) * I only read [covert pied-piping no book from THISF library].
(39) * I only didn’t read [covert pied-piping a book from THISF library].

This parallels the pattern of intervention with covert wh-pied-piping:

(13) * I know [which s. read [covert pied-piping no book from which library]].
(20) * I know [which s. didn’t read [covert pied-piping a book from which library]].

6 Conclusion

1 We argued for the existence of pied-piping in covert wh-movement:
   • by examining new patterns of Beck’s (2006) focus intervention effects,
   • following work on intervention in overt pied-piping (S&H; Cable).
   • We showed an LF preference for larger pied-piping.

2 We motivated the use of focus intervention effects as a diagnostic for Rooth-Hamblin alternative computation and pied-piping.

3 We presented evidence for intervention in focus constructions:
   • in overt pied-piping, i.e. the pivots of it-clefs;
   • in covert pied-piping, providing an argument for in-situ focus association through covert focus movement (Krifka; Wagner; a.o.).
   • This substantiates Beck’s (2006) conjecture that intervention effects occur not only in wh-questions, but also in focus constructions.

References

Cable, Seth. 2007. The grammar of Q. Doctoral Dissertation, Massachusetts Institute of Technology.
Cable, Seth. ms. Pied-piping: two recent approaches. LingBuzz.
Appendix: Ratings study

- 10 items run on Amazon Mechanical Turk with no contexts.
- 4 conditions each: crossed a/no with complement/adjunct PPs.

(39) Except for John, I know which book read...
   a. a book [PP-comp about which philosopher. 60%
   b. no book [PP-comp about which philosopher. 7%
   c. a book [PP-adj from which library. 56%
   d. no book [PP-adj from which library. 7%

- Embedded under exceptions to prefer pair-list readings.
- 160 participants, forced-choice task.

Main effect of intervener, no effect of complement vs. adjunct

Appendix: clausal pied-piping

Some of the original motivation for proposing that covert focus movement pied-pipes comes from the observation that Association with Focus is apparently island-insensitive. Drubig (1994) and others thus propose that if the F-marking is inside an island, the pied-piping must be at least island size. As is, this predicts larger intervenable regions:

(40) I only read [the book that [Mary read at SCHOOL]].

But this does not seem to be the case:

(41) I only read [the book that [Mary didn't read at SCHOOL]].

Following Kotek (upcoming); Nishigauchi (1990), we propose that in clause-sized islands, the in-situ F-marked constituent (or wth-word) can move inside the island, thus predicting a smaller intervenable region.

(42) LF: I only read [the book that [SCHOOL Mary didn't read at]].

Appendix: Intervention in Beck (2006); Pesetsky (2000)

Beck (2006) primarily discusses focus intervention effects between C and an LF-in-situ wth-word. This is observable in English in superiority-violating questions.

Pesetsky (2000); Beck (2006): Both movement and alternative computation strategies are used in English questions. In superiority-violating questions, in-situ wth-words stay in-situ at LF and are interpreted through alternatives.

(38) a. Which boy ... C didn’t read which book?
   \hspace{1cm} ⇒ no intervention
   
   b. * Which book C didn’t which boy read ?
   \hspace{1cm} ⇒ intervention!