# Diagnosing covert pied-piping*

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## 1 Introduction

Pied-piping is visible in overt movement:

(1) [$_{PP}$ 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 __?

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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 constituent, it results in ungrammaticality.

☞ This effect is due to the following structural configuration:

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

**Definition:** a region is ...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 ...which...* C ___ 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*-phrases are pronounced in their base positions. These *in-situ wh*-phrases move "covertly."

## 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.

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

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Note that higher negation does not cause such a contrast:

(20) ✓ 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) ✓ I know [*which* s. read *which* book containing **no** princesses].

☞ **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 ...INTERVENABLE... region.

**Moreover, smaller pied-piping options were not available:**

(8) *Which* student read no book from *which* library?

a. *Which* student read **no** book from [$_{pied\text{-}piping}$ *which* library]?
⇒ *predicts no intervention!* ☠

b. *Which* student read **no** book [$_{pied\text{-}piping}$ from *which* library]?
⇒ *predicts no intervention!* ☠

c. *Which* student read [$_{pied\text{-}piping}$ **no** book from *which* library]?
⇒ *predicts* ***intervention!***

**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 *smaller* pied-piping:

(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 __?

...but we have shown that *covert* pied-piping chooses the *largest* among the options for overt pied-piping.

☞ **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.

☞ *Wh*-phrases prefer to be near the left edge when pied-piped (Horvath, 2007; Heck, 2008, 2009; Cable, ms, a.o.). ⇒ ***A PF constraint!***

Data from Cable (ms):

(22) a. ✓ [[[*Whose* brother]'s friend]'s father] did you see __?
b. * [The father of *whose* brother's friend] did you see __?

(23) a. ✓ [ [ *How* big ] a __ car ] did Bill buy __?
b. * [ A [ *how* big ] car ] did Bill buy __? (cf Heck, 2008, 2009)

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

☞ The preference for pied-piping the *largest possible constituent* is **the true preference of Core Syntax and LF.**

☞ *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: $C_i$ ∿∿∿ $wh_i$

**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: $C_i$ ☠ ***Op*** ↜∿ $wh_i$

**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) of (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] $\underbrace{\lambda x \text{ does Jim own } x?}_{\textit{movement}}$
*Rooth-Hamblin alternatives*

(28) **Intervener blocks interpretation of *wh*-alt.'s by Q:** (Cable, 2007)
* LF: [$_{QP}$ $Q_i$ ***Op*** ↜∿ $wh_i$ ... ]

(5) **Intervention in pied-piped constituents:** (Cable, 2007)
[$_{QP}$ Q ...INTERVENABLE... *wh* ...] C ... __

(4b) **Intervention in overt pied-piping:** (Cable, 2007, cf S&H, 2003)
* [$_{QP}$ 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 ...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* l.]].

*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: $C/Q_i$ ***Op*** ↜∿ $wh_i$

(30) **Intervener blocks interpretation of focus alternatives:**
* LF: $Op_i$ ***Op***$_j$ ↜∿ $X_{F,i}$

☞ 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 (Krifka, 2006):

(31) **Pied-piping in *it*-clefts:**
John read a book from THIS$_F$ library.
a. It's [THIS$_F$ library] that John read a book from __.
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; Krifka, 2006). Therefore *it*-clefts are interpreted using both movement and alternative computation, much like *wh*-pied-piping:

(32) It's [$_{\textit{pied-piping}}$ a book from THIS$_F$ library] $\underbrace{\lambda x \text{ John read } x.}_{\textit{movement}}$
*Rooth-Hamblin alternatives*

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:**
a. * It's [ **no** book from THIS$_F$ library] that John's read __.
b. ✓ It's [ from THIS$_F$ library] that John's read **no** book __.
c. ✓ It's [THIS$_F$ 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 THIS$_F$ 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 THIS$_F$ 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 THIS$_F$ 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 that is indeed the case.

(37) **Intervention in *in-situ* focus:**
* I *only* read [$_{\textit{covert pied-piping}}$ **no** book from THIS$_F$ 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 [$_{\textit{covert pied-piping}}$ **no** book from THIS$_F$ library].

(36) ✓ I *only* **didn't** read [$_{\textit{covert pied-piping}}$ a book from THIS$_F$ library].

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

(13) * I know [*which* s. read [$_{\textit{covert pied-piping}}$ **no** book from *which* library]].

(20) ✓ I know [*which* s. **didn't** read [$_{\textit{covert pied-piping}}$ a book from *which* l.]].

## 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*-clefts;
- 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.**

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

Beck (2006) primarily discusses focus intervention effects between C and an LF-*in-situ wh*-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 wh*-words stay *in-situ* at LF and are interpreted through alternatives.

(38) a. *Which* boy ... C **didn't** __ read *which* book? ⇒ *no intervention*

b. * *Which* book C **didn't** *which* boy read __? ⇒ ***intervention!***



## 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 student read...

a. a book [$_{PP\text{-}comp}$ about which philosopher. 60%

b. no book [$_{PP\text{-}comp}$ about which philosopher. 7%

c. a book [$_{PP\text{-}adj}$ from which library. 56%

d. no book [$_{PP\text{-}adj}$ from which library. 7%

- Embedded under exceptives 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$_F$]].

But this does not seem to be the case:

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

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

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