The Online Interpretation of Sentence Internal Same and Distributivity

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Adjectives of Comparison

- Languages have lexical means to compare two elements and express identity / difference / similarity between them
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- Languages have lexical means to compare two elements and express identity / difference / similarity between them.
- English uses adjectives of comparison (AOCs) like *same*, *different* and *similar*. 
Sentence-external readings

• Comparing an element in the current sentence and an element mentioned previously

(1)  a. Arnold saw ‘Waltz with Bashir’.
    b. Heloise saw the same movie.
Sentence-internal readings

• A sentence-internal comparison, without referring to any previously introduced element, e.g.
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\[
\begin{cases}
\text{Each student} \\
\text{The students} \\
\text{All the students}
\end{cases}
\text{ saw the same movie.}
\]
Sentence-internal readings

• A sentence-internal comparison, without referring to any previously introduced element, e.g.

(2) \[
\begin{cases}
\text{Each student} \\
\text{The students} \\
\text{All the students}
\end{cases}
\text{ saw the same movie.}
\]

• Sentence-internal readings must be licensed by a semantic plural (Carlson, 1987)

(3) #Sue saw the same movie.
Our goal

Investigate how sentence-internal *same* is processed with:


Our goal

Investigate how sentence-internal *same* is processed with:

- 3 of its licensors
  - EACH
  - ALL
  - THE
Our goal

Investigate how sentence-internal *same* is processed with:

- 3 of its licensors
  - EACH
  - ALL
  - THE

- 2 orders
  - Q+AOC: surface scope
    
    \[
    \begin{cases}
    \text{Each student} \\
    \text{The students} \\
    \text{All the students}
    \end{cases}
    \text{saw the *same* movie.}
    \]

  - AOC+Q: inverse scope

    \[
    \begin{cases}
    \text{The *same* student saw} \\
    \text{each movie} \\
    \text{the movies} \\
    \text{all the movies}
    \end{cases}
    \]
Previous theories and their predictions

Inverse scope interpretation harder to process than surface scope:

(6) A boy climbed every tree.

Previous theories and their predictions

Explanation in terms of covert scope operations:
  • Inverse scope requires an extra operation
    (Anderson, 2004)
Previous theories and their predictions

Explanation in terms of covert scope operations:

• Inverse scope requires an extra operation (Anderson, 2004)

(7) A boy climbed every tree.

• [every tree] [a boy climbed _ ]
Previous theories and their predictions

Explanation in terms of discourse model:

- Inverse scope requires revising discourse model structure

(Fodor, 1982; Crain and Steedman, 1985)
Previous theories and their predictions

Explanation in terms of discourse model:

• Inverse scope requires revising discourse model structure
  (Fodor, 1982; Crain and Steedman, 1985)

(8) A boy climbed...
Previous theories and their predictions

Explanation in terms of discourse model:
- Inverse scope requires revising discourse model structure
  (Fodor, 1982; Crain and Steedman, 1985)

(8) A boy climbed...
(9) A boy climbed every tree.
Previous theories and their predictions

The sentence-internal reading of *same* has to be scopally licensed:

(10) The same student saw every movie.
Previous theories and their predictions

The sentence-internal reading of *same* has to be scopally licensed:

(10) The same student saw every movie.

- *every movie* scopes and distributes over *same*
  (Carlson 1987, among many others)
Previous theories and their predictions

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But no revision necessary of the discourse model structure because of the meaning of *same*. 
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The sentence-internal reading of *same* has to be scopally licensed:

(10) The same student saw every movie.

- *every movie* scopes and distributes over *same*  
  (Carlson 1987, among many others)

But no revision necessary of the discourse model structure because of the meaning of *same*.

- Thus, *same* can help us distinguish between the two theories of inverse scope
Previous theories and their predictions

In addition, previous theories:

- postulated different meanings of *same*
- postulated different meanings for quantificational NPs
Previous theories and their predictions

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On-line interpretation of AOCs brings new data which can help decide between theories.
Previous theories and their predictions

In addition, previous theories:

• postulated different meanings of *same*

• postulated different meanings for quantificational NPs
  (Heim 1985, Carlson 1987, Moltmann 1992, Beck 2000,
  Barker 2007, Dotlačil 2010, Brasoveanu 2011)

On-line interpretation of AOCs brings new data which can help decide between theories.

• Anderson 2004, Dwivedi et al. 2009
Plan

• Experimental study
• Results of the study
• Analysis of the results
Method

- A self-paced reading task testing how easy it is to process sentence-internal *same*
Method

• A self-paced reading task testing how easy it is to process sentence-internal *same*
  • with 3 licensors: EACH, ALL and THE
  • in 2 orders: Q+SAME (quantifier precedes AOC) and SAME+Q (AOC precedes quantifier)
  • i.e., $3 \times 2 = 6$ conditions in total
Method

• A self-paced reading task testing how easy it is to process sentence-internal *same*
  • with 3 licensors: EACH, ALL and THE
  • in 2 orders: Q+SAME (quantifier precedes AOC) and SAME+Q (AOC precedes quantifier)
  • i.e., $3 \times 2 = 6$ conditions in total
• Each condition was tested 8 times
  • four times in sentences most likely judged as true relative to the background scenarios
  • four times in sentences most likely judged as false
  • for a total of 48 stimuli
Sarah and Madeleine are two young women who live in a village that has only three shops, a fabric store, a bakery and a DVD store. Last Monday, Sarah went to the fabric store, then to the bakery and finally to the DVD store, while Madeleine was at home all day.
Example
Example
- think —— —— —— —— —— —— —— —— —— —— —— —— —— ——
Example

- —— that — —— — —— — ——— — —— — ———
Example
Example

- —— —— — same —— ———— —— — ———
Example
Example

- —— —— —— —— —— visited —— —— —— ——
Example

- —— —- —- — —- —– ——- each —- —— ———
Example

- —— —— —— —— —— shop —— ——
Example
Example
Example

village.
Example

Am I right to think that?
Scenarios

In general, scenarios consist of:

- 2 sets of entities (e.g., women and stores)
- a relation between them (e.g., ‘visit’)

Method

• 115 participants
Method

- 115 participants
- 2 groups
- each group: 12 items in surface scope, 12 items in inverse scope
**Method**

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- i.e., 24 test items plus 35 fillers = 59 stimuli per participant
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- the participants completed the experiment online
Method

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• 2 groups
• each group: 12 items in surface scope, 12 items in inverse scope
• i.e., 24 test items plus 35 fillers = 59 stimuli per participant
• the participants completed the experiment online
• order pseudo-randomized for each participant
Method

- the two data sets (75 and 40 participants) were initially analyzed separately
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• no differences, hence final analysis based on merged data sets
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- 22 participants excluded because 15% or more questions answered incorrectly
Method

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• no differences, hence final analysis based on merged data sets
• 22 participants excluded because 15% or more questions answered incorrectly
• Length of words and position in sentence factored out
Regions of interest

- Quantifier + 2 following words
- *Same* + 2 following words
- Reading times of full sentences
Quantifier and 2 following words

Surface scope:

- I think that each young woman visited the same shop in the village.

Inverse scope:

- I think that the same young woman visited each shop in the village.
Quantifier and 2 following words

Surface scope
Quantifier and 2 following words

Surface scope

![Graph showing surface scope for different quantifiers](image-url)
Quantifier and 2 following words

Surface scope

![Graph showing surface scope with quantifiers and words]
Quantifier and 2 following words

Surface scope

Inverse scope

---

Quant word

−4.5

−4.0

−3.5

All

Each

The

Quant word word

all

the

word

word

word

word
Quantifier and 2 following words

Surface scope

Inverse scope
Generalizations: Quant and 2 following words

- **Surface scope** > **Inverse scope**
  
  \( a > b \) means ‘a takes more time than b’
Generalizations: Quant and 2 following words

• **Surface scope** > **Inverse scope**
  
  \((a > b \text{ means ‘a takes more time than b’})\)
  
  • But the two scopes are not directly comparable due to different positions of quantifiers (subject vs. object)
Generalizations: Quant and 2 following words

- **Surface scope > Inverse scope**
  
  \(a > b\) means ‘a takes more time than b’
  
  - But the two scopes are not directly comparable due to different positions of quantifiers (subject vs. object)

- In case of **Inverse scope**: Each, The > All
Surface scope:
• I think that each young woman visited the same shop in the village.

Inverse scope:
• I think that the same young woman visited each shop in the village.
Same and 2 following words

Inverse scope

![Graph showing the inverse scope relationship between 'same' and two following words with values -4.4, -4.0, and -3.3.](image)
Same and 2 following words

Inverse scope

-4.4
-4.0
-3.3

same word word

○ All
△ Each
+ The
Same and 2 following words

Inverse scope  Surface scope

-4.4 -4.0 -3.3

<table>
<thead>
<tr>
<th>same</th>
<th>word</th>
<th>word</th>
<th>same</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Each</td>
<td>The</td>
<td></td>
</tr>
</tbody>
</table>
Same and 2 following words

Inverse scope

Surface scope

![Graph showing the relationship between 'Same' and 'word' and 'word' and 'Same' for Inverse scope and Surface scope.]

- For 'Inverse scope', the graph shows a downward trend as the distance increases.
- For 'Surface scope', the graph shows an upward trend as the distance increases.

Each point on the graph represents different words and their corresponding 'Same' value.
Generalizations: *Same* and 2 following words

- **Inverse scope** $>$ **Surface scope**
Generalizations: *Same* and 2 following words

- **Inverse scope > Surface scope**
  - But the two scopes are not directly comparable due to different positions of *same* (subject vs. object)
Generalizations: *Same* and 2 following words

- **Inverse scope > Surface scope**
  - But the two scopes are not directly comparable due to different positions of *same* (subject vs. object)
- In case of **Surface scope**: Each, The > All
Total times
Generalizations: Total times

- All:
  - Surface scope ≈ Inverse scope
Generalizations: Total times

- **All:**
  - Surface scope $\approx$ Inverse scope
- **Each, The $\succ$ All**
Generalizations: Total times

- **All:**
  - Surface scope $\approx$ Inverse scope
- **Each, The $>$ All**
- **Each, The:**
  - Inverse scope $>$ Surface scope
Three assumptions about the meanings of:

• same – ambiguous
• each – requires differentiation
• the – ordered interpretations
Three assumptions about the meanings of:

- *same* – ambiguous
Three assumptions about the meanings of:

- *same* – ambiguous
- *each* – requires differentiation
Three assumptions about the meanings of:

- *same* – ambiguous
- *each* – requires differentiation
- *the* – ordered interpretations
Assumption 1: *Same* is ambiguous
Assumption 1: *Same* is ambiguous

...like *different* in many languages (Beck, 2000; Dotlačil, 2010)

(11) \[
\begin{align*}
\text{every} & \quad \text{all the} \\
\text{each} & \quad \text{all the} \\
\text{each} & \quad \text{all} \\
\text{each} & \quad \text{each} \\
\text{every} & \quad \text{all} \\
\text{each} & \quad \text{all}
\end{align*}
\]

Iedere jongen lezen een **ander** boek.

Every boys read(s) a **different[1]** book.
Assumption 1: *Same* is ambiguous

...like *different* in many languages (Beck, 2000; Dotlačil, 2010)

(11) \{
    \begin{align*}
    Iedere & \quad ?Alle de & \quad jongen lezen een & \textbf{ander} & \text{boek}.
    \\
    ?Alle de & \quad *De & \quad Every & \text{boys read(s) a} & \textbf{different[1]} & \text{book.}
    \end{align*}
\}

(12) \{
    \begin{align*}
    #Iedere & \quad Alle de & \quad jongen lezen & \textbf{verschillende} & \text{boeken}.
    \\
    Alle de & \quad De & \quad #Every & \text{boys read(s) \textbf{different[2]} book.}
    \end{align*}
\}
Assumption 1: *Same* is ambiguous

*Same*[1]: identity between two entities

- Sentence-external:

  (13)  
  a. Arnold saw ‘Waltz with Bashir’.
Assumption 1: *Same* is ambiguous

**Same**[1]: identity between two entities

- Sentence-external:
  
  (13)  
  a. Arnold saw ‘Waltz with Bashir’.

  The movie seen by Heloise = ‘Waltz with Bashir’
Assumption 1: *Same* is ambiguous

**Same[1]:** identity between two entities

- **Sentence-external:**

  (13) a. Arnold saw ‘Waltz with Bashir’.
  

  The movie seen by Heloise = ‘Waltz with Bashir’

- **Sentence-internal:**

  (14) \{ Each boy
  
  All the boys \} saw the same[1] movie.
Assumption 1: *Same* is ambiguous

**Same[1]:** identity between two entities

- **Sentence-external:**

  (13)  
  a. Arnold saw ‘Waltz with Bashir’.

  The movie seen by Heloise = ‘Waltz with Bashir’

- **Sentence-internal:**

  (14) \[
  \left\{ \begin{array}{l}
  \text{Each boy} \\
  \text{All the boys}
  \end{array} \right\} \text{ saw the same[1] movie.}
  
  For any two boys $b_1$ and $b_2$, $b_1$’s movie = $b_2$’s movie
Assumption 1: *Same* is ambiguous

- Sentence-internal:

(15) \{ Each boy
 \quad All the boys \} saw the same[1] movie.

- The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form

<table>
<thead>
<tr>
<th>boy₁</th>
<th>boy₂</th>
<th>boy₃</th>
</tr>
</thead>
</table>
Assumption 1: *Same* is ambiguous

- Sentence-internal:

  \[
  (15) \quad \begin{cases}
  \text{Each boy} \\
  \text{All the boys}
  \end{cases}
  \text{ saw the same[1] movie.}
  \]

- The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form

  \[
  \begin{array}{c}
  \text{boy}_1 \\
  \text{boy}_2 \\
  \text{boy}_3 \\
  \end{array}
  \Rightarrow
  \begin{array}{c}
  \text{movie}_1 \\
  \text{movie}_2
  \end{array}
  \]
Assumption 1: *Same* is ambiguous

• Sentence-internal:

(15) \[ \begin{cases} 
\text{Each boy} \\
\text{All the boys} 
\end{cases} \text{ saw the same[1] movie.} \]

• The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form

\[
\begin{array}{c}
\text{boy}_1 \quad \text{movie}_1 \\
\text{boy}_2 \quad \text{movie}_2 \\
\text{boy}_3 \\
\text{etc.}
\end{array}
\]

\[ \Rightarrow \]

\[
\begin{array}{c}
\text{boy}_1 \quad \text{movie}_1 \quad \text{boy}_2 \quad \text{movie}_2 \\
\text{boy}_1 = \text{movie}_1 \quad & \quad \text{movie}_1 = \text{movie}_2
\end{array}
\]
Assumption 1: *Same* is ambiguous

• Sentence-internal:

(15) \{ Each boy
\quad \{ All the boys \}
\} saw the same[1] movie.

• The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form

\[
\begin{align*}
\text{boy}_1 & \quad \text{movie}_1 & \quad \text{boy}_2 & \quad \text{movie}_2 \\
\text{boy}_1 & \quad \text{movie}_1 & \quad \text{boy}_3 & \quad \text{movie}_3 \\
\end{align*}
\]

& movie_1 = movie_2

\Rightarrow

\[
\begin{align*}
\text{boy}_1 & \quad \text{movie}_1 \\
\text{boy}_2 & \quad \text{movie}_2 \\
\text{boy}_3 & \quad \text{movie}_3 \\
\end{align*}
\]

&
Assumption 1: *Same* is ambiguous

- **Sentence-internal:**
  \[
  \{\text{Each boy} \quad \text{All the boys}\} \quad \text{saw the same[1] movie.}
  \]

- **The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form**

  \[
  \begin{align*}
  \text{boy}_1 & \quad \text{movie}_1 & \quad \text{boy}_2 & \quad \text{movie}_2 \\
  \text{boy}_1 & \quad \text{movie}_1 & \quad \text{boy}_3 & \quad \text{movie}_3 & \quad \text{& movie}_1 \ = \ \text{movie}_2 \\
  \text{boy}_2 & \quad \text{movie}_2 & \quad \text{& movie}_1 \ = \ \text{movie}_3
  \end{align*}
  \]
Assumption 1: *Same* is ambiguous

- **Sentence-internal:**

  (15) \[ \{ \text{Each boy}\ 
  \{ \text{All the boys}\} \text{ saw the same[1] movie.} \]

- **The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form**

  \[
  \left\{ \begin{array}{c}
  \text{boy}_1 \text{ movie}_1 \\
  \text{boy}_2 \text{ movie}_2 \\
  \text{boy}_3 \text{ movie}_3
  \end{array} \right\}
  \& \text{ movie}_1 = \text{ movie}_2
  \left\{ \begin{array}{c}
  \text{boy}_2 \text{ movie}_2 \\
  \text{boy}_1 \text{ movie}_1
  \end{array} \right\}
  \& \text{ movie}_1 = \text{ movie}_3
Assumption 1: *Same* is ambiguous

- **Sentence-internal:**

  (15) \(\{\) Each boy

  \(\{\) All the boys \(\}\) saw the same[1] movie.

- **The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form**

  \[
  \begin{align*}
  \text{boy}_1 & \text{ movie}_1 & \text{boy}_2 & \text{movie}_2 \quad \& \quad \text{movie}_1 = \text{movie}_2 \\
  \text{boy}_1 & \text{ movie}_1 & \text{boy}_3 & \text{movie}_3 \quad \& \quad \text{movie}_1 = \text{movie}_3 \\
  \text{boy}_2 & \text{ movie}_2 & \text{boy}_1 & \text{movie}_1 \quad \& \quad \text{movie}_2 = \text{movie}_1 \\
  \end{align*}
  \]

\[\]
Assumption 1: *Same* is ambiguous

- **Sentence-internal:**

\[(15) \left\{ \begin{array}{l} \text{Each boy} \\ \text{All the boys} \end{array} \right\} \text{ saw the same[1] movie.} \]

- The distributive quantifier temporarily creates in its scope interpretation contexts of sentence-external form

\[
\begin{align*}
\text{boy}_1 & \quad \text{movie}_1 & \quad \text{boy}_2 & \quad \text{movie}_2 & \quad \text{& movie}_1 = \text{movie}_2 \\
\text{boy}_2 & \quad \text{movie}_1 & \quad \text{boy}_3 & \quad \text{movie}_3 & \quad \text{& movie}_1 = \text{movie}_3 \\
\text{boy}_3 & \quad \text{movie}_2 & \quad \text{boy}_1 & \quad \text{movie}_1 & \quad \text{& movie}_2 = \text{movie}_1 \\
\text{etc.} &
\end{align*}
\]
Assumption 1: *Same* is ambiguous

*Same*[2]: relates parts of a plural individual to one entity by a binary relation $R$

Dowty, 1985, Barker, 2007

\[
\{ \text{The boys} \ \text{All the boys} \} \ \text{saw the same[2] movie.}
\]
Assumption 1: *Same* is ambiguous

**Same[2]**: relates parts of a plural individual to one entity by a binary relation $R$
Dowty, 1985, Barker, 2007

(16) \[
\begin{cases}
\text{The boys} \\
\text{All the boys}
\end{cases}
\text{ saw the same[2] movie.}
\]

- plural individual $\equiv$ the boys
- $R \equiv$ saw movie
Assumption 1: *Same* is ambiguous

**Same[2]:** relates parts of a plural individual to one entity by a binary relation $R$
Dowty, 1985, Barker, 2007

(16) \[ \{ \text{The boys} \quad \text{All the boys} \} \text{ saw the same[2] movie.} \]

- plural individual $= \text{the boys}$
- $R = \text{saw movie}$
- same[2]:
  ‘saw movie’ relates any two boy atoms to the same entity
Assumption 1: *Same* is ambiguous

Sentence-internal reading with *same*[1]:
- all the work is done by the distributive quantifier (the licensor)
Assumption 1: *Same* is ambiguous

Sentence-internal reading with *same*[1]:
  • all the work is done by the distributive quantifier (the licensor)

Sentence-internal reading with *same*[2]:
  • all the work is done by *same*
Assumption 2: Each requires differentiation

Tunstall, 1998: Each needs “differentiated” events in its scope

(17) Jake photographed \( \{ \text{each student} \) in the class, but \( \text{every student} \) not separately.
Assumption 3: Ordered readings for The

COLLECTIVE >> CUMULATIVE >> DISTRIBUTIVE

(18) a. The boys elected the representative.
    b. The boys hugged the girls.
    c. The boys had a sip of juice.

Accounting for generalizations

The is interpreted collectively by default, so incompatible with same:

(19) # The boys elected the same president.
Accounting for generalizations

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(19) # The boys elected the same president.

Reanalyzing towards non-collective takes extra time, hence:
**Accounting for generalizations**

**The** is interpreted collectively by default, so incompatible with *same*:

\[(19)\] # The boys elected the same president.

Reanalyzing towards non-collective takes extra time, hence:

- **The** > **All** for reading times on *same* in surface scope

\[(20)\] The/all the young women visited the same shop in . . .
Accounting for generalizations

The is interpreted collectively by default, so incompatible with same:

(19) # The boys elected the same president.

Reanalyzing towards non-collective takes extra time, hence:

- The > All for reading times on same in surface scope

(20) The/all the young women visited the same shop in . . .

- and for full-sentence readings times in surface scope

(21) The/all the young women visited the same shop in . . .
Accounting for generalizations

Each requires differentiation:

(22) Each young woman visited a shop.

a very strong preference for distinct shops (Anderson 2004, Roeper et al. 2011)
Accounting for generalizations

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    a very strong preference for distinct shops (Anderson 2004, Roeper et al. 2011)

...which makes it a dispreferred licensor of same:

(23) Each young woman visited the same shop.
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...which makes it a dispreferred licensor of same:

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Hence:

• Each > All for reading times on same in surface scope

(24) Each/all the young women visited the same shop in...
Accounting for generalizations

Each requires differentiation:

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a very strong preference for distinct shops (Anderson 2004, Roeper et al. 2011)

...which makes it a dispreferred licensor of same:

(23) Each young woman visited the same shop.

Hence:

• Each > All for reading times on same in surface scope

(24) Each/all the young women visited the same shop in...

• and for full-sentence readings times in surface scope

(25) Each/all the young women visited the same shop in...
Accounting for generalizations

No difference in full-sentence reading times between Inverse scope and Surface scope for All, hence:

- no evidence for processing costs of covert scoping operations
Accounting for generalizations

- **Inverse scope** > **Surface scope** for Each and The for full-sentence reading times

(26) The same young woman visited each shop / the shops...
Accounting for generalizations

- **Inverse scope > Surface scope** for *Each* and *The* for full-sentence reading times

  (26) The same young woman visited each shop / the shops...

- **Each, The > All** for reading times on QUANT in inverse scope

  (27) The same young woman visited [each shop / the shops]...
Accounting for generalizations

- **Inverse scope > Surface scope** for Each and The for full-sentence reading times

(26) The same young woman visited each shop / the shops...

- Each, The > All for reading times on QUANT in inverse scope

(27) The same young woman visited each shop / the shops...

Each and The (unlike All) force disambiguation of same:
- *same*[1] for Each
- *same*[2] for The
Accounting for generalizations

• **Inverse scope** > **Surface scope** for **Each** and **The** for full-sentence reading times

(26) The same young woman visited each shop / the shops...

• **Each, The** > **All** for reading times on QUANT in inverse scope

(27) The same young woman visited [each shop / the shops]...

**Each** and **The** (unlike **All**) force disambiguation of **same**:

• **same[1]** for **Each**
• **same[2]** for **The**

(28) The same young woman
Accounting for generalizations

- **Inverse scope > Surface scope** for Each and The for full-sentence reading times

(26) The same young woman visited each shop / the shops...

- Each, The > All for reading times on QUANT in inverse scope

(27) The same young woman visited each shop / the shops...

Each and The (unlike All) force disambiguation of **same**:

- same[1] for Each
- same[2] for The

(28) The same young woman visited each shop / the shops.
Accounting for generalizations

- **Inverse scope** > **Surface scope** for Each and The for full-sentence reading times

(26) The same young woman visited each shop / the shops...

- Each, The > All for reading times on QUANT in inverse scope

(27) The same young woman visited each shop / the shops...

Each and The (unlike All) force disambiguation of same:

- same[1] for Each
- same[2] for The

(28) The same young woman visited each shop / the shops.

Late disambiguation takes extra time (Cliffton and Staub, 2008)
Conclusion

- Inverse scope of quantifiers is costly because of model structure reanalysis, not because of covert scope operations
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  - no inverse-scope slowdown when All licenses same
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  - no inverse-scope slowdown when All licenses *same*
  - inverse-scope slowdown with Each and The due to *same* disambiguation
Conclusion

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  - no inverse-scope slowdown when All licenses same
  - inverse-scope slowdown with Each and The due to same disambiguation

- Surface-scope slowdown on Each and The, as compared to All, because of lexical incompatibility with same
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References I


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References II


References III


