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THE PROCESSING COST OF STRESS SHIFT

1. The problem: scope shift with plural numeral indefinites.

A prevailing assumption: plural numeral indefinites can never have wide distributive scope, when they occur VP internally. Ruys (1992) Ben Shalom (1993), Beghelli and Stowell (1997), Kamp and Reyle (1993), Szabolcsi (1997)

- 1) A porter lifted two tables
- 2
 - a) Three men lifted two tables.
 - b) [two tables] D [three men lifted e]
 - c) $\exists X$ (two (X) & tables (X) & $\forall z \in X$ ($\exists Y$ (three (Y) & men (Y)) & y lifted z))
Possibly, six men are involved in the event.

Contextual factors: Reinhart (1995) argued that when the overt scope is inconsistent with world knowledge, it is easier to perceive the scope-shift reading.

- 3) An American flag was hanging in front of every building (Hirschbuhler (1982)).
- 4
 - a) A flag was hanging in front of two building.
 - b) A guard stood in front of two buildings.

Beghelli and Stowell (1997): Contextual factors don't help when the subject is also a plural numeral.

- 5
 - a) Three flags were hanging in front of two buildings
 - b) Five guards stood in front of twenty buildings

2. Why should the properties of the subject affect the scope potential of the object?

2.1. *Beghelli and Stowell's (1997) syntactic answer:*

a. The distributive operator (their "silent each") has a fixed position lower than the external subject position ("between AGRS-P and AGRO-P"). It is only up to that position that the internal indefinite can move. Thus, to begin with, the subject is not in the scope of the moved indefinite and its distributive operator. To enter this scope, the subject needs to reconstruct to its original theta position (in Spec VP). In (4a) this reconstruction takes place, so *a flag* ends up in the (distributive) scope of *two buildings*.

b. But the subject cannot always reconstruct. Only "simple indefinites" which they define to be singular indefinites and bare plurals can do so. All other indefinites, like the plural

numeral subjects in (2) and (5), or Generalized Quantifiers indefinites (like *less than three guards*) must be interpreted in their surface position. Hence, the relevant scope shift cannot be obtained in (2) and (5).

2.2. A puzzle: *The subject effect disappears when it is not distributive.*

- 6 a) Three flags were hanging in front of two buildings.
b) Three identical flags were hanging in front of two buildings.
- 7 a) Two simultaneous questions confused fifteen subjects in the experiment. (The others did fine with two simultaneous questions.)
b) Ten matching answers brought two couples to the final round [in a televised couples-contest].
c) Two subsequent meetings took place in three offices.
- 8 a) Four guests sleep in two rooms.
b) Four guests sleep together in two rooms.
- 9 Three Canadian flags were hanging together on two buildings.

2.3 A note on soliciting the judgments.

- 10 a) A tablecloth covers every table. (Up to as many tablecloths as tables)
b) A doctor will examine every patient. (Up to as many doctors as patients).
- 11 a) A tablecloth covers two tables. (Up to two tablecloths)
b) A doctor will examine ten patients. (Up to ten doctors)
- 12 a) Two doctors will examine ten patients. (Up to twenty doctors)
b) Three men lifted two tables. (Up to six men)

3. A processing account.

3.1. QR requires reference set computation.

On the analysis Fox (1995, 2000) and Reinhart (1995, 2006), scope shifting ("long distance" QR) is an interface repair strategy that is permitted only when it generates a reading that could not be obtained otherwise. This entails that when a scope-shifting QR applies, the resulting interpretation must be compared against alternative interpretations that could be obtained without the application of this operation. Technically, it requires constructing a reference set of <d(erivatoin), i(nterpretation)> pairs, to check if the same interpretation could not have obtained without scope-shifting QR. Reinhart (2006) argues that the need to construct and compare a reference-set is costly in terms of processing, since it requires holding two or more full derivations in working memory.

Reference set for (3)

- 13 a) **d:** An American flag was hanging in front of every building.
i: $\exists f (\text{CH} (f) \wedge \forall z (\text{building} (z) \rightarrow f(\text{American flag) was hanging in front of } z))$
- b) **d:** [every building] [a flag was hanging in front of e]
i: $\forall z (\text{building} (z) \rightarrow \exists f (\text{CH} (f) \wedge f(\text{flag) was hanging in front of } z))$

3.2. The size of the reference-set.

3.2.1 Scope shift with distributive subjects (4 to 5-members reference set).

- 14 a) Two flags are hanging in front of three buildings
b) [[three buildings] [two flags were hanging in front of e]]

15 *The three interpretations of (14a) (14a is associated with three (actually four) <d,i> pairs.)*

Collective interpretation (choice function) of both numerals:

- a) There is a set x of two flags and a set y of three buildings, such that x is hanging in front of y. (two flags, three buildings)

Distributive subject: (Subject is distributed, but the existential closure of the collective object can be either inside or outside the scope of the Dist operator.)

- b) There is a set of two flags, such that for each flag x in this set, there is a set y of three buildings, and x is hanging in front of y. (two flags, six buildings)
c) There is a set of three buildings y, and a set of two flags such that each flag x in this set is hanging in front of y. (two flags, three buildings)

16 *The <d,i> of (14b)*

d: [three buildings] [two flags were hanging in front of e]

i: There is a set of three buildings such that for each building x in this set, there is a set y of two flags, and y is hanging in front of x (six flags, three buildings).

The reference-set required to compute scope shift in (14) has four (or five) members, which exceeds processing capacity.

3.2.2. Scope shift with collective subjects (2-members reference set).

- 6) Two identical flags were hanging in front of three buildings.
9) Two Canadian flags were hanging together on three buildings.

- 17 *Reference set for scope shift in (6):*
- a) **d:** [Two identical flags were hanging in front of three buildings]
i: There is a set x of two identical flags and a set y of three buildings, such that x is hanging in front of y . (two flags, three buildings)
 - b) **d:** [[three buildings] [two identical flags were hanging in front of e]]
i: There is a set of three buildings such that for each building x in this set, there is a set y of two flags, and y is hanging in front of x (six flags, three buildings).

3.2.3. Intermediate cases: 3-members reference set.

- 4) A flag was hanging in front of two buildings.
- 18
- a) **d:** [A flag was hanging in front of two buildings]
i: $\exists f_i (CH (f_i) (\exists f_j (CH (f_j) (f_i(\text{flag}) \text{ was hanging in front of } f_j(\text{building}))))$
 - b) **d:** [A flag was hanging in front of two buildings]
i: $\exists f_j (CH (f_j) (\exists f_i (CH (f_i) (f_i(\text{flag}) \text{ was hanging in front of } f_j(\text{building}))))$
 - c) **d:** [[two buildings] [a flag was hanging in front of e]]
i: There is a set of two buildings such that for each building x in this set, there is a flag hanging in front of it (two buildings two flags).
- 19
- a) (=18a) There is a flag x , such that there is a set of two buildings y , and x was hanging in front of y (two buildings, one flag)
 - b) (=18b) There is a set of two buildings y such that there is a flag x , and x was hanging in front of y (two buildings, one flag)
- 20
- a) A doctor will examine every patient. (2-members reference set)
 - b) A doctor will examine twenty patients. (3-members reference set)
- 21) Some tourists visited every museum. (Reinhart (1976): No scope shift)

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