Stranded Quantifiers, Reconstruction and QR

Masaki Ohno

Showa University
mohno@cas.showa-u.ac.jp

Abstract

Sportiche's (1988) theory of quantifier stranding does not in principle exclude the possibility of quantifiers being stranded in theta-positions. This prediction is not borne out, however, as in **The students were arrested all*. Bošković (2001, 2004) states that quantifiers cannot be stranded in theta-positions. In this paper I argue that the object part of Bošković's generalization is derived from the interaction between reconstruction and QR.

1. Issue: Stranded Quantifiers in Object Position

Quantifiers are not stranded in the internal argument position, or roughly speaking, object position. In (1a-c), the position of the stranded object-related quantifiers seems to be responsible for the ungrammaticality of each sentence.

- (1a) *The students arrived all.
- (1b) *The teachers were arrested all.
- (1c) *John kicked the students all.

Bošković (2001, 2004) states that quantifiers cannot be stranded in theta-positions. Let us call this Bošković's generalization (hereafter, BG). Although Bošković argues that his generalization holds of quantifiers in general, irrespective of whether they modify the subject or the object, here I focus on the object part of BG.

BG is supported by the contrast in (2) as well. In (2a) the quantifier is stranded by *wh*-movement in its base-position, resulting in the ungrammaticality. (2b) is reported to be marginally acceptable. This is perhaps because the sentence does not contain a stranded quantifier in the base position.

- (2a) *The books, which I will have to read all, are interesting.
- (2b) ?The books, which I will all have to read, are interesting. (Doetjes 1992)

The contrast in (3) also illustrates the same point. Stranding a quantifier through relativization results in the ungrammaticality as in (3a).

- (3a) *the books that John read all
 (3b) ?the books that all were read by John
 (3c) the books that were all read by John (Bowers 1993)

In French, however, it looks like object-related quantifiers can be stranded in their theta-positions.

- (4) Je les ai vus tous.
 I them(cl) have seen all
 'I have seen them all' (Doetjes 1992)

It is not clear, though, whether (4) holds as a counterexample to BG. We could analyze *tous* as being at VP-adjoined position (right adjoined position) by clitic movement on the way to its final landing site. Or it may be that *tous* is located at a higher position (e.g., Spec-AgrP) than its base position, but the surface position of *tous* is obscured by the following clitic movement and overt movement of *vus*. In this view, it amounts to saying that in fact *tous* is stranded at Spec of a functional projection higher than VP. If this is tenable, then we can assume that the object part of BG still holds in (4).

Suppose that BG is true. Then why is it that quantifiers cannot be stranded in object position? To this problem, I point out that an obligatory application of reconstruction, combined with Quantifier Raising (QR), provides an answer. Specifically, I argue that sentences containing stranded object quantifiers cannot meet the contradictory requirement of these two operations simultaneously, leading to their ungrammaticality.

2. Stranded Quantifiers and Reconstruction

Consider the following examples.

- (5a) All the boys aren't happy. (^{OK}all > not), (^{OK}not > all)
 (5b) The boys aren't all happy. (*all > not), (^{OK}not > all)

The sentence in (5a) is ambiguous with respect to scope of *all* and negation. On one reading, called a wide scope reading of all (all > not), it says that for each of the boys it is true that he is not happy ("x [student (x) → ¬happy (x)]"). On the other reading, called a wide scope reading of negation (not > all), it says that it is not the case that all the boys are happy (¬"x [student

($x \rightarrow \text{happy}(x)$)). Suppose that reconstruction of the (subject) noun phrase to its base position is optionally applied at LF. Then this explains the scope ambiguity in (5a).

In contrast, the sentence in (5b) is not ambiguous. It has only a wide scope reading of negation. The initial observation would be that sentences containing a stranded quantifier cancel scope ambiguity. In other words, only a surface scope reading is available to them. I assume that reconstruction of the (subject) noun phrase is obligatorily applied at LF to the position where its stranded quantifier is located. In (5b), the stranded quantifier *all* requires the A-moved subject *the boys* to be reconstructed to its base position (i.e., the predicate internal subject position), resulting in a wide scope reading of negation (not > all).

Dowty and Brodie (1984) observes that the sentence (6a) below is ambiguous, whereas the sentence (6b) is not.

(6a) The students all didn't leave. ($^{OK}all > not$), ($^{OK}not > all$)

(6b) The students didn't all leave. ($*all > not$), ($^{OK}not > all$)

(Dowty and Brodie 1984)

I take it from the examples above that the position of a stranded quantifier indicates that the A-moved host DP is interpreted as a whole QDP there at LF. Let us describe this requirement as follows.

(7) Reconstruction

At LF, host DPs must be reconstructed and interpreted as QDPs in the position where their stranded quantifiers are located.

In (6b), *the students* is obligatorily reconstructed to the position where *all* is located in accordance with the rule in (7). I assume that *all* in (6b) occupies a thematic position, or put differently, it is located at the predicate internal subject position.

(8) The students didn't [_{VP} all leave].

This results in a wide scope reading of negation in (6b) (and a wide scope reading of *all* in the case of (6a)). Notice that reconstruction of A-moved DPs to their base position is optional. Thus a wide scope reading of negation in (6a) appears after the obligatory application of reconstruction of the host DP followed by the optional application of reconstruction of the whole QDP to its base position.

Regarding optionality of reconstruction, I follow Fox's (2000) Scope Economy, which disallows semantically vacuous applications of covert operations.

- (9) Scope Economy (Fox 2000)
Scope-shifting operations cannot be semantically vacuous.

The economy consideration provides an account of the contrast in (10a,b) below.

- (10a) The contestants all can win. (${}^{0K}all > can$), ($*can > all$)
(10b) The contestants can all win. ($*all > can$), (${}^{0K}can > all$)
(Dowty and Brodie 1984)

The rule in (7) predicts that *all* has a scope over *can* in (10a), whereas *can* has a scope over *all* in (10b). This prediction is borne out. In addition, (10a) has the possibility of undergoing an optional application of reconstruction of *all the contestants* to its base position. However, this possibility is ruled out by Scope Economy as it has no semantic effect on the sentence.

3. Type Mismatch Problems and Quantifier Raising

Syntactic trees are interpreted node by node by application of semantic rules. Let us see a simple case.

A two-place predicate denotes a function which maps individuals to a function which maps individuals to truth values. In (11), the two-place predicate *kicked* takes *Mary* as its argument by function application and maps to a one-place predicate. This one-place predicate, namely the VP node, is a function which maps any individual that kicked Mary to a truth value "True". In (11), the VP takes *John* as its argument by function application and maps to a truth value. With this in mind, consider the sentence below where the subject is a quantificational NP.

- (12) Every student kicked Mary

Let us assume that *kicked Mary* is a one-place predicate which is true of any individual which kicked Mary. From the way the sentence in (11) is interpreted, we may expect that *kicked Mary* takes *every student* as its argument by function application.

But this is not possible because quantificational NPs cannot denote individuals. There are several facts that quantificational NPs do not denote an individual. Here is one example discussed in Heim and Kratzer (1998). In the inference below, any argument of type *e* is expected to make it valid if the argument makes the premise true. This is so when the denotation of *came yesterday morning* (a set of individuals who came yesterday morning) is a subset of the denotation of *came yesterday* (a set of individuals who came yesterday), and a sentence whose subject denotes an individual is true iff that individual is a member of the set denoted by the VP.

- (13) *Subset-to-superset inference*
 x came yesterday morning.
 ∴ x came yesterday.

The inference in (14) below is expected to be valid if the premise is true, because if $[[\text{John}]]$ is a member of $[[\text{came yesterday morning}]]$, then $[[\text{John}]]$ is also a member of $[[\text{came yesterday}]]$.

- (14) John came yesterday morning.
 ∴ John came yesterday.

However, there is a case in which the premise is true but the conclusion is false. QNPs like *no boy*, *few students*, when substituted for *x* in (13), make the inference invalid.

- (15) No boy came yesterday morning.
 ∴ No boy came yesterday.

The inference in (15) is invalid even if the premise is true. There may be some boy who came yesterday evening. A plausible conclusion therefore is that the denotation of QNPs is not of type *e*.

A solution for interpreting the sentence in (12) is to assume that actually the QNP in subject position is a higher order function that takes as its argument the VP-predicate, rather than the other way around. More generally, it is assumed that generalized quantifiers denote a function which maps a predicate to truth value ($\langle\langle e, t \rangle t \rangle$).

- (16) *Every student kicked Mary*
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graph TD
 S["S, t"] --- ES["Every student"]
 S --- VP["VP <e, t>"]
 ES --- ET["<<e, t> t>"]
 VP --- K["kicked"]
 VP --- M["Mary"]
 K --- KE["<e <e, t>>"]
 M --- ME["<e>"]

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Since QNPs denote  $\langle\langle e, t \rangle, t \rangle$ , given that the semantic type of NPs is  $\langle e, t \rangle$ , and quantifiers and NPs semantically combine by function application, it follows that the meaning of quantifiers is  $\langle\langle e, t \rangle, \langle\langle e, t \rangle, t \rangle\rangle$ .

Now, let us consider how the sentence in (18) below is interpreted in which a QNP appears in object position.

(18) John kicked every student.

It is clear, by now, that the sentence in (18) cannot be interpreted as it stands. The object QNP cannot combine with a predicate by function application because of a type mismatch. The LF syntactic structure in (19) is not interpretable unless we assume a semantic approach with flexible type mechanisms.

In Heim and Kratzer (1998), it is proposed that type mismatch problems induced by the object QNP are resolved in terms of application of Quantifier Raising (QR), with several additional rules such as 'traces left by QR denote an individual' and 'sister nodes of Q-raised DP denote the set of individuals'. Ultimately, QR creates the interpretable LF structure where it provides the transitive verb in (19) with an argument of type  $e$ , and the Q-raised DP with an argument of type  $\langle e, t \rangle$ .

## 4. Reconstruction and QR

This section provides an account of the problem why quantifiers cannot be stranded in object position. I argue that the interaction of reconstruction and QR is responsible for the ungrammaticality of sentences with a stranded object quantifier. Consider (20).

(20) \*John kicked the students all.

The previous section reviewed that QDPs in object position always incur a type mismatch problem. This interpretability problem occurs because the meaning of quantificational expressions is a higher order predicate which takes as its argument a predicate from individuals to truth values ( $\langle\langle e, t \rangle, t \rangle$ ). The logical form reconstruction of a host NP requires that *the students* in (20) move back to its base position, as in (21).

(21) John kicked  $t$  [ all the students]

But the resulting LF structure is not interpretable, as it induces a type mismatch. Generally, QR can save type mismatch problems. But in the case of (20) it cannot, because of a contradictory requirement of reconstruction and QR. The position of the quantifier in (20) indicates that the whole QDP should be interpreted at the Q-stranded position, i.e., the object position. If reconstruction does not occur, it leads to a failure of quantification of a stranded quantifier. If reconstruction occurs, the result is a type mismatch and semantic computation is stuck. Therefore object quantifiers cannot be stranded in base positions.

## 5. Conclusion

In this paper I first reviewed that stranded quantifiers require their host DPs to undergo reconstruction to the position where their modifying quantifiers are stranded. Then I introduced Heim and Kratzer's version of QR application. I argued that a contradictory requirement of reconstruction and QR provides an account of the ungrammaticality of sentences with stranded object quantifiers. One consequence is that the proposed account predicts that subject quantifiers can be stranded in theta-positions, which departs from part of Bošković's generalization.

## References

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