

Abstract

Quantifiers canonically attach to nouns or noun phrases as modifiers to specify the amount or number of the entity expressed by the noun. However, it has been observed that quantifiers can be positioned outside of the noun phrase. These so-called floating quantifiers (FQs) exhibit intriguing syntactic and semantic characteristics. On the one hand, they appear to have a close relationship with a noun; semantically they quantify a noun in the same way as non-floating quantifiers, and quite often they exhibit agreement with the noun. On the other hand, their phrase structure distribution is very similar to that of VP-adverbs. In this paper, we argue that the distribution of FQs is constrained not purely by syntax, but also by information structure. We show that FQs play a focus role whereas modified nouns are reference-oriented topic expressions. Building upon Dalrymple & Nikolaeva's (2011) recent proposal, we formulate the interaction between syntactic, semantic and information structure features of FQs within LFG's projection architecture.

1 Introduction

As observed in the generative literature since its early days, quantifiers that modify a noun can appear not only inside of the noun phrase (NP) but also outside of it. Since nominal modifiers are canonically located at NP-internal positions, those quantifiers appearing outside of the NP are often called “floating” quantifiers (FQs). FQs can be observed in a wide variety of languages, although there are restrictions on phrase structure positions available for FQs and lexical items that can float. (1) exemplifies FQs in English, French, German and Japanese respectively.

- (1) a. The students have *all* finished the assignment.
b. Elles sont *toutes* allées à la plage.
they.F are all.F.PL gone.F.PL to the beach
'They all went to the beach.' (French)
c. Diesen Studenten habe ich gestern *allen* geschmeichelt.
these.DAT.PL students have I yesterday all.DAT.PL flattered
'I flattered all of these students yesterday.' (German)
(Bobaljik, 2003, 107–9)
d. kodomo-tati wa *minna* eiga o tanosinda.
children-PL TOPIC all movie ACC enjoy.PAST
'The children all enjoyed the movie.' (Japanese)

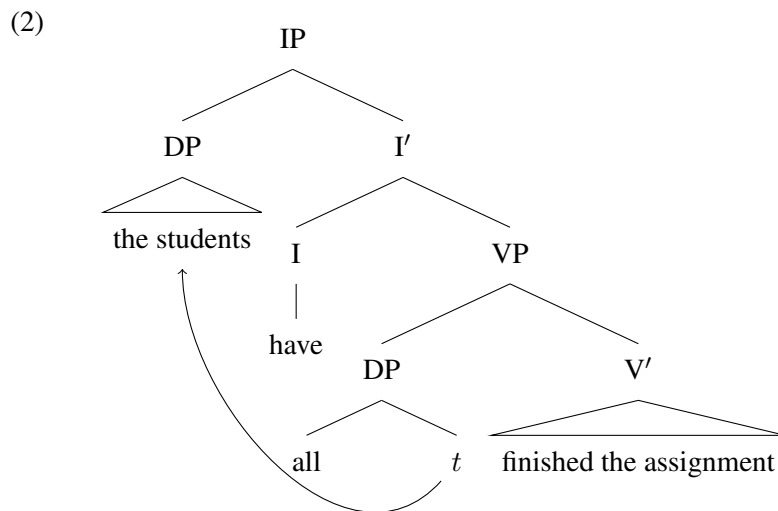
In English and French examples (1a) and (1b), *all* and *toutes* appear between the finite auxiliary and the non-finite lexical verb although they semantically modify

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the subject nouns. In the German example (1c), the quantifier *allen* is located immediately before the clause final non-finite verb and modifies the object noun *Studenten*. Finally in Japanese, the quantifier *minna* appears between the clause-initial topic and the object NP as shown in (1d).

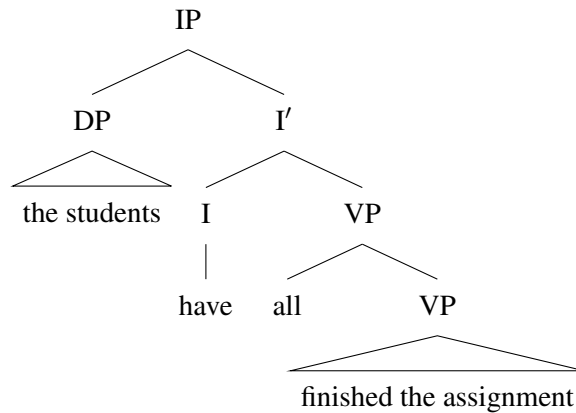
2 Previous analyses

One proposal often found in a derivational approach to syntax is the so-called stranding analysis (Sportiche, 1988; Shlonsky, 1991). In this type of analysis, a quantifier is originally located in an NP (or DP) and the modified NP moves to a higher projection leaving the quantifier behind. For instance, (2) shows that *all the students* originally appears in Spec,VP and *the students* moves to Spec,IP.



Another approach is often referred to as the VP-modifier analysis, in which a quantifier is essentially treated as a VP adverb and adjoined to VP as illustrated in (3) (Dowty & Brodie, 1984; Baltin, 1982; Bobaljik, 2003; Kim & Kim, 2009). In this approach, the quantifier and the noun do not form a syntactic constituent from the beginning.

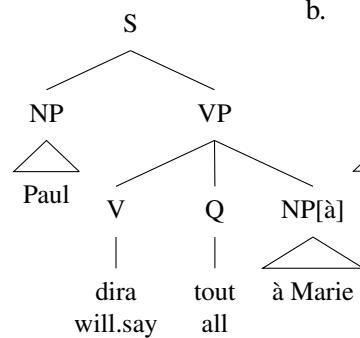
(3)



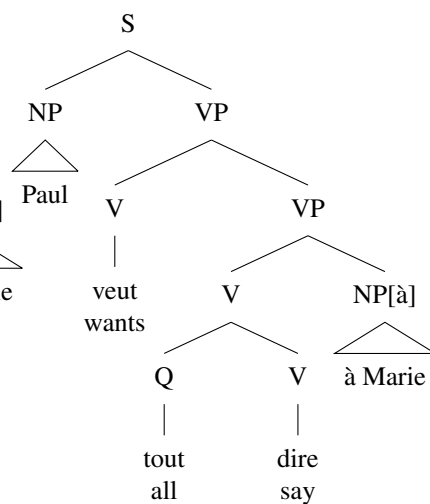
These two types of approaches differ with respect to the syntactic association between a quantifier and a noun. The stranding analysis tries to capture their relation directly in syntax, while the VP-modifier analysis regards FQs as one type of VP-adverb and their relation to a quantified noun is not formulated in the syntax.

Abeillé & Godard (1998) take a different view and propose a complement and adjunct analysis in Head-driven Phrase Structure Grammar (HPSG) for French quantifier floating. In their approach, a post-verbal quantifier is treated as a complement of the verb as in (4a), while a pre-verbal quantifier is treated as a lexical-level adjunction, i.e. V^0 -adjunction, as in (4b).

(4) a.



b.



2.1 Against a stranding analysis

One of the counter arguments against the stranding analysis is that an FQ does not always form a constituent with an NP at the NP-internal position. In French, for example, *chacun* 'each' can appear outside of the modified NP as in (5a), while it cannot form a constituent with a head noun as in (5b). Similarly, in English,

although *all* cannot appear inside of an NP consisting of co-ordinated nouns as shown in (6b), it is perfectly acceptable as an FQ as in (6a).

- (5) a. Ces enfants ont *chacun* lu un livre différent.
these children have each read a book different
'These children have each read a different book.'
- b. **Chacun* ces enfants a lu un livre différent.
each these children has read a book different
'Each of these children has read a different book.' (French)
- (Bobaljik, 2003, 123–4)
- (6) a. John, Bill and Tom *all* came to the class.
- b. **All* John, Bill and Tom came to the class.

In addition, some languages have different lexical items for NP-internal and NP-external quantifiers. In Dutch, for instance, *alle* is used in an NP-internal position whereas *allemaal* is used as an FQ as shown in (7). In the same vein, Mandarin Chinese has *suo you* as an NP-internal quantifier and *dou* as an NP-external one as shown in (8).

- (7) a. *Alle* toeristen zullen Boston bezoeken.
all tourists will Boston visit
'All tourists will visit Boston.'
- b. De toeristen zullen *allemaal* Boston bezoeken.
the tourists will all Boston visit
'The tourists will all visit Boston.' (Dutch)
- (8) a. *suo you* de ren zou le
all PRT people left ASP
'All the people have left.'
- b. ren *dou* zou le
people all left ASP
'The people have all left.' (Mandarin Chinese)
- (Dowty & Brodie, 1984, 82)

2.2 Issues

The above data strongly suggests that there is a dissociation between floating and non-floating quantifiers, namely an FQ is unlikely to be formed by moving a modified NP. The VP-modifier analysis, on the other hand, gives a straightforward account for them. Since an FQ is treated as a VP-adjunct in that approach, it would not be surprising if FQs are distinct from NP-internal quantifiers and are exclusively used for NP-external positions.

However, there are some issues to be resolved even if we assume that FQs are VP-adverbs. Firstly, FQs can appear at non-VP modifier positions in specific

constructions, such as ditransitive clauses and secondary predicate constructions. In English, for instance, an FQ that quantifies the object NP cannot appear after that NP as shown in (9). However, in ditransitive constructions like (10a, b) and secondary predicate constructions like (10c), an FQ can occur after the object NP position. A similar pattern is found in Dutch as shown in (11) and many other languages.

- (9) a. *The teacher scolded the students *all*.
b. *Tom met the girls *all* in his office.
- (10) a. I gave the kids *each* a quarter.
b. Mary put the books *all/both/each* (back) on the proper shelf.
c. We consider the Joneses *both* unbearably pompous.
(Maling, 1976, 712, 715)
- (11) a. Marie sloeg de mannen *allebei* op het gezicht.
M. hit the men both in the face
‘Marie hit the men both in the face.’
b. Ik vind de talen *allemaal* mooi.
I find the languages all beautiful
‘I find the languages all beautiful.’ (Dutch)

Another issue is agreement between an FQ and a noun. As (1b, c) illustrates, languages like French and German exhibit long distance agreement. In (1b), for example, *toutes* ‘all.F.PL’ agrees with the third person feminine plural pronoun *elles*. Hence, an FQ and a quantified noun hold a relationship at some level, so that the modified noun controls the agreement and triggers the inflection of the FQ.

3 Proposal

3.1 Topic–comment structure

To resolve the issues summarised in the previous section, we propose an alternative analysis based on LFG’s projection architecture. The essence of our proposal is that an FQ is licensed by information structure partitioning. More specifically, the NP quantified by an FQ is a ‘reference-oriented topic expression’ (Lambrecht, 1994; Neeleman & van de Koot, 2008; Neeleman & Vermeulen, 2012) and the FQ functions as a focus (cf. Kuno & Takami, 2003; Rochman, 2010). It has been pointed out that the default position of a reference-oriented topic expression is sentence-initial, and the following part functions as a comment that consists of a focus and a background as schematically represented in (12). The outermost structure is construed by the topic–comment partitioning where the Kleene star represents multiple occurrences of topic. In the comment, the structure is divided into a focus and a background.

- (12) topic* [comment focus [background ...]]
(Neeleman & van de Koot, 2008, 146)

Considering the relation between information structure and phrase structure, one of the most isomorphic syntactic configurations corresponding to the information structure (12) would be (13), in which a quantifier phrase (QP) is adjoined to VP and an NP is in the clause-initial position. Examples of this information structure partitioning and the corresponding phrase structure configuration are given in (14) for English and in (15) for Dutch.

- (13) NP [VP QP [VP ...]]
topic focus background
- (14) a. [topic The students] [comment have [focus *all*] [background finished the assignment]]
b. [NP The students] have [VP [QP *all*] [VP finished the assignment]]
- (15) a. [topic De toeristen] [comment zullen [focus *allemaal*] [background Boston bezoeken]]
b. [NP De toeristen] zullen [VP [QP *allemaal*] [VP Boston bezoeken]]
the tourists will all Boston visit
'The tourists will all visit Boston.' (Dutch)

Another isomorphic syntactic configuration can be found VP-internally as represented in (16). The examples following this pattern are ditransitive constructions and secondary predicate constructions as shown in (17) and (18).

- (16) ... [VP V NP QP XP]
topic focus background
- (17) a. I gave [topic the kids] [comment [focus *each*] [background a quarter]].
b. I [VP gave [NP the kids] [QP *each*] [NP a quarter]]
- (18) a. Ik vind [topic de talen] [comment [focus *allemaal*] [background mooi]]
b. Ik vind [VP [NP de talen] [QP *allemaal*] [AP mooi]]
I find the languages all beautiful
'I find the languages all beautiful.' (Dutch)

According to our proposal, an FQ is not licensed purely by syntax as a VP-adjunct, but by information structure as a focus. We argue that the reason why an FQ frequently appears as a VP-adjunct is that the topic–comment information partitioning can be transparently encoded by such a syntactic configuration as illustrated in (13). Similarly, the reason why a quantifier can float in constructions involving ditransitive verbs and secondary predicates is that the topic–comment structure can be construed VP-internally in those constructions as shown in (16).

3.2 Topic and focus properties in quantifier floating

One piece of evidence for the reference-oriented topic status of a quantified noun involved in an FQ construction comes from the fact that an indefinite noun cannot appear with an FQ as shown in (19).

- (19) a. The children *all* visited London.
b. #Children *all* visited London.

If we assume that the subject NP in (19) which is modified by the quantifier must be a reference-oriented topic expression, the unacceptability of (19b) can be straightforwardly accounted for. A reference-oriented topic expression by default refers to an entity that is salient in the discourse. An indefinite noun normally lacks those properties, so *children* in (19b) cannot be a reference-oriented expression and accordingly cannot occur with an FQ under our assumptions.

There are some cases where an indefinite noun can occur with an FQ as shown in Dutch example (20a). In that case, however, the sentence must be a statement of generic properties about the indefinite noun, so in (20a), *Kinderen* ‘children’ is a reference-oriented topic expression by referring to children in general, and the following comment is a statement about the generic property of children. Thus, if we replace *allemaal* ‘all’ with *allebei* ‘both’, the sentence will be unacceptable as shown in (20b).¹ This is because the statement cannot be interpreted as a generic property of children.

- (20) a. Kinderen genieten *allemaal* van de film.
children enjoy all of the film
‘Children all enjoy the film.’
b. *Kinderen genieten *allebei* van de film.
children enjoy both of the film
‘Children both enjoy the film.’ (Dutch)

The topic status of quantified nouns is also confirmed by Japanese data. As (21a, b) show, an FQ cannot quantify an NP with the dative particle *ni* or the ablative particle *kara* in the pre-verbal position. In Japanese, like many other verb final languages, elements appearing in the immediately pre-verbal position are given a focus role in the information structure unless the pre-verbal elements themselves are marked as not being focus. In our proposal, the noun quantified by an FQ must be a reference-oriented topic expression, so the unacceptability of (21a, b) is explained by incompatibility of their topic status with a default focus interpretation in the pre-verbal position.

- (21) a.??Taroo ga Hanako o sinseki ni *minna* syookai sita.
T. NOM H. ACC relatives DAT all introduce do.PAST
‘Taro introduced Hanako to all of his relatives.’

¹We thank Frank Van Eynde for pointing out the unacceptability of this example.

b.?sono seizika ga kihukin o siensya kara 50-me
 that politician NOM donation ACC supporter from 50-CL
 atumeta.
 collect.PAST
 ‘That politician collected donations from 50 supporters.’ (Japanese)

Interestingly, if those casemarked NPs are marked by the contrastive topic particle *wa*, the sentences will be acceptable as shown in (22a, b). Since the overt morphological marking of contrastive topic defocuses the casemarked NPs in the pre-verbal position, they can function as a topic and can be modified by a focus FQ.

- (22) a. Taroo ga Hanako o sinseki ni wa minna syookai
 T. NOM H. ACC relatives DAT TOPIC all introduce
 sita.
 do.PAST
 ‘As for his relatives, Taro introduced Hanako to all of them.’
 b. sono seizika ga kihukin o siensya kara wa 50-me
 that politician NOM donation ACC supporter from TOPIC 50-CL
 atumeta.
 collect.PAST
 ‘As for supporters, that politician collected donations from 50 of them.’

Finally, it is well-known that certain types of adverbs including manner adverbs that convey new information are by default given a focus interpretation (Kuno & Takami, 2003). Our proposal predicts that they cannot precede an FQ because the positioning of adverbs blocks topic–comment structure involving an FQ. This prediction is borne out. Kuno & Takami (2003) point out that Japanese manner adverbs like *geragera-to* ‘loudly’ cannot precede an FQ as shown in (23a). Note that the reverse order is acceptable as shown in (23b). A focus-bearing adverb is assigned a focus role when it is adjoined to VP, and any following elements are thereby given a background status. In (23a), the manner adverb is assigned a focus role and forces the FQ to be part of the background information structure role. However, since an FQ is required to be a focus, this information structure role assignment is not permitted. This violation does not happen in (23b) because manner adverbs, despite their default information focus role, can also play other roles including background. This ordering restriction does not arise with non-focus bearing locative adverbials as in (23b) or sentential adverbs as in (23c).

- (23) a. *kodomo ga geragera-to hutari waratta.
 child NOM loudly two.CL laughed
 ‘Two children laughed loudly.’
 b. kodomo ga hutari geragera-to waratta.
 child NOM two.CL loudly laughed

- ‘Two children laughed loudly.’
- c. *gakusei ga office ni hutari kita.*
 student NOM office to two.CL came
 ‘Two students came to the office.’ (Kuno & Takami, 2003, 283–4)
- d. *gakusei ga kinoo hutari kita.*
 student NOM yesterday two.CL came
 ‘Two students came yesterday.’ (Japanese)

Similarly in English and Spanish, an FQ must precede a manner adverb or a completive adverb to mark the VP-edge which forms a topic–comment structure as in (24a) and (25a). The intervention of focus-bearing adverbs prevents the FQ from forming this information structure partitioning, so (24b) and (25b) are unacceptable. The same order restriction is not observed between a sentential adverb and an FQ as shown in (24c, d).

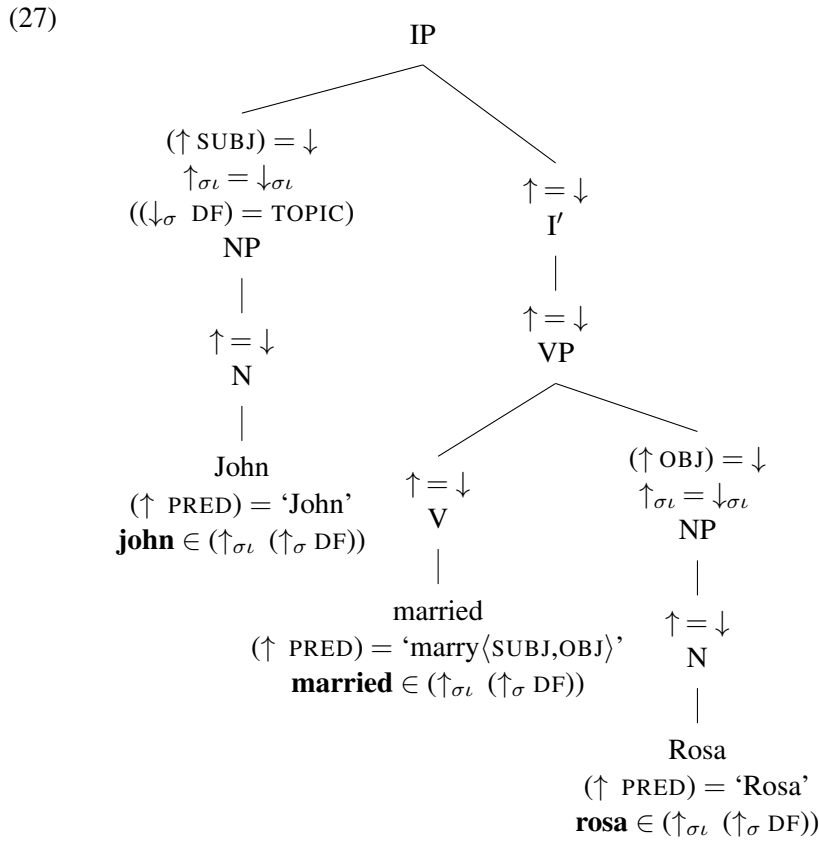
- (24) a. These thieves could *all* completely crack this safe in 5 minutes flat.
 b. *These thieves could completely *all* crack this safe in 5 minutes flat.
 c. The thieves have *all* certainly been apprehended.
 d. The thieves have certainly *all* been apprehended.
 (Bobaljik, 1995, 231–2)
- (25) a. ?Los estudiantes entenderán *todos* completamente (ese problema).
 the students will.understand all completely that problem
 ‘The students will understand all completely that problem.’
 b. *Los estudiantes entenderán completamente *todos* (ese problema).
 the students will.understand completely all that problem
 (Spanish; Bošković 2004, 686)

4 Analysis

In this section, we present an LFG analysis of FQs. Since information structure plays a crucial role in constraining the distribution of FQs, we adopt the standard LFG projection architecture, in which different types of linguistic information are encoded in distinct structures. Following Butt & King (1996, 2000) and Choi (1999), we assume that a sentence is partitioned into four discourse functions (DFs) in information structure: TOPIC, FOCUS, BACKGROUND and COMPLETIVE. Further, as formulated in Dalrymple & Nikolaeva (2011), DF is present in s(ematic)-structure and can be specified in various ways, such as by phrase-structure position, prosody or morphological marking. The specification of a value for the semantic structure feature DF determines the membership of the information structure roles. Dalrymple & Nikolaeva (2011) show correspondences between c-structure, f-structure, s-structure and information structure for sentence (26-A), in which *John* is a topic and *married Rosa* is a focus. These correspondences are shown

in (27). The Spec,IP position is a subject position, but it is also a default topic position, so the value of DF is optionally determined by the c-structure configuration, i.e. $(\downarrow_{\sigma} \text{DF}) = \text{TOPIC}$. The discourse prominence feature and other linguistic features reinforce this TOPIC assignment. The boldface notation is an abbreviation for meaning constructors, e.g., **john** is an abbreviation for $john: \uparrow_{\sigma}$. Since **john** $\in (\uparrow_{\sigma\iota} (\uparrow_{\sigma} \text{DF}))$ is specified in the lexical entry of *John*, the meaning constructor, **john**, becomes a member of TOPIC in the information structure, namely **john** $\in (\uparrow_{\sigma\iota} (\uparrow_{\sigma} \text{TOPIC}))$. Contrary to topic specification, the specification of FOCUS is determined not by c-structure annotation, but by pragmatic context as in (29), which makes the meaning constructors, **married** and **rosa**, become members of FOCUS in the information structure. Thus, the resultant information structure can be represented as in (30).

- (26) Q: What did John do?
 A: John married Rosa.
 TOPIC FOCUS



$$(28) \quad m : \left[\begin{array}{ll} \text{PRED} & \text{'marry'} \langle \text{SUBJ}, \text{OBJ} \rangle \\ \text{SUBJ} & s : \left[\begin{array}{ll} \text{PRED} & \text{'John'} \end{array} \right] \\ \text{OBJ} & o : \left[\begin{array}{ll} \text{PRED} & \text{'Rosa'} \end{array} \right] \end{array} \right]$$

$$(29) \quad s_\sigma : [\text{DF} \quad \text{TOPIC}] \\ m_\sigma : [\text{DF} \quad \text{FOCUS}] \\ o_\sigma : [\text{DF} \quad \text{FOCUS}]$$

$$(30) \quad m_{\sigma\iota} : \left[\begin{array}{ll} \text{TOPIC} & \{ \mathbf{john} \} \\ \text{FOCUS} & \left\{ \begin{array}{l} \mathbf{married} \\ \mathbf{rosa} \end{array} \right\} \end{array} \right]$$

(cf. Dalrymple & Nikolaeva, 2011, 84–5)

4.1 VP-adjunct quantifiers

As discussed above, an FQ functions as a focus, so the DF specification of FOCUS is given in the c-structure positions associated with FQs. Firstly, as (13) shows, a QP can be adjoined to VP, so we propose a c-structure rule as in (31). Crucially, QP is annotated with $(\downarrow_\sigma \text{ DF}) = \text{FOCUS}$. Further, the constituent following the QP becomes a background, so the annotation $(\downarrow_\sigma \text{ DF}) = \text{BACKGROUND}$ is given to the adjoined VP.

$$(31) \quad \text{VP} \longrightarrow \begin{array}{ccc} \text{QP} & & \text{VP} \\ \downarrow \in (\uparrow \text{ADJ}) & & \uparrow = \downarrow \\ \uparrow_{\sigma\iota} = \downarrow_{\sigma\iota} & & \uparrow_{\sigma\iota} = \downarrow_{\sigma\iota} \\ (\downarrow_\sigma \text{ DF}) = \text{FOCUS} & & (\downarrow_\sigma \text{ DF}) = \text{BACKGROUND} \end{array}$$

Consider the Japanese example (1d), repeated here as (32).

$$(32) \quad \text{kodomo-tati wa} \quad \text{minna eiga o} \quad \text{tanosinda.} \\ \text{children-PL TOPIC all} \quad \text{movie ACC enjoy.PAST} \\ \text{'The children all enjoyed the movie.' (Japanese)}$$

Since the quantifier is adjoined to VP and annotated as $\downarrow \in (\uparrow \text{ADJ})$, it is not a modifier of the quantified noun in the f-structure. In terms of semantics, however, an FQ is clearly related to a noun. In glue semantics, a quantifier relates an individual x to two propositions $R(x)$ (restrictive meaning) and $S(x)$ (scope meaning) (Dalrymple et al., 1997; Dalrymple, 2001), so this specification must be encoded in the lexical entry of quantifiers. This can be achieved by using a local name. For instance, we propose the lexical entry for Japanese quantifier *minna* ‘all’ as in (33), in which the local name $\%t$ is introduced. Since the quantifier modifies the topic noun, $\%t$ must be equal to the grammatical function corresponding to that noun. For the GF

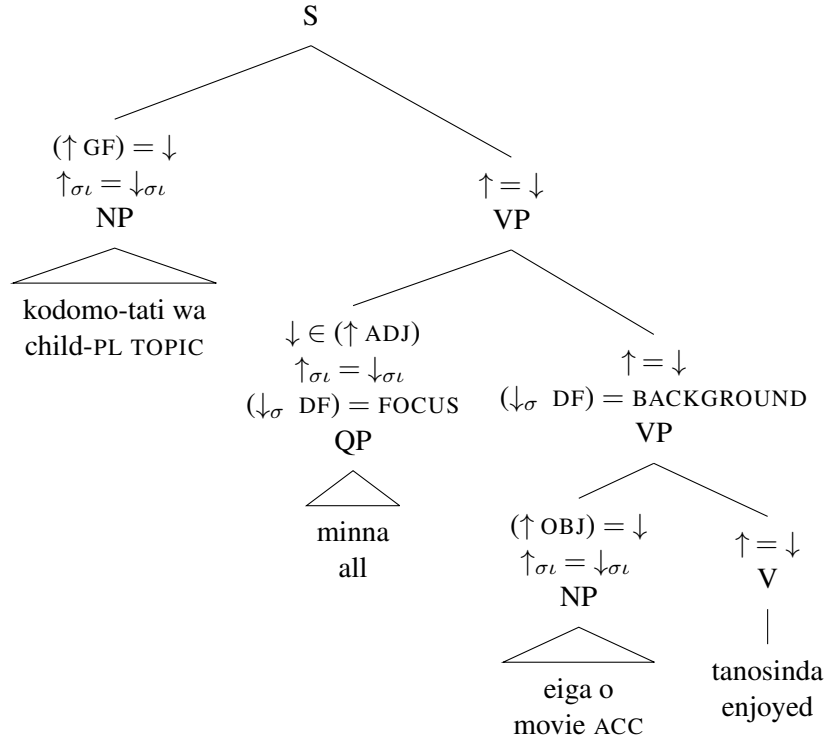
specification of %t, the inside-out path ($\text{ADJ} \in \uparrow$) is required to refer to the outer f-structure, and in that f-structure the off-path constraint, $(\rightarrow_{\sigma} \text{DF}) = \text{TOPIC}$, picks up the GF that corresponds to an s-structure whose value of DF is TOPIC.

$$\begin{aligned}
 (33) \quad & \text{minna} \quad \text{Q} \quad (\uparrow \text{PRED}) = \text{'all'} \\
 & \lambda R. \lambda S. \text{all}(x, R(x), S(x)) : \\
 & [((\%t)_{\sigma} \text{VAR}) \multimap ((\%t)_{\sigma} \text{RESTR})] \\
 & \multimap [\forall H. [(\%t)_{\sigma} \multimap H] \multimap H] \\
 & ((\text{ADJ} \in \uparrow) \quad \text{GF} \quad) = \%t \\
 & \quad (\rightarrow_{\sigma} \text{DF}) = \text{TOPIC} \\
 & \mathbf{all} \in (\uparrow_{\sigma\iota} (\uparrow_{\sigma} \text{DF}))
 \end{aligned}$$

For the sentence (32), the c-structure (34), the f-structure (35), the s-structure (36) and the information structure (37) can be postulated. The subject NP is not encoded purely by c-structure position in Japanese, so the GF value of the sentence-initial NP is unspecified (cf. Matsumoto, 1996). The VP-internal NP is an object.² In (34), the topic status of the sentence-initial NP is overtly encoded by the topic marker *wa*, so the DF value of the subject NP becomes TOPIC in the s-structure. As discussed in Dalrymple & Nikolaeva (2011, 78–79), topic NPs are characterised by various semantic properties such as identifiability and activation in the discourse, so those features are encoded in the s-structure as well by such features as STATUS and ACTV. Those semantic feature specifications rule out the occurrence of a noun that lacks topic-worthiness like indefinite nouns. Due to the specifications in the c-structure rule (31), the DF value in the s-structure corresponding to the QP becomes FOCUS. The presence of the QP makes the following elements BACKGROUND, so despite the immediately pre-verbal position, the object NP becomes part of BACKGROUND. As a result, in the information structure in (34), the meaning constructor of the modified NP is a member of TOPIC, that of the FQ is a member of FOCUS, and those of the remaining elements are in BACKGROUND. Hence, the topic–comment information partitioning is correctly encoded in this structure.

²According to Sells (1990) an object NP can appear either under VP or under S in Japanese. For expository purpose, we only show structures in which an object NP appears under VP.

(34)



(35)

$$e : \left[\begin{array}{l} \text{PRED} \quad \text{'enjoy' (SUBJ, OBJ)} \\ \text{SUBJ} \quad s : \left[\text{PRED} \quad \text{'child'} \right] \\ \text{OBJ} \quad o : \left[\text{PRED} \quad \text{'movie'} \right] \\ \text{ADJ} \quad \left\{ a : \left[\text{PRED} \quad \text{'all'} \right] \right\} \end{array} \right]$$

(36)

$$s_{\sigma} : \left[\begin{array}{l} \text{STATUS} \quad \text{IDENTIFIABLE} \\ \text{ACTV} \quad \text{ACTIVE} \\ \text{VAR} \quad [] \\ \text{RESTR} \quad [] \\ \text{DF} \quad \text{TOPIC} \end{array} \right]$$

$o_{\sigma} : [\text{DF} \quad \text{BACKGROUND}]$

$a_{\sigma} : [\text{DF} \quad \text{FOCUS}]$

$e_{\sigma} : [\text{DF} \quad \text{BACKGROUND}]$

$$(37) \quad e_{\sigma\iota} : \left[\begin{array}{ll} \text{TOPIC} & \{ \mathbf{children} \} \\ \text{FOCUS} & \{ \mathbf{all} \} \\ \text{BACKGROUND} & \left\{ \begin{array}{l} \mathbf{enjoyed} \\ \mathbf{movie} \end{array} \right\} \end{array} \right]$$

Based on the s-structure in (36), the meaning of the sentence can be composed as in (38). Thanks to the local name specification in the lexical entry (33), the quantifier correctly consumes the resource of the s-structure corresponding to the topic NP, i.e. s_σ , and the meaning of the entire sentence, i.e. e_σ , is obtained.

$$(38) \quad \begin{array}{lll} \mathbf{all} & \lambda R. \lambda S. all(x, R(x), S(x)) : & [(s_\sigma \text{ VAR}) \multimap (s_\sigma \text{ RESTR})] \\ & & \multimap [\forall H. [s_\sigma \multimap H] \multimap H] \\ \mathbf{child} & \lambda x. child(x) : & (s_\sigma \text{ VAR}) \multimap (s_\sigma \text{ RESTR}) \\ \mathbf{enjoy-movie} & \lambda x. enjoy(x, movie) : & s_\sigma \multimap e_\sigma \\ & \mathbf{all, child, enjoy-movie} \vdash all(x, child(x), enjoyed-movie(x)) : e_\sigma \end{array}$$

4.2 VP-internal floating quantifiers

An FQ appearing inside of VP as sister to V requires a different analysis. As shown in (16), an FQ can appear under VP alongside object and oblique arguments. Thus, we postulate the c-structure rule that yields English ditransitive constructions as in (39).³ The QP is an adjunct in the f-structure and the DF value in its s-structure is FOCUS. We assume that the presence of a QP makes the preceding object NP become a topic, so the optional equation for the TOPIC assignment for the DF in the s-structure is specified for the object NP. Similarly, the oblique PP receives the DF of BACKGROUND when the QP precedes it, so the s-structure DF value is optionally specified as BACKGROUND.

$$(39) \quad \text{VP} \longrightarrow \begin{array}{cccc} \text{V} & \text{NP} & \text{QP} & \text{PP} \\ \uparrow = \downarrow & (\uparrow \text{OBJ}) = \downarrow & \downarrow \in (\uparrow \text{ADJ}) & (\uparrow (\downarrow \text{PCASE})) = \downarrow \\ & \uparrow_{\sigma\iota} = \downarrow_{\sigma\iota} & \uparrow_{\sigma\iota} = \downarrow_{\sigma\iota} & \uparrow_{\sigma\iota} = \downarrow_{\sigma\iota} \\ ((\downarrow_\sigma \text{ DF}) = \text{TOPIC}) & ((\downarrow_\sigma \text{ DF}) = \text{FOCUS}) & ((\downarrow_\sigma \text{ DF}) = \text{BACKGROUND}) \end{array}$$

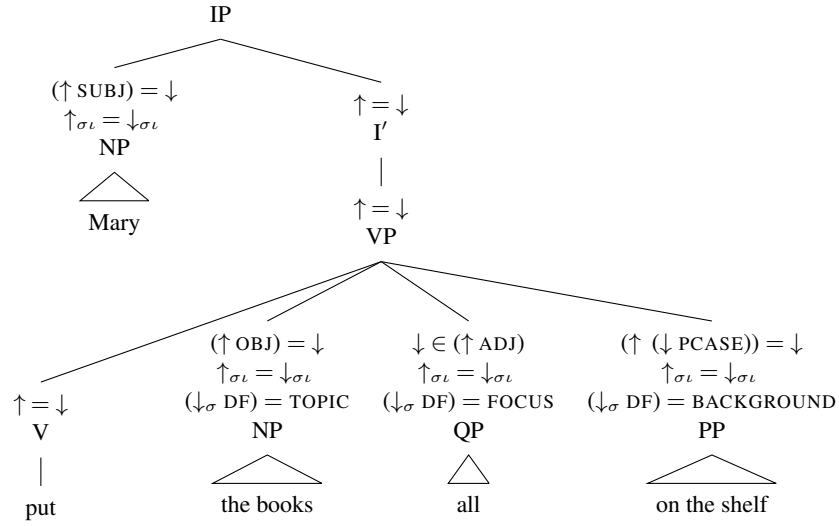
The following structures can be posited for an English ditransitive sentence with an FQ, *Mary put the books all on the shelf*. The quantifier functions as an adjunct of the clause in terms of f-structure, but it establishes the topic–comment structure inside of the VP by having the preceding object NP, *the books*, as TOPIC and the following oblique PP, *on the shelf*, as BACKGROUND.⁴ We assume that the elements preceding the object NP are outside of the topic–comment frame, so they

³For ease of exposition, we only show the c-structure rule relevant to ditransitive constructions, in which a primary object NP and an oblique PP appear under VP.

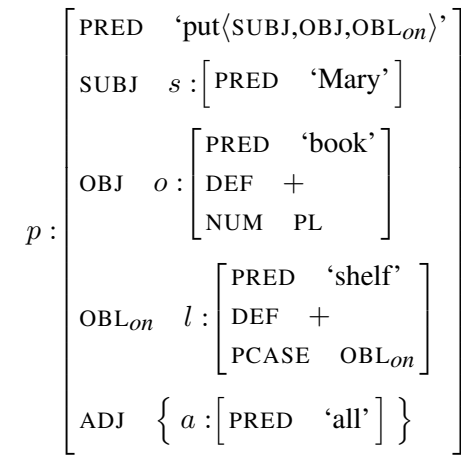
⁴Regarding semantic composition of a quantifier and a modified noun, a complication would arise in relation to a determiner. A determiner also relates an individual x to two propositions $R(x)$ and $S(x)$, so the determiner *the* in *the books* and the FQ *all* both relate *books* to the restricted meaning and the scope meaning simultaneously, which causes invalid semantic composition. Since it is beyond the scope of this paper, we leave this issue open.

are given COMPLETIVE roles in the information structure. Thus, the information structure in (43) is constructed.

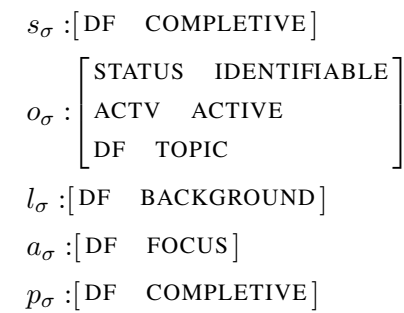
(40)



(41)



(42)



$$(43) \quad p_{\sigma t} : \left[\begin{array}{ll} \text{TOPIC} & \{ \textbf{the-books} \} \\ \text{FOCUS} & \{ \textbf{all} \} \\ \text{BACKGROUND} & \{ \textbf{on-the-shelf} \} \\ \text{COMPLETIVE} & \left\{ \begin{array}{l} \textbf{Mary} \\ \textbf{put} \end{array} \right\} \end{array} \right]$$

4.3 Agreement

In our analysis, a quantifier is an adjunct at the clause level in f-structure, so agreement between the quantifier and the modified noun cannot be straightforwardly accounted for. However, agreement beyond NP-internal constituents is not so unusual. For instance, Fitzpatrick (2006) reports that agreement is often found between secondary predicates and nouns as illustrated in (44) and (45).

- (44) a. Ella llegó borracha.
 she.F.SG arrived drunk-F.SG
 ‘She arrived drunk.’
 b. Ellas llegaron borrachas/*os.
 they.F.PL arrived drunk-F.PL
 ‘They arrived drunk.’ (Spanish; Fitzpatrick 2006, 75)
- (45) a. Vadim vernulsja iz bol’nicy zdoroviy.
 V.M.SG.NOM returned from hospital healthy.M.SG.NOM
 ‘Vadim returned from the hospital healthy.’
 b. Ja zakazala rybu syruju.
 I ordered fish.F.SG.ACC raw.F.SG.ACC
 ‘I ordered the fish raw.’ (Russian; Fitzpatrick 2006, 76)

In Spanish, the secondary predicates agree with the subject noun in number and gender as in (44). Similarly in Russian, the secondary predicate agrees with the main verb’s subject in gender, number and case in (45a), while it agrees with the main verb’s object in gender, number and case in (45b).

Note that in our proposal, secondary predicate constructions license quantifier floating—see (10c) and (11b), because the NP predicated by the secondary predicate can be a reference-oriented topic expression. Therefore, the agreement patterns found in (44) and (45) can be regarded as an instance of topic agreement, which is attested in many languages (Polinsky & Comrie, 1999; Bobaljik & Wurmbrand, 2002; Corbett, 2006; Dalrymple & Nikolaeva, 2011). In Ostyak, for example, object agreement is optional when the object can be either a topic or not as shown in (46a). When the topic interpretation is obligatory in the discourse, the verb must agree with the object as in (46b, c).

- (46) a. (ma) tam kalaŋ we:l-s-əm / we:l-s-∅-e:m
 I this reindeer kill-PAST-1.SG.SUBJ kill-PAST-SG.OBJ-1.SG.SUBJ
 ‘I killed this reindeer.’
- b. (What did you do to this reindeer?)
 tam kalaŋ we:l-s-e:m / *we:l-s-əm
 this reindeer kill-PAST-OBJ/1.SG.SUBJ kill-PAST-1.SG.SUBJ
 ‘I killed this reindeer.’
- c. kalaŋ xalša we:l-s-əlli / *we:l-əs
 reindeer where kill-PAST-OBJ/1.SG.SUBJ kill-PAST-1.SG.SUBJ
 ‘Where did he kill the/a reindeer?’
 (Ostyak; Dalrymple & Nikolaeva 2011, 142, 146)

If long-distance agreement found between an FQ and a noun is an instance of topic agreement, feature specification of an agreement controller can be simply stated in the lexical entry of a quantifier. For example, the lexical entry for the quantifier *allen* ‘all.DAT.PL’ used in the German example (1c), repeated here as (47), can be postulated as in (48).

- (47) Diesen Studenten habe ich (gestern) *allen* geschmeichelt.
 these.DAT.PL students have I (yesterday) all.DAT.PL flattered
 ‘I flattered all of these students yesterday.’ (German)
- (48) *allen* Q (↑ PRED) = ‘all’
 (%t CASE) = DAT
 (%t NUM) = PL
 ...
 ((ADJ ∈ ↑) $\xrightarrow{\sigma}$ GF) = %t
 (\rightarrow_{σ} DF) = TOPIC
all ∈ (↑_{σ_L} (↑_σ DF))

The local name %t is already introduced to refer to the GF corresponding to a topic noun, so it can also be used to refer to the agreement controller. The equations, (%t CASE) = DAT and (%t NUM) = PL, co-specify the case and number features of the nouns.

As pointed out in subsection 2.2, long-distance agreement is problematic for the VP-modifier analysis because agreement is in principle determined locally between the agreement controller and the target. Our approach overcomes this problem because the specification of the agreement controller is determined with reference to the information structure role.

5 Conclusion

In the generative literature, quantifier floating has long been regarded as a syntactic phenomenon. A stranding analysis tries to capture the association between

the quantifier and the noun by assuming that they form a syntactic constituent at an initial stage of derivation, but the absence of non-stranded constituents and the presence of distinct lexical items for FQs make this approach untenable. A VP-modifier analysis, on the other hand, does not face these problems. However, since the quantifier and a noun do not hold a direct syntactic relation, the analysis requires some additional assumptions to capture the semantic association and agreement between them. The existence of VP-internal FQs are also problematic for this type of approach.

The aftermentioned problems that arise in these different proposal stem from the attempt to capture quantifier floating purely in terms of syntactic structure. Our proposal overcomes these problems by incorporating information structure properties necessary for FQ constructions to arise into the analysis. An FQ requires a reference-oriented topic expression to be present, so that it can function as a focus to form a topic–comment information structure partitioning. The phrase structure distribution of FQs reflects the organisation of the sentence in terms of this information structure pattern. The VP-adjunct configuration encodes the preceding subject NP as a topic, the quantifier as a focus and the remaining VP as a background in an isomorphic way. This analysis also gives a straightforward account for the presence of VP-internal FQs in ditransitive constructions and secondary predicate constructions. They form a topic–comment structure with the object as a topic, the quantifier as a focus and the secondary object/oblique argument or the secondary predicate as background information. Agreement between a quantifier and a noun is also captured in a straightforward manner once it is analysed as an instance of topic agreement.

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