On Floating Quantifiers

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1. Introduction

The aim of this paper is to show the mechanism whereby Floating Quantifiers (FQs) occur in sentences. One of the properties of FQs is that they can appear in positions which are far from the noun phrases they modify. In English, the quantifiers *all*, *both* and *each* can be FQs.

(1) a. All the students have finished the assignment.

b. The students have all finished the assignment. (Bobaljik (2003: 1))

As can be seen in (1), both of the sentences seem to have the same interpretation with the same words, but the places where the quantifier *all* appears are different. The quantifier in (1b) is a so-called FQ. There are two main types of analyses of the FQ—the adverbial analysis and the stranding analysis. The former considers an FQ as an adverb, and the latter assumes that an FQ is stranded by movement. Here I adopt the stranding analysis. However I will point out that there are some problems in the literature and demonstrate that my original analysis can solve problems which the two types of analyses have.

Bošković (2004) observes places where FQs occur. His conclusion is as follows.

(2) Quantifiers cannot be floated in θ-positions. (Bošković (2004: 685))

Although this generalization might seem a strong candidate for explaining FQs cross-linguistically, there are some sentences in English where his generalization does not hold. Also FQs in Hebrew, which show agreement with their associated noun phrases, cannot be accounted for by Bošković's derived structure in view of the idea in (2), since it does not have FQ movement from base positions. Thus, it is plausible to say that Bošković's assumption is not sufficient to explain the phenomena of FQs. Here I will broaden and modify his idea and present a new proposal in respect to an FQ *all* which can apply to a variety of languages including English and Japanese.

This paper is organized as follows. Section 2 reviews the previous studies and shows their problems. Section 3 presents new assumptions for FQs. In section 4, the phenomena of FQs in English and Japanese are investigated. The overall conclusion is given in section 5.

2. Previous Studies and Problems

2.1. Sportiche (1988)

Sportiche (1988) argues that FQs are not adverbial elements but are elements which are base-generated in positions adjacent to VPs. He suggests that FQs are generated with the associated DPs in the original position based on the VP-Internal Subject Hypothesis, and when the associated DPs move out from within the VPs, they strand FQs there. However, Sportiche's analysis has a problem as pointed out by many linguists (Bobaljik (2003), Bošković (2004), among others.)

(3) a.*The students arrived all.

   b.*The students were arrested all.   (Bošković (2004: 682))

His stranding analysis predicts that FQs in the DPs' original positions can be left in unaccusative and passive sentences which contain DP movement to Spec-IP. The examples in (3) should be grammatical if we assume that the FQ *all* has a modification relation with the DP *the students*. But in fact (3a, b) are ungrammatical.

2.2. Shlonsky (1991)

Shlonsky (1991) suggests that an FQ indicates the position where movement originates, and also that floated DPs move from within a maximal projection of the QP (Quantifier Phrase). Let us first see the following examples in Hebrew.

(4) a. Katafti   ʔet   [kol/*kul-am   ha-praxim]   bo-zhirut.
    (I) picked   ACC   all/*all-[3MPL]   the-flowers   with-care
    'I picked all the flowers carefully.'

  b. Katafti   ʔet   [ha-praxim   kul-am/*kol]   bi-zhirut.
    (I) picked   ACC   the-flowers   all-[3MPL]/*all   with-care
    'I picked all the flowers carefully.'

(Shlonsky (1991: 160, 161))

The Qs can occur preceding or following their associated DPs. In (4a) the FQ *kol* should be bare if its associated object DP comes after it. In contrast, if the Q is placed to the right of its associated object DP, it must obligatorily have a clitic pronoun which agrees with the DP in gender and number as in (4b). According to Shlonsky (1991), the Q *kol* is a head, not a specifier or an adjunct. This implies that only heads can host clitics in Hebrew, therefore in (4b) *kol* can appear with the clitic. Thus, *kol* heads the QP with the DP complement. (5a) represents the structure of (4a), in which the Q is bare and the DP is a complement of it, and (5b) is that of (4b), in which Q involves an agreeing clitic as a result of the movement of the complement DP.

(5) a. [$_{QP}$ Q DP]

  b. [$_{QP}$ DP [$_{Q'}$ Q DP]]

In (5b) the quantifier stranding is triggered. Here the generalization should be noted, that is "agreement is a relation which holds exclusively between a head and a local specifier and not between a head and its complement (Shlonsky (1991: 165))."   For
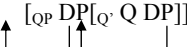
this reason, the obligatory presence of the agreement clitic can be explained. We will now look at the next sentence, which has an FQ in the sentence final position with a clitic agreement with its associated subject DP.

(6) Ha-yeladim   yašnu   kul-am/*kol**.**

    The-children slept   all-[3MPL]/*all

    'The children all slept.'   (Shlonsky (1991: 167))

(7)   [QP DP[Q' Q DP]]

The structure of the QP in (6) is in (7). The movement of the subject DP from the complement to Spec-QP causes the agreement of the clitic, and also the stranding of Q in the sentence final position. This phenomenon may be taken as one of the strong piece of empirical evidence for the stranding analysis. It is because without the movement, the clitic agreement which an FQ hosts is impossible to explain.

2.3. Bošković (2004)

    Bošković (2004) aims to resolve the problem of Sportiche's (1988) assumption as stated above. Bošković focuses on the following descriptive generalization.

(8) Quantifiers cannot be floated in θ-positions. (=(2))

(8) is the key assumption for his analysis of FQs. This generalization leads to an explanation for the positions of FQs in various languages. Also it can explain the problem of Sportiche (1988) in (3). Given that the FQs associated with the subjects in (3a, b) are located in the θ-positions, the sentences will not be grammatical. Furthermore, Bošković (2004) suggests that FQs are inserted acyclically after their associated DPs move out of the θ-marked positions.

(9) The students were all arrested. (Bošković (2004: 692))

(10) a. [$_{V'}$ arrested the students]

    b. [$_{VP}$ the students [$_{V'}$ arrested t]]

    c. [$_{VP}$ **all** the students [$_{V'}$ arrested t]]

    d. [$_{IP}$ The students were all t [$_{V'}$ arrested t]]

(ibid.)

(10a-d) are the derivational process of (9). After the movement, as in (10c), *all* is inserted acyclically. Finally, *the students* moves to the subject position, leaving *all*, and the derivation converges. Thus, the assignment of a θ-role to *the students* is not interrupted by adjunction *all*.

However, there are sentences that cannot be explained by Bošković's (2004) generalization.

(11) a. *[$_{DP}$ the professors who Taylor will have all met before the end of term]

    b. *These professors, Taylor will have all met before the end of term.

    c. *Which professors will Taylor have all met before the end of term?

(Bobaljik (2003: 15))

In (11), although the quantifiers *all* appear in the θ'-positions, these sentences are ungrammatical. Therefore here I argue that Bošković's (2004) generalization is not sufficient to explain the places for FQs. In addition, his derived structure cannot explain the Hebrew sentences of (4a, b) and (6) observed by Shlonsky (1991). Bošković (2004) proposes that FQs are adjoined after DP movement. Therefore since the agreement of the FQ with the DP cannot occur under the speifier-head relation, (4a, b) and (6) cannot be derived.

3. Assumptions and Proposals for Floating Quantifiers

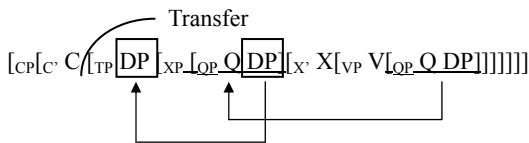## 3.1. Proposals to Reanalyze Floating Quantifiers

An alternative approach here can be suggested based on the fact that

A'-movement does not generally allow FQs, but A-movement does in English (Bobaljik (2003: 15)). From this perspective, I would like to present the two assumptions in (12).
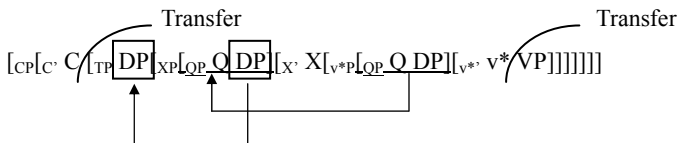
(12) a. Noun phrases and their associated Floating Quantifiers have relations within the same transfer domains.

    b. When quantifiers float, they must move from the base positions with the noun phrases, and then the noun phrases move to the upper places, resulting in Floating Quantifiers.

(13) a. Passive/ Unaccusative verbs

Transfer

[$_{CP}$[$_{C'}$ C/[$_{TP}$ DP $_{XP}$[$_{QP}$ Q DP][$_{X'}$ X[$_{VP}$ V[$_{QP}$ Q DP]]]]]]]

b. Transitive/ Unergative verbs

Transfer   Transfer

[$_{CP}$[$_{C'}$ C/[$_{TP}$ DP $_{XP}$[$_{QP}$ Q DP][$_{X'}$ X[$_{v*P}$[$_{QP}$ Q DP][$_{v*'}$ v*/VP]]]]]]]]

In light of (12), the FQ structures are illustrated as in (13). Following Sportiche (1988) and Shlonsky (1991), I assume that a subject makes a constituent with an FQ, and originally they are in the base position together. (13a, b) are structures with subject-oriented quantifiers. (13a) is an FQ structure with passive or unaccusative verbs, and (13b) is one with transitive or unergative verbs. In both structures, the whole QP moves from the base position and the quantifiers are left in the moved places, in these cases, in the specifiers of XPs. Only the DPs move out of the QPs to the subject position in TP of the main clauses. This movement is triggered by the edge features of T. v*Ps and CPs are assumed to be the phases according to Chomsky (2001, 2004, 2008). At the point of each phase, part of the syntactic

structure already built up is transferred to the phonological and semantic components. Therefore, when a complete CP is constructed, the domain of the phase head C, which is TP, will be transferred by the operation Transfer (Chomsky (2001, 2004), see also Radford (2009)). Also the same explanation can be made for v*P phases. Under the framework of Chomsky (2001, 2004, 2008), I will argue that FQs and their associated noun phrases which land in the final positions must be related in the same transfer domains as indicated in (12a).

There have been some studies which assert that a quantifier phrase must move. Firstly, May (1977, 1985) says that quantifiers move from the base positions for interpretation. Secondly, Aoun and Li (1993) indicate that quantifiers cannot stay in θ-positions, and variables have to be left in the base positions by Quantifier Raising (QR) (see Kuno and Takami (2002)). Finally, Heim and Kratzer (1998) propose that "Quantifying DPs are interpreted in positions that are different from their argument positions and related to them by movement." Moreover, considering the Ban on Vacuous Quantification (henceforth BVQ) in (14), the idea that FQs have to move from their base positions would be much stronger.

(14) Ban on vacuous quantification

Operators must bind variables.

According to Chomsky (1982, 1995) and Koopman and Sportiche (1982), vacuous quantification is banned by Full Interpretation. Also Belletti (1982) states that in order to avoid vacuous quantification an FQ is adjoined to its associated DP. From this insight, it seems plausible to assume that the principle of BVQ works in FQ constructions, because there are operator-variable relations there, that is, when a QP with a quantifier and its associated DP moves it will become an operator, and the movement creates a variable in the base position. Thus the movement of an FQ from the original position for the sake of BVQ is assumed as in (12b).

3.2. Radford (1997)

In this section, I will focus on Radford's (1997) proposal, which is applied to the analysis in this paper. He points out that a structure where quantifiers are floated and one where they are not are different.

(15) a. Both the men were watching him.

b. The men were both watching him.

(16) a. [$_{TP}$ DP[$_{T'}$ T [$_{v*P}$[$_{DP}$ QP[$_{D'}$ D NP]] [$_{v*'}$ v* [$_{VP}$ V DP]]]]]

b. [$_{TP}$ DP[$_{T'}$ T [$_{v*P}$[$_{QP}$ Q[$_{DP}$ D NP]][$_{v*'}$ v* [$_{VP}$ V DP]]]]]

(16a), which is the structure of (15a) without an FQ, shows that the subject DP *both the men* appears in the Spec-v*P, and it gets the Agent θ-role from v*. Further, the subject moves to the Spec-TP in order to check the nominative Case. In (16b), which is the structure of (15b) with an FQ, there is a projection of QP which dominates DP. Only the subject DP *the men* in the QP moves to the Spec-TP to check the nominative Case, and the quantifier *both* in the Q head is stranded. Thus there are two kinds of maximal projections for the structures involving quantifiers. The proposals in (12) and the idea that QP dominates DP in FQ constructions lead us to reanalyze the phenomena of FQs in the next section.

4. Analyses of Floating Quantifiers

4.1. Floating Quantifiers in English
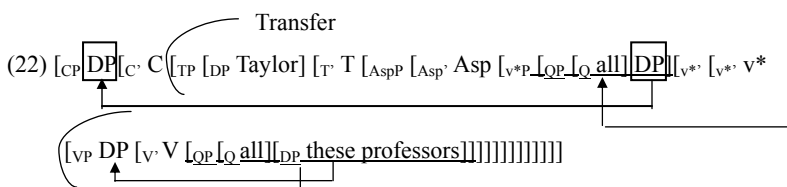
4.1.1. Passive and Unaccusative Sentences

As presented in section 3, the two proposals in (12) and the proposal of Radford (1997), which assumes the different structures between FQ and non FQ structures, are applied to the analysis here. Firstly, I will look at FQ structures with subject-oriented FQs in passive or unaccusative verb sentences. (18) is the structure of (17).[1]

(17) The students were all arrested. (=(9))

(18) [$_{CP}$ C [$_{TP}$ [$_{DP}$ the students] [$_{T'}$ T [$_{vP}$[$_{QP}$ [$_Q$ all] DP] [$_{v'}$ v [$_{VP}$ V[$_{QP}$ [$_Q$ all] [$_{DP}$ the

students]]]]]]]]

Transfer

In the structure which has an FQ associated with a passive verb, at first the QP which includes DP moves out from within VP to Spec-vP in order to satisfy the rule of (14), BVQ. At the intermediate position, in this case, Spec-vP, only the DP within the QP is extracted to the Spec-TP for Case-checking, resulting in an FQ structure.[2] Therefore, the stranded Q and the moved DP can have a relation in the same transfer domain, and this leads to (17) being grammatical. Thus the proposals in this paper of (12a, b) capture the fact in (17).

4.1.2. Transitive and Unergative Sentences

Let us next consider an FQ structure with subject-oriented FQs in transitive or unergative verb sentences.

(19) The students have all finished the assignment. (=(1b))

(20) [$_{CP}$ C [$_{TP}$ [$_{DP}$ the students] [$_{T'}$ T [$_{AspP}$ [$_{QP}$ [$_Q$ all] DP] [$_{Asp'}$ Asp [$_{v*P}$ [$_{QP}$ [$_Q$ all] [$_{DP}$ the

students]] [$_{v*'}$ v* [$_{VP}$ V DP]]]]]]]]]

Transfer

(19) is illustrated as in (20). Here the Asp is projected for a perfect auxiliary *have*. Based on Chomsky (2008), it is assumed that a subject QP is originally placed in v*P-Spec. In (20) the whole QP once moves from the base position to the upper place, in this case, Spec-AspP, for BVQ. Leaving a quantifier *all*, DP moves to

Spec-TP from Spec-AspP for case checking. After these movements, the stranded FQ in the intermediate position and the moved DP in the final position are associated with each other in the same transfer domain.

Next I will analyze the example of (11) ((11b) is repeated as (21)), which is problematic for Bošković's (2004) proposal as discussed above. (22) illustrates the structure of (21).

(21) *These professors, Taylor will have all met before the end of term. (=(11b))

Transfer

(22) [$_{CP}$ DP [$_{C'}$ C [$_{TP}$ [$_{DP}$ Taylor] [$_{T'}$ T [$_{AspP}$ [$_{Asp'}$ Asp [$_{v*P}$ [$_{QP}$ [$_{Q}$ all] DP] [$_{v*'}$ [$_{v*}$ v*

[$_{VP}$ DP [$_{V'}$ V [$_{QP}$ [$_{Q}$ all][$_{DP}$ these professors]]]]]]]]]]]]]

In order to explain the example, the parallel operation proposed by Chomsky (2008) is utilized. He notes that "along with Transfer, all other operations will also apply at the phase level, as determined by the label/probe (Chomsky (2008: 143))." Therefore for the sake of the satisfaction of Agree-feature of T and C, two distinct operations occur simultaneously because CP and v*P, but not TP, are phases. Following the parallel movement hypothesis by Chomsky (2008), I will explain the ungrammatical example of (21). Assume that the complement of the verb is QP. DP within the QP moves to the Spec-VP for case checking, and simultaneously the whole QP containing DP moves to the outer-Spec of v*P by edge feature from the base position. These operations result in both the satisfaction of case and the BVQ. At the place of the outer-Spec of v*P, a quantifier *all* is stranded and only the DP out of QP moves to Spec-CP. Because of the movement into CP, a quantifier and its associated noun phrase cannot be interpreted in the same transfer domain. Therefore the structure of (22) is not appropriate and the ungrammaticality of (21) can be explained. Thus the example of (11), which Bošković's generalization cannot cover, can be naturally explained by my proposals.

4.2. Floating Quantifiers in Japanese

4.2.1. Passive and Unaccusative Sentences

I will now consider the floating constructions of NQs in Japanese utilizing my proposals. The following examples are subject-oriented floated NQs which appear in passive and unaccusative sentences, and (24) shows their structures.

(23) a. Kuruma-ga doroboo-ni ni-dai nusum-are-ta.

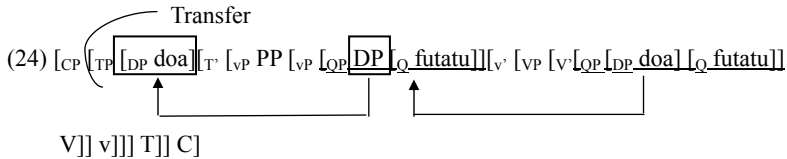   Car-NOM   thief-by 2-CL   steal-PASS-PAST

      'Two cars were stolen by a thief.'

  b. Doa-ga   kono kagi-de   futatu aita.

    door-NOM this   key-with 2-CL opened

    'Two doors opened with this key.'

                            (Miyagawa and Arikawa (2007: 646))

Transfer

(24) [$_{CP}$ [$_{TP}$ [$_{DP}$ doa][$_{T'}$ [$_{vP}$ PP [$_{vP}$ [$_{QP}$ DP [$_{Q}$ futatu]][$_{v'}$ [$_{VP}$ [$_{V'}$ [$_{QP}$ [$_{DP}$ doa] [$_{Q}$ futatu]]

    V]] v]]] T]] C]

The whole QP moves from the in-situ position to Spec-vP because of BVQ. From this place, in order to receive a nominative Case, only DP out of QP moves to Spec-TP leaving an NQ. Through this process, the examples in (23a, b) can be appropriately derived.

4.2.2. Transitive and Unergative Sentences

Let us look at transitive and unergative sentences with NQs. Subject-oriented NQs are shown in (25).

(25) a. Kodomo-ga san-nin geragerato waratta.
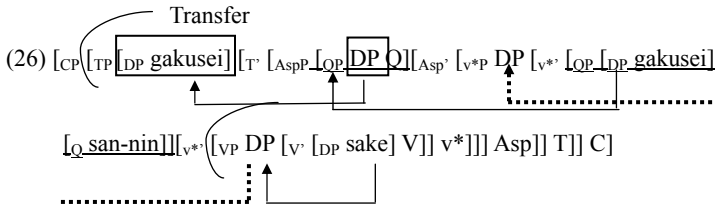
     child-NOM 3-CL   loudly   laughed

     'Three children laughed loudly.'

  b. Gakusei-ga   san-nin sake-o   nonda.

     student-NOM   3-CL   sake-ACC   drank

     'Three students drank sake.'

(Miyagawa and Arikawa (2007: 648))

Transfer

(26) $[_{CP}[_{TP}[_{DP} \text{gakusei}]][_{T'} [_{AspP}[_{QP}[_{DP} Q][_{Asp'} [_{v*P} DP [_{v*'} [_{QP} [_{DP} \text{gakusei}]$

$[_{Q} \text{san-nin}]][_{v*'}[_{VP} DP [_{V'} [_{DP} \text{sake}] V]] v*]]] Asp]] T]] C]$

(26) illustrates the derivation of (25b). Since in Japanese, a scrambling of objects occurs, it happens in this structure as well, so after an object DP moves to Spec-VP for Case-checking it can further undergo scrambling. As for the subject containing an NQ, it is base-generated at Spec-v*P. From that position the whole QP goes up to Spec-AspP, and it results in the satisfaction of BVQ. Furthermore, in order to check the nominative Case, the DP moves to Spec-TP out of the QP. Thus the derivation converges.

     The contrast between (27a) and (27b) might seem strange, because the only difference is in the use of a universal quantifier *zen'in* instead of an NQ *san-nin*.

(27) a. *Gakusei-ga sake-o san-nin nonda.

  b. Gakusei-ga   sake-o   zen'in   nonda.

     students-NOM sake-ACC all-people   drank

     'All the students drank sake.'

For those sentences, the meaning of *san-nin* and *zen'in* should be considered. *zen'in* can modify units of people. Also *zen'in* may be a single word by itself and may not

be an FQ because *zen'in* already has the meaning of people (I use the term of [+human] to refer to this meaning). In (28a), the only noun that *zen'in* can possibly modify is the subject noun phrase *gakusei*. In contrast, as in (28b), if there are two possibilities that *zen'in* can modify in the same transfer domain, it cannot associate with the subject noun phrase *gakusei*, but it can have a relation with the object noun phrase *sensei*, which is closer to *zen'in* than the subject.

(28) a. Gakusei-ga$_i$ biiru-o$_j$ zen'in$_{i/*j}$ nonda.
        Students-NOM   beer-ACC   all-[+human]   drank
        'All the students drank beer.'

   b. Gakusei-ga$_i$ sensei-o$_j$ zen'in$_{*i/j}$ nagutta.
      Students-NOM teachers-ACC   all-[+human]   hit
      'The students hit all the teachers.'

Furthermore, unlike (28a), (29a) shows that words that have the meaning of [±human] can modify the object noun phrase *biiru*, but they cannot modify the subject noun phrase *gakusei*. *Zenbu*, *minna*, and *subete* are ambiguous and they can both indicate human and non-human objects, therefore they can refer both to *gakusei* and *biiru*. In (29a), the closer element is the object, and it is chosen for modification.

(29) a. Gakusei-ga$_i$ biiru-o$_j$ $\left\{\begin{array}{c}\text{zenbu}\\\text{min'na}\\\text{subete}\end{array}\right\}_{*i/j}$ nonda.

      students-NOM beer-ACC   all-[±human]   drank
       'Students drank all of the bear.'
   b. Gakusei-ga$_i$ biiru-o$_j$ san-nin$_{*i/*j}$ nonda.
      Students-NOM beer-ACC   3-CL   drank
      'Three students drank beer.'

As for (29b), *san-nin* cannot be associated with both the subject and the object. The classifier *-nin* is used in order to count the number of people. Here I assume that classifiers are grammatical elements and they are determined based on their association. That is, only the number of *3* is transferred and a classifier of *–nin* is attached by its association at PF. Therefore since in syntax the number *3* is not indicative of what it can modify, the number will associate with an element that is the closest one. Through the observations from (27) to (29), it may be plausible to say that if the words have [+human], they are not FQs, so they will not follow the rule of the two main proposals that I presented here at all.

5. Concluding Remarks

Thus far, I have examined the FQ constructions in English and Japanese, and suggested a mechanism for the derivations of FQs. In this paper, I have focused on Bošković's (2004) generalization, and revealed that certain phenomena of FQs in English cannot be covered by the generalization. Therefore, I have presented an alternative analysis, in which transfer domains and BVQ play a crucial role, based on Radford's (1997) FQ structures. Assuming the two proposals presented in this paper, it becomes possible to account for not only the grammaticality of FQ structures in English, but also Shlonsky's (1991) Hebrew examples, which could not be explained by the structure suggested by Bošković (2004). In alternative structures, in which DPs move to Case-checking positions directly, there is no problem even if we assume that the DPs move through Spec-QP.

Furthermore, the two main proposals are effective on NQ floating structures in Japanese, and the grammaticality of a number of sentences is well-captured. Therefore, although further research is needed for cross-linguistic study, it can be concluded that the present proposals are on the right track for analyzing FQ phenomena at least in both English and Japanese.

Notes

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1. Because of space limitations, VoiceP or other possible projections are not indicated.

2. According to Legate (2003), unaccusative and passive vP are also phases. She provides evidence that Spec-vP is an intermediate position for the movement.

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