Investigating Scope Interpretations: Adjuncts and Subjects in Japanese

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1. Introduction

In the study of Japanese linguistics, the phenomenon of 'scope interpretation' is often a significant subject of inquiry.[1]

(1) [Yonin-no   syoonen]-ga [sannin-no   syoozyo]-o syootaisita.

  four-GEN[2]   boy-NOM   three-GEN   girls-ACC   invited

  'Four boys invited three girls.'

   NP-*ga* > NP-*o*   ([four boys]$_{ga}$ > [three girls]$_{o}$)

   (Available interpretation: There are four boys, each of whom invited three girls.)

   *NP-*o* > NP-*ga*   (*[three girls]$_{o}$ > [four boys]$_{ga}$)

   (Unavailable interpretation: There are three girls, each of whom has been invited by four boys.)

                                             [Hoji 1985: 236, (53a)]

In sentence (1), a common reading, called 'group reading', which could be interpreted as 'Four boys invited three girls'. is generally acceptable, but in this paper, we only focus the discussion on the scope interpretation. The scope interpretation 'four boys > three girls (NP-*ga* > NP-*o*)' implies that each of the four boys invited three girls. Similarly, the interpretation 'three girls > four boys (NP-*o* > NP-*ga*)' suggests that each of the three girls was invited by four boys. However, the interpretation 'NP-*o* > NP-*ga*' has often been argued to be unacceptable in the *ga-o*-V word order, as in (1).

In the literature, the scope interpretation between argument NPs, such as NP-*ga* and NP-*o*,

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[1] In this paper, we use a five-level scale to describe acceptability judgments, represented as 'ok/?/??/?*/*'. Among these, 'ok/?/??' corresponds to the prediction of grammaticality for the sentence, while '?*/*' aligns with the prediction of ungrammaticality. Note that if no marking is present in the text, it should be understood as an acceptability judgment of 'ok'.

[2] In this paper, the following abbreviations are used in word-by-word glosses.

  ACC: accusative case-marker
  DAT: dative case-marker
  GEN: genitive case-marker
  NOM: nominative case-marker

has been a central focus of discussion. Yet, limited observations have been reported on the scope interpretation with adjunct NPs such as NP-*de*. (See Hoji (1985), Takai (2009), among others.) The paper is organized as follows: In section 2, I will summarize the observations, particularly focusing on the scope interpretation between NP-*ga* and NP-*de*. Then, in section 3, I will outline the traditional analysis of the scope interpretation that assumes quantifier raising (QR) and point out its problems. In section 4, after introducing an alternative approach, I also discuss the structural position of NP-*de* in the sentence based on the data observed. The conclusion will be summarized in section 5.

2. Observations on Scope Interpretation of NP-*ga* and NP-*de*

Hoji (1985:243-244) stated the scope interpretation involving quantificational adverbials (Q-Adverbials) as "[u]nlike the cases of the subject and the object QP's, the reversing of the order of the QP's does not result in scope ambiguity." He also generalized the scope interpretation of QP-*ga* and Q-Adverbial as in (2).

(2)　　a.　QP-ga　Q-Adv(erbial)　V　　　　unambiguous

　　　　b.　Q-Adv　QP-ga　　　　V　　　　unambiguous

[Hoji 1985: 244, (78)]

However, only the scope interpretation between Q-Adverbials is shown as an example sentence. The scope interpretation of QP-*ga* and Q-Adverbial is not exemplified. Nevertheless, based on the generalization in (2), since the preceding NPs take a wide scope, it is predicted that the scope interpretation of NP-*ga* and NP-*de* will be as in (3):

(3)　　　The prediction of the scope interpretation of NP-*ga* and NP-*de* based on Hoji (1985):

　　　　a.　*ga-de*-V word order:

　　　　　　NP-*ga* > NP-*de*

　　　　　*NP-*de* > NP-*ga*

　　　　b.　*de-ga*-V word order:

　　　　　　NP-*de* > NP-*ga*

　　　　　*NP-*ga* > NP-*de*

As also pointed out by Takai (2009), indeed, for the *ga-de*-V word order, only the scope

interpretation of NP-*ga* > NP-*de* is acceptable, as shown in (4).[3]

(4) *ga-de*-V word order:

      [Sannin-no sensei]-ga   [yonkasyo-no tihoo tosi]-de   kooenkai-o   hiraita.

      three-GEN teacher-NOM   four-GEN   local city-DAT   lecture-ACC   held

      'Three teachers held lectures in four local cities.'

      ?*NP-*de* > NP-*ga*   (?*[four local cities]$_{de}$ > [three teachers]$_{ga}$)

      (Unavailable interpretation: There were four local cities where, in each location, three teachers held lectures.)

                                                 [cf. Takai 2009: 109, (272)]

However, in the case of the *de-ga*-V word order, data that differed from the literature were observed. Specifically, in the *de-ga*-V word order, there are cases where both the interpretations of NP-*ga* > NP-*de* and NP-*de* > NP-*ga* are possible, as in (5), and cases which allow only NP-*ga* > NP-*de* interpretation, as in (6).

(5) *de-ga*-V word order:

      [Yonkasyo-no   tihoo tosi]-de   [sannin-no sensei]-ga   kooenkai-o   hiraita.

      four-GEN   local city-DAT   three-GEN teacher-NOM   lecture-ACC   held

      'In four local cities, three teachers held lectures.'

       NP-*de* > NP-*ga*   ([four local cities]$_{de}$ > [three teachers]$_{ga}$)

      ?NP-*ga* > NP-*de*   (?[three teachers]$_{ga}$ > [four local cities]$_{de}$)

      (Available interpretation: There were three teachers, each of whom held lectures in four local cities.)

                                                 [cf. Takai 2009: 110, (278)]

(6) *de-ga*-V word order:

      [Yottu-no   zairyoo]-de   [hutari-no kokku]-ga   ryoori-o   tukutta.

      four-GEN   ingredient-DAT   two-GEN cook-NOM   dish-ACC   made

      'With four ingredients, two cooks made the dishes.'

      *NP-*de* > NP-*ga*   (*[four ingredients]$_{de}$ > [two cooks]$_{ga}$)

       NP-*ga* > NP-*de*   ([two cooks]$_{ga}$ > [four ingredients]$_{de}$)

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[3] Takai (2009) also made observations about the scope interpretation of NP-*ga* and adjuncts, including differences in acceptability by semantic role as in this paper. However, this paper reexamines the observations regarding the scope interpretation of NP-*ga* and NP-*de*, with a particular focus on NP-*de*, as a piece of evidence to indicate that the QR analysis is not valid.

In this paper, I would like to point out that this difference lies in the semantic roles of NP-*de*. To begin with, NP-*de* in Japanese has several usages, such as *Location* '*tihoo tosi-de*' (in local cities), *Instrument* '*zairyoo-de*' (with ingredients) or *Reason* '*kasitu-de*' (because of the faults). Similar to example (5), sentences in (7) illustrate cases where interpretations of both NP-*de* > NP-*ga* and NP-*ga* > NP-*de* are possible in the *de-ga*-V word order.

(7)   *de-ga*-V word order: NP-*de* > NP-*ga*,   NP-*ga* > NP-*de*

    a.   [Mittu-no   koozyoo]-de [yonin-no syokunin]-ga   nuno-o   someta.

        three-GEN   factory-DAT   four-GEN artisan-NOM   cloth-ACC   dyed

        'At three factories, four artisans dyed the cloth.'

        NP-*de* > NP-*ga*   ([three factories]$_{de}$ > [four artisans]$_{ga}$)

        NP-*ga* > NP-*de*   ([four artisans]$_{ga}$ > [three factories]$_{de}$)

    b.   [Goken-no zyuutaku]-de [sannin-no   hikkosigyoosya]-ga nimotu-o   katazuketa.

        five-GEN house-DAT   three-GEN   mover-NOM   package-Acc   cleaned up

        'At five houses, three movers cleaned up packages.'

        NP-*de* > NP-*ga*   ([five houses]$_{de}$ > [three movers]$_{ga}$)

        NP-*ga* > NP-*de*   ([three movers]$_{ga}$ > [five houses]$_{de}$)

On the other hand, examples in (8), as in (6), show that the interpretation of NP-*de* > NP-*ga* is unacceptable in the *de-ga*-V word order, and only the interpretation of NP-*ga* > NP-*de* is acceptable.

(8)   *de-ga*-V word order: *NP-*de* > NP-*ga*,   NP-*ga* > NP-*de*

    a.   [Mittu-no   kasitu]-de [hutari-no giin]-ga   sinyoo-o   usinatta.

        three-GEN   fault-DAT   two-GEN councilor-NOM   trust-ACC   lost

        'Because of the three faults, two councilors lost their trusts.'

        *NP-*de* > NP-*ga*   ([three faults]$_{de}$ > [two councilors]$_{ga}$)

        NP-*ga* > NP-*de*   ([two councilors]$_{ga}$ > [three faults]$_{de}$)

b. [Nisyurui-no origami]-de   [gonin-no   seito]-ga   sakuhin-o   tukutta.

     two-GEN   origami-DAT   five-GEN   student-NOM   craft-ACC   made

     'With two kinds of origami, five students made crafts.'

     *NP-*de* > NP-*ga*   ([two kinds of origami]$_{de}$ > [five students]$_{ga}$)

      NP-*ga* > NP-*de*   ([five students]$_{ga}$ > [two kinds of origami]$_{de}$)

<div align="right">[Inoue 2023: 27, (6b)]</div>

Examples above show the scope interpretation of NP-*de* > NP-*ga* in the *de-ga*-V word order is acceptable when the semantic role of NP-*de* is *Location*, as in (7), but unacceptable when it is *Instrument* or *Reason*, as in (8).

     The results regarding the scope interpretation of NP-*ga* and NP-*de* are summarized in (9).

(9)   The results of the scope interpretation of NP-*ga* and NP-*de* :

semantic role	*ga-de*-V word order		*de-ga*-V word order	
Location	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	NP-*de*>NP-*ga*
Instrument	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*
Reason	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*

As stated above, the acceptability of NP-*de* > NP-*ga* depends on the semantic role of NP-*de*. To deal with this observation, in section 3, I will briefly summarize how the scope interpretation has been analyzed in the traditional generative grammar and discuss the problems of this analysis. Then, the concept of 'logical subject' is introduced as an alternative to account for the observations in (9).

3. Traditional Analysis of Scope Interpretation Assuming QR

     In this section, I will first outline the traditional analysis of scope in generative grammar to explain what it means that interpretations such as NP-*ga* > NP-*de* and NP-*de* > NP-*ga* to be acceptable.

     In generative grammar, the idea which is often taken is to apply a syntactic operation called quantifier raising (QR), as in (10b), to quantifier expressions such as *everyone* and *someone* in (10a), to correspond to a form of predicate logic as in (10c).

(10) a. everyone loves someone.

      b. LF representation : everyone$_x$ [someone$_y$ [t$_x$ loves t$_y$]]

      c. logical representation : $\forall$x   [$\exists$y   [x loves y]]

In this case, the 'scope' is the domain where quantifiers such as the universal quantifier (e.g., *everyone*) and the existential quantifier (e.g., *someone*) operate, and '$\alpha > \beta$' represents that the quantifier β is included in the scope of the quantifier α. In other words, in the case of (10), the quantifier *someone* is included in the scope of the quantifier *everyone*, so it represents the scope interpretation of '*everyone > someone*'.

However, assuming the correspondence with the form of predicate logic, adjunct NPs such as NP-*de* cannot be treated in the same way as argument NPs. This is because in predicate logic, the relation between predicates and their argument NPs is taken as the function-argument relation, but it is not clear how the relation between predicates and adjunct NPs should be treated.

QR has been favored in generative grammar because it is easy to map into the form of predicate logic, as shown in (10). Additionally, QR has the great advantage of being able to be applied in any order, making it easier to account for ambiguities in scope interpretation. Nevertheless, as noted in Kuroda (1969/1970), Huang (1982), Hoji (1985), Liu (1990), and Szabolcsi (1997), it is now considered that the scope interpretation is not necessarily ambiguous. And indeed, this idea is illustrated by the examples in section 2. If the ambiguity of the scope interpretation is not the subject of description in the first place, then the greatest advantage of assuming QR would be lost. Of course, there is a way to account for the unambiguity of the scope interpretation while still assuming QR. Hoji (1985) argued that (11) should be assumed to explain the unambiguous scope interpretation that only NP-*ga* > NP-*o* is acceptable in the *ga-o*-V word order as in (1), repeated here in (12).

(11)   at LF *QP$_i$ QP$_j$ t_j t_i where each member c-commands the member to its right

                                                                    [Hoji 1985: 244, (76)]

(12) *ga-o*-V word order: NP-*ga* > NP-*o*,   *NP-*o* > NP-*ga*
      [Yonin-no   syoonen]-ga [sannin-no   syoozyo]-o syootaisita.
      four-GEN   boy-NOM   three-GEN   girls-ACC   invited
      'Four boys invited three girls.'
            NP-*ga* > NP-*o*   ([four boys]$_{ga}$ > [three girls]$_o$)
            *NP-*o* > NP-*ga*   (*[three girls]$_o$ > [four boys]$_{ga}$)

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However, just assuming (11) would not be sufficient to explain the ambiguous scope interpretation observed in the *o-ga*-V word order, as shown in (13).

(13) *o-ga*-V word order: NP-*o* > NP-*ga*,   NP-*ga* > NP-*o*

    [Sannin-no   syoozyo]-o   [yonin-no   syoonen]-ga   syootaisita.

    three-GEN   girls-ACC   four-GEN   boy-NOM   invited

    'Three girls were invited by four boys.'

       NP-*o* > NP-*ga*   ([three girls]$_o$ > [four boys]$_{ga}$)

       NP-*ga* > NP-*o*   ([four boys]$_{ga}$ > [three girls]$_o$)

[cf. Hoji 1985: 237, (55)]

The subsidiary assumption that Hoji (1985: 247) adds to explain this ambiguity can be summarized as (14).

(14) The traces of QR can be deleted when there are traces of overt movement.

In this way, assuming (11) and (14) can explain the scope interpretation of NP-*ga* and NP-*o*. (15) is a table summarizing the acceptability of the scope interpretation of NP-*ga* and NP-*o*.

(15) The results of the scope interpretation of NP-ga and NP-o :

| *ga-o*-V word order		*o-ga*-V word order	
NP-*ga* > NP-*o*	*NP-*o* > NP-*ga*	NP-*o* > NP-*ga*	NP-*ga* > NP-*o*

Since, the analysis assuming QR refers only to the sentence structure, it cannot account for the different acceptability caused by the difference in semantic roles, as discussed in the scope interpretation of NP-*ga* and NP-*de* given in section 2.

    The conventional analysis assuming QR is not appropriate as a scope analysis because even with the addition of new and unnatural constraints, it still leaves several unexplained observations about the scope interpretation of NP-*ga* and NP-*de*. In order to say that we can 'explain' the observations of the scope interpretation, we need to verify conceivable derivations. Moreover, in cases where scope interpretation is unacceptable, it is necessary to demonstrate that all conceivable derivations are ungrammatical due to some factors, which causes the disadvantage that the more derivations to be investigated, the more cumbersome the process becomes.

    If we assume QR in the analysis, for each constituent, the derivations will all be different

depending on (i) where it is base-generated, (ii) whether there is an overt movement, (iii) where it is located after QR, and (iv) whether there is deletion of QR traces. Considering specifically NP-*ga* and NP-*de* as described above, there are 30 possible derivation patterns of sentences corresponding to NP-*de* > NP-*ga* in the *ga-de*-V word order shown in (4), and 30 possible derivation patterns of sentences corresponding to NP-*de* > NP-*ga* in the *de-ga*-V word order shown in (5) and (6). [4] All derivations corresponding to NP-*de* > NP-*ga* in (4) must be ungrammatical, but there are 16 out of 30 derivations that would be grammatical using only the conventional assumption, so new constraints are needed to exclude them. An example of such derivations is (16), for instance.

(16) *ga-de*-V word order: NP-*de* > NP-*ga*
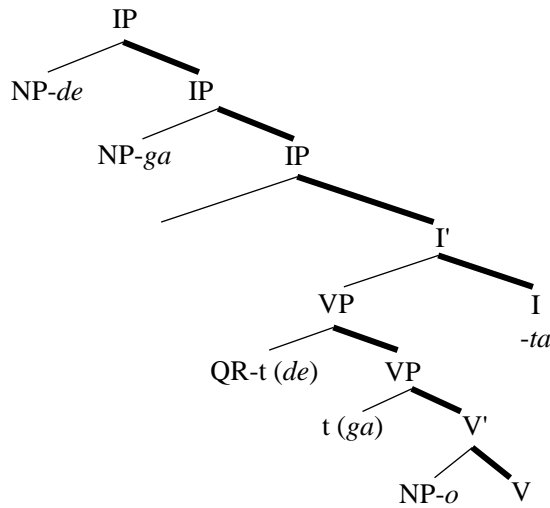
In addition, the derivations corresponding to NP-*de* > NP-*ga* in (5) and (6) must be determined whether they are grammatical or ungrammatical based on the difference of their semantic roles, but there are 16 derivations out of 30 that would all be grammatical by only using the traditional assumptions. An example of such derivations is (17), for instance.

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[4] Specifically, regarding the scope interpretation of NP-*de* and NP-*ga*, there are three possibilities at the Deep Structure (DS), three at the Surface Structure (SS), eight at the Logical Form (LF), and two at the Phonetic Form (PF). In practice, computing all derivation patterns of NP-*ga* > NP-*de* and NP-*de* > NP-*ga* requires division into cases based on the presence or absence of NP-*de*'s overt movement. Thus, there exist a total of 120 derivations, calculated as 24 (DS3×SS1×LF4×PF2) + 96 (DS3×SS2×LF8×PF2). These include 60 instances each of NP-*ga* > NP-*de* and NP-*de* > NP-*ga*. Thus, there are 30 derivations that correspond to each of NP-*de* > NP-*ga* in the *ga-de*-V word order and NP-*de* > NP-*ga* in the *de-ga*-V word order.

(17) *de-ga*-V word order: NP-*de* > NP-*ga*
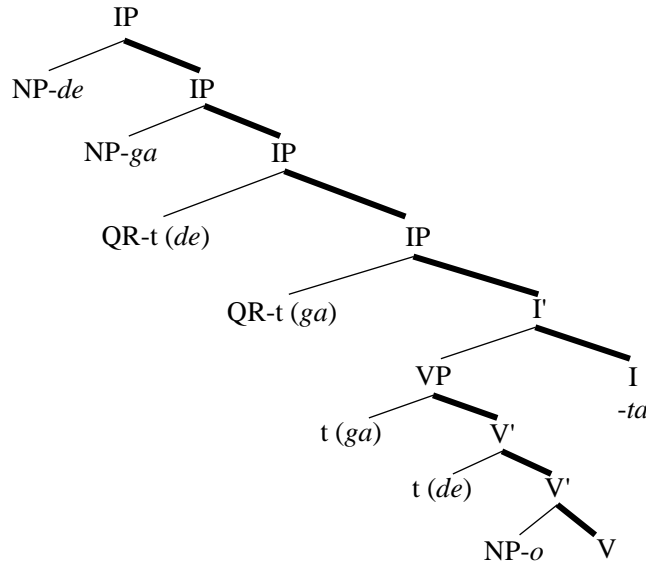
As a result, the traditional analysis assuming QR generates a huge number of derivation patterns that need to be examined in order to capture the scope properly. On top of that, it cannot adequately explain the phenomenon. In other words, the analysis of the scope itself, which assumes that any quantifier expressions must undergo QR to correspond to the conventional form of predicate logic, should not be considered as valid.

4. Logical Subject and Scope Interpretation

To solve the problem pointed out in section 3, in this section, I will argue that the scope can be properly captured by the notion of 'logical subject' as described in Kuroda (1969/1970). Kuroda (1969/1970) talks about the so-called scope relationship by using the concept of 'subject' as explained in (18).

(18)   one may introduce a kind of 'higher predicate' S (,), where the first place is to be filled with a variable or constant and the second place with a usual type of predicate formula one of whose places is, however, left blank; for example, $S(a, P(-, b))$ is a well-formed formula in the proposed system and is intended to be interpreted as '*a* is a subject of the property which says that between it and *b* the relation *P* holds'.

<div align="right">[Kuroda 1969/1970: 78]</div>

He displays the interpretation of each sentence in (19a, b) as in (20a, b). (Here 'σ' represents *sae* and 'δ' represents *dake*.)

(19) a. John sae S.S. dake o yonda   [Kuroda 1969/1970: 85, (26)]

      b. S.S. dake wa John sae ga yonda   [Kuroda 1969/1970: 86, (30)]

(20) a. $S\,(\sigma\text{John},\,Y\,(-,\,\delta\text{S.S.}))$ [Kuroda 1969/1970: 87, (34)]

      b. $S\,(\delta\text{S.S.},\,Y\,(\sigma\text{John},\,-))$ [Kuroda 1969/1970: 87, (37)]

To avoid confusions, in what follows, I will call the 'subject' in the sense of Kuroda (1969/1970) the *logical subject*. In (20a), 'δS.S.' is included in the logical predicate '$Y\,(-,\,\delta\text{S.S.})$' of the logical subject 'σJohn', thus it corresponds to the scope interpretation 'John *sae* > S.S. *dake*'. Similarly, (20b) corresponds to the scope interpretation 'S.S. *dake* > John *sae*' because 'σJohn' is included in the logical predicate '$Y\,(\sigma\text{John},\,-)$' of the logical subject 'δS.S.'.
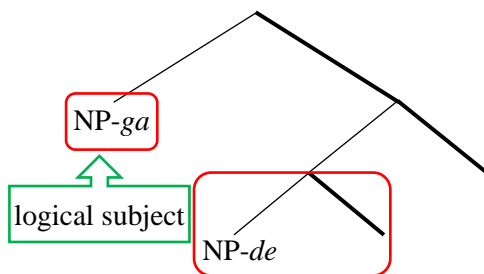
     Now, let see how the observations in (9), repeated below, can be reinterpreted with this approach.

(9)   The results of the scope interpretation of NP-*ga* and NP-*de* :

semantic role	ga-de-V word order		de-ga-V word order	
Location	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	NP-*de*>NP-*ga*
Instrument	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*
Reason	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*	NP-*ga*>NP-*de*	*NP-*de*>NP-*ga*

The fact that NP-*ga* > NP-*de* is acceptable in both *ga-de*-V word order and *de-ga*-V word order means that NP-*ga* can be a logical subject of the subject-predicate relation that include NP-*de* as the logical predicate. In other words, NP-*ga* can always be a logical subject. This means that, as shown in the tree structure in (21), NP-*ga* can be in the position of the arrow, which represents a logical subject, in both *ga-de*-V word order and *de-ga*-V word order.[5]
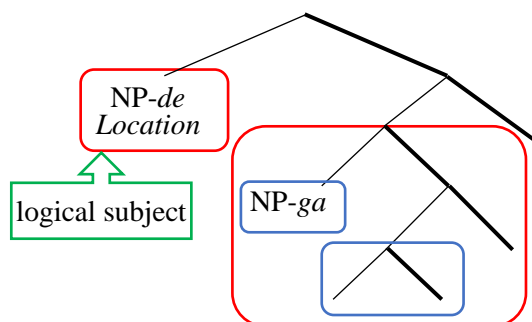

(21) a. *ga-de*-V word order: b. *de-ga*-V word order:

_____
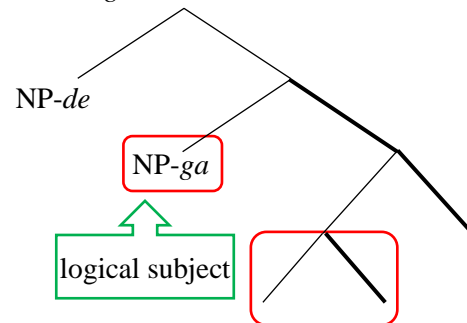
[5] The tree structures in (21) to (24) focus on the subject-predicate relation and are intentionally not labeled for easy understanding.

On the other hand, since NP-*de* > NP-*ga* is sometimes unacceptable, NP-*de* is not always able to be a logical subject. In (9), the observation that NP-*de* > NP-*ga* is acceptable in the *de-ga*-V word order indicates that only NP-*de* with the semantic role *Location* in this word order can be a logical subject as shown in (22).

(22) *de-ga*-V word order (the semantic role of NP-*de* is *Location*):


In contrast, there are multiple possible cases in which NP-*de* cannot be a logical subject. First, in the *ga-de*-V word order, NP-*de* > NP-*ga* is constantly unacceptable. That is, in the *ga-de*-V word order, NP-*de* cannot be a logical subject, regardless of its semantic role. This is represented by the arrow in the tree structure in (23).

(23) *ga-de*-V word order:
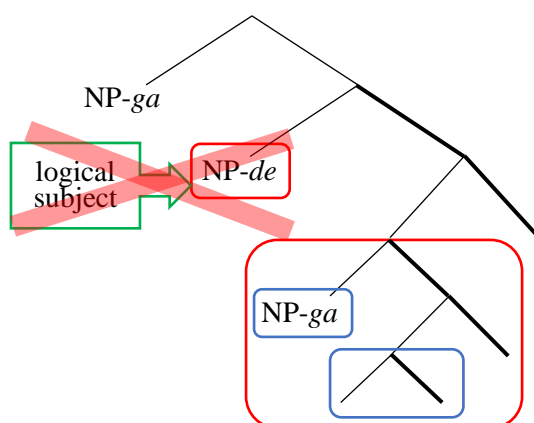
Besides, as shown in (9), the fact that NP-*de* > NP-*ga* is unacceptable in the *de-ga*-V word order means that NP-*de* whose semantic role is *Instrument* or *Reason* cannot be a logical subject.

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(24) *de-ga*-V word order (the semantic role of NP-*de* is *Instrument* or *Reason*):
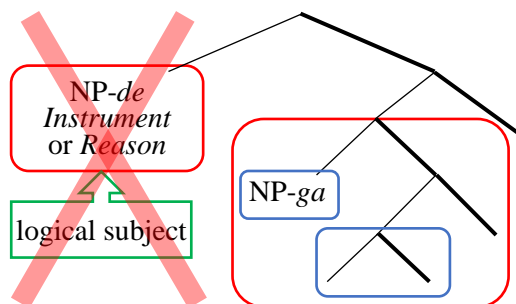
In summary, the claims of this paper with respect to the structural position of NP-*ga* and NP-*de* in the sentence are as in (25).

(25) a. NP-*ga* can always be a logical subject.

　　 b. NP-*de* can only be a logical subject when its semantic role is *Location* in the *de-ga*-V word order (it cannot be a logical subject when its semantic role is *Instrument* or *Reason*).

5. Conclusion

Traditionally, most studies about scope interpretation only dealt with argument NPs, such as NP-*ga* and NP-*o*. In this paper, we focused on adjunct NPs such as NP-*de*, and show that the scope interpretation of NP-*ga* and NP-*de* takes the form (9), which cannot be explained by generative grammar that assumes QR. I also argued that this observation shows the conditions under which NP-*ga* and NP-*de* can be a logical subject are different. Furthermore, this observation can be adequately explained by assuming that both word order and semantic role are related to the conditions, as summarized in (25).

The claims in (25) suggest that Japanese syntax must be the mechanism that can explain the observations. Moreover, although the concept of 'logical subject' is not commonly used to deal with scope interpretation, it provides adequate explanations for the data observed and reflect our linguistic intuitions well. For future study, more data with different syntactic structures should be examined.

Acknowledgements

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