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Methodological Remarks on the Investigation of LF Structural Properties: A case study of quantifier scope[1, 2]

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1. Introduction

- The scope interaction among *quantificational noun phrases* (= QPs) is extensively used to investigate LF structural properties in generative grammar.
- In this investigation, what is crucial is the assumption in (1). Once (1) is given, we may adopt (2) as a working hypothesis, cf. May 1977.

(1) The scope interpretation among QPs emerge directly trough LF compositional computation.

(2) Let *S* be a sentence whose configuration is $[_{\Psi} \dots \alpha \dots \beta \dots]$, where α and β are QPs, and Ψ is a clause-denoting element

a. α can take scope above β iff *S* is represented as (3a) at LF.

b. α can take scope below β iff *S* is represented as (3b) at LF.

(3) a. LF: $[_{\Psi} \alpha [_{\Psi} \dots \beta [_{\Psi} \dots t_{\alpha} \dots t_{\beta} \dots]]]$

b. LF: $[_{\Psi} \beta [_{\Psi} \dots \alpha [_{\Psi} \dots t_{\alpha} \dots t_{\beta} \dots]]]$

- The fact that (4) can be taken to mean either (5a) or (5b), for example, is taken to be evidence that (4) can be represented at LF either (6a) or (6b), cf. May 1977.

(4) More than two students visited three professors.

(5) a. There are more than two *x*s, *x* is a student such that there are three *y*s, *y* is a professor such that *x* visited *y*.

b. There are three *y*s, *y* is a professor such that there are more than two *x*s, *x* is a student such that *x* visited *y*.

(6) a. LF: [more than two students$_1$ [three professor$_2$ [t_1 visited t_2]]]

b. LF: [three professor$_2$ [more than two students$_1$ [t_1 visited t_2]]]

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[1] This presentation is based on Hayashishita 2003:Chapters 2 & 3.

[2] In this talk, I choose to illustrate proposed generalizations based on Japanese empirical materials because the audience mostly consists of Japanese native speakers. But similar illustrations can be made with English empirical materials, see Hayashishita 2003:Chapters 2 & 3.

- **Question 1:**
  Can we always assume that (1) holds?
- The negative answer seems to be more natural:
  - ✓ The speaker's intuitions about a given sentence in a given context can be sensitive to non-formal factors such as those having to do with pragmatics and discourse
  - ✓ If the answer is yes, why so many judgmental fluctuations? For example,

RE: English QP_{Sub} Verb QP_{Obj},

Chomsky 1957	$^{YES}QP_{Sub}>QP_{Obj}$ $^{NO}QP_{Obj}>QP_{Sub}$
Katz & Postal 1964	$^{YES}QP_{Sub}>QP_{Obj}$ $^{YES}QP_{Obj}>QP_{Sub}$

RE: Japanese QP_{Sub} QP_{Obj} Verb

Kuroda 1969/70, Hoji 1985	$^{YES}QP_{Sub}>QP_{Obj}$ $^{NO}QP_{Obj}>QP_{Sub}$
Kitagawa 1990, Kuno et al. 1999	$^{YES}QP_{Sub}>QP_{Obj}$ $^{YES}QP_{Obj}>QP_{Sub}$

- If the answer to Question 1 is negative, we cannot always utilize quantifier scope for the study of LF structural properties.
- **Question 2:**
  When can we reasonably assume that (1) holds, i.e., when can we use quantifier scope to investigate LF structural properties?

The outline of the talk:

- This talk is to address Questions 1 and 2.

(7) The main objectives of this talk:

a. To demonstrate that it is not always that case that the scope interaction among QPs emerges through LF compositional computation.

b. To spell out when we can reasonably assume that the scope interaction among QPs emerges through LF compositional computation.

SECTION 2 demonstrates that the $QP_{Obj}>QP_{Sub}$ reading (= inverse scope reading) obtains in the configuration (8) (= the basic order) only if three conditions are met, but the availability of the $QP_{Sub}>QP_{Obj}$ reading (= surface scope reading) is not subject to such conditions.

(8) [… QP_{Sub} [… QP_{Obj} …]], where the QP_{Sub} and the QP_{Obj} are clause-mates

SECTION 3 argues for (9); in particular, (10) is demonstrated.

(9) Surface scope readings may emerge through LF compositional computation while inverse scope readings do not.

(10) Surface scope readings may emerge based on the LF in (11a) while inverse scope readings are not based on the LF in (11b).

(11) a. LF: [QP_{Sub} [QP_{Obj} [… t_{Sub} [… t_{Obj} …]]]]

b. LF: [QP_{Obj} [QP_{Sub} [… t_{Sub} [… t_{Obj} …]]]]

Inverse scope readings therefore must involve an extra-grammatical operation. Hence, there are two sources of scope interaction.

SECTION 4 spells out when we can reasonably assume that the scope interaction among QPs emerges through LF compositional computation, based on Sections 2 and 3.

2. Differences between surface scope and inverse scope

2.1. Specificity effects

(12) Generalizations

a. The QP_{Obj} can take scope above the QP_{Sub} in the basic order only if the speaker refers to a specific group with the QP_{Obj}.

b. The QP_{Sub} can take scope above the QP_{Obj} in the basic order even if the speaker does not refer to a specific group with the QP_{Sub}.

Inverse scope readings:

- (13) exemplifies cases where we may reasonably assume that the speaker refers to a specific group with the QP_{Obj}, and (14) cases where it is reasonable to assume that the speaker does NOT refer to a specific group with the QP_{Obj}.

(13) a. **学部内選挙で、[*s* 十人以上の学生]が [*o* 二人の教授]に投票した。でも他の教授にはだれも投票しなかった。** ^{YES} $QP_{Obj}>QP_{Sub}$

b. (Context: There are five bad-mannered students. You know the fact that several professors split up into five groups and went to visit each of the students. You describe your knowledge as follows.)

[*s* 少なくとも誰か]が [*o* 全ての不良学生]を訪問した。 ^{YES} $QP_{Obj}>QP_{Sub}$

(14) a. **USC では、毎年、[*s* 三人の教授]が[*o* 五人以上の新入生]を人文科学賞に推薦する。** ^{NO} $QP_{Obj}>QP_{Sub}$

b. **今度の学会は、もし、[*s* 二人以上の発表者]が[*o* 沢山の聴衆]に議論をしかけたら、成功としよう。** ^{NO} $QP_{Obj}>QP_{Sub}$

- The unavailability of the $QP_{Obj}>QP_{Sub}$ reading in (14) cannot be explained in terms of the QP type, for the examples in (15) allow the reading under discussion.[3]

(15) a. (Context: We are wondering if we should rob some shops on 5th Avenue in New York. We agree that we will not execute the plan if five or more buildings on 5th Avenue are guarded. You go to spy, and see seven buildings guarded by two security guards. You return and report your observation.)

だめだ。 [*s* 二人のガードマン]が[*o* 五つ以上のビル]の前に立っていた。 ^{YES} $QP_{Obj}>QP_{Sub}$

b. (Context: You are watching a film showing a court situation of the Roman Empire. In this period, for each court case two witnesses are required. You have seen that 55 out of the 100 criminals (in the film) were testified against. Then, you report what you have seen.)

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[3] Contrasts like the one between (14) and (15) speak against works such as Liu 1990 and Beghelli & Stowell 1997, who classify QPs into several grammatical types, and claim that inverse scope readings fail to obtain in the basic order if the QP_{Obj} is a QP of a certain type.

[$_s$ 二人の証人]が [$_o$ 沢山の容疑者]に不利な証言を出していた。
YES $QP_{Obj}>QP_{Sub}$

Surface scope readings:

- (16) exemplifies cases where we may reasonably assume that the speaker refers to a specific group with the QP_{Sub}, and (17) cases where it is reasonable to assume that the speaker does NOT refer to a specific group with the QP_{Sub}.

(16) a. [$_s$ トヨタと日産]が [$_o$ 三つ以上の保険会社]に契約を申し込んだとしよう。
YES $QP_{Sub}>QP_{Obj}$

b. (Context: You know the fact that Student A and Student B voted for four professors. You describe your knowledge as follows.)

学部内選挙で、 [$_s$ 二人の学生]が [$_o$ 三人以上の教授]に投票した。
YES $QP_{Sub}>QP_{Obj}$

(17) a. USC では、毎年、[$_s$ 沢山の新入生]が [$_o$ 五人の教授]を人文科学賞に推薦する。
YES $QP_{Sub}>QP_{Obj}$

b. 今度の学会では、もし、[$_s$ 20%以上の発表者]が [$_o$ 二人の聴衆]に議論を仕掛けたら、成功としよう。
YES $QP_{Sub}>QP_{Obj}$

2.2. Freezing effects

2.2.1. Freezing effects on scope

(18) Generalizations

a. While the QP_{Obj} takes scope above the QP_{Sub} in the basic order, the narrow scope taking QP, the QP_{Sub}, cannot take wide scope with respect to another QP.

b. While the QP_{Sub} takes scope above the QP_{Obj} in the basic order, the narrow scope taking QP, the QP_{Obj}, can still take wide scope with respect to another QP.

Inverse scope readings:

- (19a) gives rise to the $QP_{D\text{-}Obj}>QP_{Sub}$ reading and (19b) to the $QP_{Sub}>QP_{I\text{-}Obj}$ reading.

(19) a. [$_s$ 三人以上の教授]が[$_{DO}$ 例の二人の学生]を会社に推薦していた。
YES $QP_{D\text{-}Obj}>QP_{Sub}$

b. [$_s$三人以上の教授]がジョンを[$_{IO}$ 二つの会社]に推薦していた。
YES $QP_{Sub}>QP_{I\text{-}Obj}$

- However, the two readings, which are independently possible, cannot co-occur with each other.

(20) [$_s$ 三人以上の教授]が[$_{DO}$ 例の二人の学生]を[$_{IO}$ 二つの会社]に推薦していた。
NO $QP_{D\text{-}Obj}>QP_{Sub}$ co-occurring with $QP_{Sub}>QP_{I\text{-}Obj}$

- The reading, which (20) lacks, is expressed as in (21), using logical formula, and this intuition is confirmed by the fact that (20) cannot be truthfully uttered in the situation depicted by (22).

(21) $\exists Y\ (Y \subseteq \textit{student} \wedge |Y| = 2)\ \forall y\ (y \in Y)\ [\exists X\ (X \subseteq \textit{professor} \wedge |X| \geq 3)$
$\forall x\ (x \in X)\ [\exists Z\ (Z \subseteq \textit{company} \wedge |Z| = 2)\ \forall z\ (z \in Z)$ [x recommended y to z]]]

(22) Elena and Victoria are the students under discussion.

For Elena, Professor A recommended her to Companies 1 & 2, Professor B to Companies 2 & 3, and Professor C to Companies 3 & 4.

For Victoria, Professor D recommended her to Companies 4 & 5, Professor E to Companies 5 & 6, Professor F to Companies 6 & 7, and Professor G to Companies 7 & 8.

- The reading that is available when (20) gives rise to the $QP_{D\text{-}Obj}>QP_{Sub}$ reading is expressed as in (23), and this intuition is confirmed by the fact that (20) can be truthfully uttered in the situation depicted by (24).

(23) $\exists Y\ (Y \subseteq \textit{student} \wedge |Y| = 2)\ \forall y\ (y \in Y)\ [\exists X\ (X \subseteq \textit{professor} \wedge |X| \geq 3)$
$\exists Z\ (Z \subseteq \textit{company} \wedge |Z| = 2)\ [\forall x\ (x \in X)\ \exists z\ (z \in Z)$ [x recommended y to z] $\wedge\ \forall z\ (z \in Z)\ \exists x\ (x \in X)$ [x recommended y to z]]]

(24) Elena and Victoria are the students under discussion.

For Elena, Professor A recommended her to Companies 1 & 2, Professor B, to Company 2, and Professor C, to Company 1.

For Victoria, Professor D recommended her to Companies 3 & 4, Professor E to Company 3, Professor F to Company 4, and Professor G to Companies 3 & 4.

- Altering the word order between the direct object and the indirect object does not change the factual assessment.

(25) a. [$_S$ 三人以上の教授]が会社に[$_{DO}$ 例の二人の学生]を推薦していた。
YES $QP_{D\text{-}Obj}>QP_{Sub}$

b. [$_S$ 三人以上の教授]が[$_{IO}$ 二つの会社]にジョンを推薦していた。
YES $QP_{Sub}>QP_{I\text{-}Obj}$

(26) [$_S$ 三人以上の教授]が[$_{IO}$ 二つの会社]に[$_{DO}$ 例の二人の学生]を推薦していた。
NO $QP_{D\text{-}Obj}>QP_{Sub}$ co-occurring with $QP_{Sub}>QP_{I\text{-}Obj}$

- The fact that (20) and (26) cannot give rise to the reading in (21) cannot be dismissed since their niyotte-passive counterpart allow that reading.

(27) [$_{DO}$ 例の二人の学生]が[$_S$ 三人以上の教授]によって[$_{IO}$ 二つの会社]に推薦された。
YES $QP_{D\text{-}Obj}>QP_{Sub}$ co-occurring with $QP_{Sub}>QP_{I\text{-}Obj}$

- More examples to support the generalization in (18a)

(28) a. [$_S$ 三人以上のヘッドハンター]が[$_{DO}$ 二つの会社]を[$_{IO}$ 全ての学生]に紹介していた。
NO $QP_{I\text{-}Obj}>QP_{Sub}$ co-occurring with $QP_{Sub}>QP_{D\text{-}Obj}$

b. [$_S$ 三人以上のヘッドハンター]が[$_{IO}$ 全ての学生]に[$_{DO}$ 二つの会社]を紹介していた。
NO $QP_{I\text{-}Obj}>QP_{Sub}$ co-occurring with $QP_{Sub}>QP_{D\text{-}Obj}$

Surface scope readings:

- The examples in (29) allow the $QP_{Sub}>QP_{I\text{-}Obj}$ reading to co-occur with the $QP_{I\text{-}Obj}>QP_{D\text{-}Obj}$ reading.

(29) a. **毎年、[$_S$ 沢山の教授]が[$_{IO}$ 五人の学生]に[$_{DO}$ 二つ以上の会社]を推薦する。**
YES $QP_{Sub}>QP_{I\text{-}Obj}$ co-occurring with $QP_{I\text{-}Obj}>QP_{D\text{-}Obj}$

b. **[$_S$ 木村教授と山田教授]が[$_O$ 三人以上の学生]に[$_O$ 四つの会社]を紹介していた。**
YES $QP_{Sub}>QP_{I\text{-}Obj}$ co-occurring with $QP_{I\text{-}Obj}>QP_{D\text{-}Obj}$

2.2.2. Freezing effects on binding

(30) Generalizations

a. While the QP_{Obj} takes scope above the QP_{Sub} in the basic order, the narrow scope taking QP, the QP_{Sub}, cannot bind a dependent term.

b. While the QP_{Sub} takes scope above the QP_{Obj} in the basic order, the narrow scope taking QP, the QP_{Obj}, can still bind a dependent term.

Inverse scope readings:

- (19a) gives rise to the $QP_{Obj}>QP_{Sub}$ reading and (19b) allows the QP_{Sub} to bind a dependent term *soko.*

(31) a [$_S$ **三つ以上の銀行]が[$_O$ 例の二つの会社]を取引先に紹介したとしよう。**
YES $QP_{Obj}>QP_{Sub}$

b [$_S$ **三つ以上の銀行]がトヨタを<u>そこ</u>の取引先に紹介したとしよう。**
YES QP_{Sub} binding *soko*

- However, the wide scope reading and the binding, which are independently possible, cannot co-occur with either other.

(32) [$_S$ **三つ以上の銀行]が[$_O$ 例の二つの会社]を<u>そこ</u>の取引先に紹介したとしよう。**
NO $QP_{Obj}>QP_{Sub}$ co-occurring with the QP_{Sub} binding *soko*

- The reading, which (32) lacks, is expressed as in (33), using logical formula, and this intuition is confirmed by the fact that (32) cannot be truthfully uttered in the situation depicted by (34).

(33) $\exists Y\ (Y \subseteq company \wedge |Y| = 2)\ \forall y\ (y \in Y)\ [\exists X\ (X \subseteq bank \wedge |X| \geq 3)$
$\forall x\ (x \in X)$ [x introduced y to x's customer]]

(34) Toyota and Nissan are the two companies under discussion. There are seven banks, A, B, C, D, E, F, and G. For Toyota, A introduced it to A's customer, B to B's customer, C to C's customer, and D to D's customer. For Nissan, E introduced it to E's customer, F to F's customer, and G to G's customer.

- Altering the word order between the direct object and indirect object does not change the factual assessment.

(35) a. [$_S$ **三つ以上の銀行]が取引先に[$_O$ 例の二つの会社]を紹介したとしよう。**
YES $QP_{Obj}>QP_{Sub}$

b. [$_S$ **<u>三つ以上の銀行</u>]が<u>そこ</u>の取引先にトヨタを紹介したとしよう。**
YES QP_{Sub} binding *soko*

(36) [$_S$ **<u>三つ以上の銀行</u>]が<u>そこ</u>の取引先に[$_O$ 例の二つの会社]を紹介したとしよう。**
NO $QP_{Obj}>QP_{Sub}$ co-occurring with the QP_{Sub} binding *soko*

- The fact that (32) and (36) cannot give rise to the reading in (34) is noteworthy, since (37), their *niyotte*-passive counterpart, allows the reading under discussion.

(37) [$_o$ **例の二つの会社**]**が**[$_s$ **三つ以上の銀行**]**によってそこの取引先に紹介されたとしよう。** ^{YES} QP_{Obj}>QP_{Sub} co-occurring with the QP_{Sub} binding *soko*

- More examples to support the generalization in (30a)

(38) a. **調査によると、**[$_s$ **五つ以上の会社が**]**が**[$_o$ **全ての弁護士**]**にそこの問題を持ちかけていた。** ^{NO} QP_{Obj}>QP_{Sub} co-occurring with the QP_{Sub} binding *soko*

b. **調査によると、**[$_s$ **五つ以上の会社が**]**がそこの問題を**[$_o$ **全ての弁護士**]**に持ちかけていた。** ^{NO} QP_{Obj}>QP_{Sub} co-occurring with the QP_{Sub} binding *soko*

Surface scope readings:

- The examples in (39) allow the QP_{Sub}>QP_{Obj} reading to co-occur with the QP_{Obj} binding a dependent term *soko.*

(39) a. [$_s$ **二つ以上の銀行**]**が**[$_o$ **五つ以上の自動車会社**]**にそこの関連会社を紹介したら、自動車業界は安泰だ。** ^{YES} QP_{Sub}>QP_{Obj} co-occurring with the QP_{Obj} binding *soko*

b. [$_s$ **例の二つの経営相談事務所**]**が**[$_o$ **沢山の会社**]**にそこの問題の解決案を提出した。** ^{YES} QP_{Sub}>QP_{Obj} co-occurring with the QP_{Obj} binding *soko*

2.3. Scope minimizing effects on negation

(40) Generalizations

a. When the QP_{Obj} takes scope above the QP_{Sub} in the basic order in which the verb is negated, the scope of the verbal negation is limited to the verb itself.

b. When the QP_{Sub} takes scope above the QP_{Obj} in the basic order in which the verb is negated, the scope of the verbal negation is not limited to the verb itself.

Inverse scope readings:

- The Neg>QP_{Sub} reading is available in (41a) and the Neg>QP_{Obj} reading in (41b).

(41) a. **もし、**[$_s$ **二人以上の教授**]**がメアリーをトヨタに推薦しなかったら、ジョンは憤慨するだろう。** ^{YES} Neg>QP_{Sub}

b. **もし、木村教授が**[$_o$ **全ての学生**]**をトヨタに推薦しなかったら、ジョンは憤慨するだろう。** ^{YES} Neg>QP_{Obj}

- However, while the QP_{Obj}>QP_{Sub} reading obtains in (42), the scope order in (43c) is possible but not that in (43a) and that in (43b), i.e., (42) can be taken to mean (44c), but not (44a) or (44b).

(42) **もし、**[$_s$ **二人以上の教授**]**が**[$_o$ **全ての学生**]**をトヨタに推薦しなかったら、ジョンは憤慨するだろう。**

(43) a. Neg>QP_{Obj}>QP_{Sub} Unavailable

b. QP_{Obj}>Neg>QP_{Sub} Unavailable

c. QP_{Obj}>QP_{Sub}>Neg Available

(44) a. John will be mad if it is not the case that each student is recommended by two or more professors to Toyota. Unavailable

b. John will be mad if for each student, it does not hold that two or more professors recommend him or her to Toyota. Unavailable

c. John will be mad if each student has two or more professors that do not recommend him or her to Toyota. Available

Surface scope readings:

- The Neg>QP_{Sub} reading is available in (45a) and the Neg>QP_{Obj} reading in (45b).

(45) a. **もし、[$_S$ 全ての教授]がメアリーをトヨタに推薦しなかったら、ジョンは憤慨するだろう。** ^{YES} Neg>QP_{Sub}

b. **もし、木村教授が[$_O$ 二人以上の学生]をトヨタに推薦しなかったら、ジョンは憤慨するだろう。** ^{YES} Neg>QP_{Obj}

- Furthermore, while the QP_{Sub}>QP_{Obj} reading obtains in (46), the scope order in (47a) is possible in addition to that in (47c). That is, (46) can be taken to mean (48a) or (48c) (but not (48b)).

(46) **もし、[$_S$ 全ての教授]が[$_O$ 二人以上の学生]をトヨタに推薦しなかったら、ジョンは憤慨するだろう。**

(47) a. Neg>QP_{Sub}>QP_{Obj} Available

b. QP_{Sub}>Neg>QP_{Obj} Unavailable

c. QP_{Sub}>QP_{Obj}>Neg Available

(48) a. John will be mad if it is not the case that each professor recommend two or more students to Toyota. Available

b. John will be mad if for each professor it does not hold that he or she recommend two or more students to Toyota. Unavailable

c. John will be mad if each professor has two or more students who he or she does not recommend to Toyota. Available

2.4. Summary

- The generalizations that have emerged above are summarized in (49).

(49) a. The QP_{Obj} can take scope above the QP_{Sub} in the basic order only if all of the conditions, (i)-(iii), are met.

b. The QP_{Sub} can take scope above the QP_{Obj} in the basic order even if it is not the case that all of the conditions, (i)-(iii), are met.

i. The speaker refers to a specific group with the QP taking wide scope.

ii. If there is a QP α that is not the QP_{Sub} or the QP_{Obj}, or a potential dependent term β, the QP taking narrow scope does not take wide scope with respect to α or bind β.

iii. If the verb is negated, the scope of the verbal negation is limited to the verb itself.

3. Surface scope readings may emerge through LF compositional computation while inverse scope readings do not.

- **Question:**
  Why the distribution of inverse scope readings is so limited, comparing with that of surface scope readings?
- I answer the question by arguing that (9), repeated here, holds.

(9) Surface scope readings may emerge through LF compositional computation while inverse scope readings do not.

- In particular, I demonstrate that (10) holds. (10) and (11) are also repeated here.

(10) Surface scope readings may emerge based on the LF in (11a) while inverse scope readings are not based on the LF in (11b).

(11) a. LF: [QP_{Sub} [QP_{Obj} [… t_{Sub} [… t_{Obj} …]]]]

b. LF: [QP_{Obj} [QP_{Sub} [… t_{Sub} [… t_{Obj} …]]]]

Argument:

- Suppose that inverse scope readings can emerge based on the LF in (11b). Then, the generalizations in (49) indicate that the following LFs are not accessible to the speaker.

(50) LF: [QP_{Obj} [QP_{Sub} [… t_{Sub} [… t_{Obj} …]]]],
where the QP_{Obj} does not refer to a specific group

(51) a. LF: [QP_{Obj} [QP_{Sub} [QP_{α} [… t_{Sub} [… $t_{Obj/\alpha}$ … $t_{\alpha/Obj}$ …]]]]]

b. LF: [QP_{Obj} [QP_{Sub} [… t_{Sub} [… NP_{α}/t_{Obj} … t_{Obj}/NP_{α} …]]]],
where the NP_{α} is bound by the QP_{Sub}

(52) a. LF: [not [QP_{Obj} [QP_{Sub} [… t_{Sub} [… t_{Obj} …]]]]]

b. LF: [QP_{Obj} [not [QP_{Sub} [… t_{Sub} [… t_{Obj} …]]]]]

- However, the scope interaction in the 'scrambled' constructions reveals that they are indeed accessible representations.
- The availability of the QP_{Obj}>QP_{Sub} reading in the following examples indicates that (50) is accessible to the speaker.

(53) (Cf. (14).)

a. USC **では、毎年、**[$_{O}$ **五人以上の新入生**]**を**[$_{S}$ **三人の教授**]**が人文科学賞に推薦する。**
YES QP_{Obj}>QP_{Sub}

b. **今度の学会は、もし、**[$_{O}$ **沢山の聴衆**]**に**[$_{S}$ **二人以上の発表者**]**が議論をしかけたら、成功としよう。**
YES QP_{Obj}>QP_{Sub}

- The fact that the examples in (54) allow the $QP_{I/O\text{-}Obj}$>QP_{Sub} reading to co-occur with the QP_{Sub}>the $QP_{O/I\text{-}Obj}$ reading indicates that (51a) is an accessible LF representation.

(54) (Cf. (20), (26), and (28).)

a. [$_{DO}$ **例の二人の学生**]を[$_{S}$ **三人以上の教授**]が[$_{IO}$ **二つの会社**]に推薦していた。
YES $QP_{I\text{-}Obj}$>QP_{Sub} co-occurring with QP_{Sub}>$QP_{D\text{-}Obj}$

b. [$_{IO}$ **全ての学生**]に[$_{S}$ **三人以上のヘッドハンター**]が[$_{DO}$ **二つの会社**]を紹介していた。
YES $QP_{D\text{-}Obj}$>QP_{Sub} co-occurring with QP_{Sub}>$QP_{D\text{-}Obj}$

- The fact that the examples in (55) allow the $QP_{I/O\text{-}Obj}$>QP_{Sub} reading to co-occur with the QP_{Sub} binding a dependent term indicates that (51b) is an accessible LF representation.

(55) (Cf. (32), (36), and (38).)

a. [$_{O}$ **例の二つの会社**]を[$_{S}$ **三つ以上の銀行**]が**そこ**の取引先に紹介したとしよう。
YES QP_{Obj}>QP_{Sub} co-occurring with the QP_{Sub} binding *soko*

b. **調査によると、**[$_{O}$ **全ての弁護士**]に[$_{S}$ **五つ以上の会社が**]が**そこ**の問題を持ちかけていた。
YES QP_{Obj}>QP_{Sub} co-occurring with the QP_{Sub} binding *soko*

- The examples in (56) allows the QP_{Obj}>QP_{Sub} reading to occur in all of the following scope orders, (i) negation>QP_{Obj}> QP_{Sub}, (ii) QP_{Obj}>negation>QP_{Sub}, and (iii) QP_{Obj}>QP_{Sub}>negation. Hence, the LF representations in (52) are also accessible to the speaker.

(56) (Cf. (42).)

a. **もし、**[$_{O}$ **全ての学生**]を[$_{S}$ **二人以上の教授**]がトヨタに推薦しなかったら、ジョンは憤慨するだろう。

b. [$_{O}$ **例の二人の教授**]に [$_{S}$ **三人以上の学生**]が話しかけなかったので、ジョンはがっかりしているだろう。

4. Implications

- Given that surface scope readings may emerge through LF compositional computation while inverse scope readings do not, we are led to conclude:

(57) There are two sources of the scope interaction among QPs: (i) LF compositional computation and (ii) an extra-grammatical operation.

- It is thus reasonable to consider that the generalizations in (49) are special instances of the generalizations in (58).

(58) Let α and β be QPs.

a. α can take scope above β due to the extra-grammatical operation, only if all of the conditions, (i)-(iii), are met.

b. α can take scope above β through LF compositional computation, even if it is not the case that all of the conditions, (i)-(iii), are met

i. The speaker refers to a specific group with α.

ii. If there is a QP γ that is not α or β or a potential dependent term δ, then β does not take wide scope with respect to γ or bind δ

iii. If the verb of which α is an argument is negated, the scope of the verbal negation is limited to the verb itself.

- The scope interaction among QPs can be utilized for the study of LF structural properties only in the environments where it is not the case that all of the necessary conditions for the extra-grammatical operation are met.

5. Summary and further remarks

Summary:

- In summary, I have accomplished the objectives in (7), repeated here, through an investigation of the scope interaction between the QP_{Sub} and the QP_{Obj} in the basic order.

(59) The main objectives of this talk:

a. To demonstrate that it is not always the case that the scope interaction among QPs emerges through LF compositional computation.

b. To spell out when we can reasonably assume that the scope interaction among QPs emerges through LF compositional computation.

Further remarks:

- I have argued the LF/extra-grammatical dichotomy, based on the scope interaction between the QP_{Sub} and the QP_{Obj} in the basic order. But this dichotomy is motivated in a number of ways.
  - ✓ Hayashishita (2003:Ch.3) demonstrates that some instances of surface scope readings must be due the extra-grammatical operation.
  - ✓ Hayashishita (2003:Ch.5) argues that this dichotomy is relevant for the scope interaction between a *wh*-word and a QP. In particular, functional readings may be through LF compositional computation while pair-list readings must be due to the extra-grammatical operation.
  - ✓ Hayashishita (2000) observes this dichotomy with the scope interaction in the di-transitive construction between the direct object QP and the indirect object QP.

- I have not spelled out what the extra-grammatical operation is. However, Hayashishita (2003:Ch3) provides a number of properties that whatever account one may put forth must explain. One of them is (60).

(60) When α takes scope above β due to the extra-grammatical operation, where α and β are QPs, both α and β must be in an A-position.

- Provided that (60) holds, when a QP α takes scope above another QP β in a sentence whose configuration is $[_{\Psi} \ldots \alpha \ldots \beta \ldots]$, the sentence may be represented at LF either as (61a) or as (61b).

(61) a. LF: $[_{\Psi} \alpha [_{\Psi} \ldots \beta [_{\Psi} \ldots t_{\alpha} \ldots t_{\beta} \ldots]]]$

b. LF: $[_{\Psi} \ldots \alpha \ldots \beta \ldots]$, where α and β are in an A-position.

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