Complex NPs and *Wh*-Quantification in Japanese

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1. Introduction: Universal Quantification in Japanese

The particle *mo* in Japanese has the meaning of a universal quantifier when it is accompanied by a *wh*-phrase (or an "indeterminate pronoun" in Kuroda's (1965) terms). (1) shows that *mo* accompanied by *dare* 'who' means everyone, and *mo* accompanied by *dono gakusei* 'which student' means every student.[1]

(1) a. Dare-mo-ga kita. 'Everyone came.'
who-MO-Nom came

b. Dono gakusei-mo kita. 'Every student came.'
which student-MO came

A *wh*-phrase that accompanies *mo* can be embedded in the sister constituent of *mo*, as shown in (2a), where *dono gakusei* 'which student' occurs inside *mo*'s sister NP. (2b) shows that *mo*'s sister in which a *wh*-phrase occurs can be a complex NP.

(2) a. [Dono gakusei -no okaasan]-mo kita.
which student-Gen mother -MO came
'Every student's mother came/The mother of every student came.'

b. [[Dono gakusei-ga ø syootaisita] sensei]-mo kita.
which student-Nom invited teacher-MO came
'The teacher(s) that whichever student invited came.'

I refer to these cases of non-local association of *wh*-phrases and *mo* in (2) as the *wh-mo* construction. Although the syntax and semantics of the *wh-mo* construction has been

*For their valuable comments, I thank Irene Heim, Kyle Johnson, Angelika Kratzer, Barbara Partee, Bernhard Schwarz, audiences at NELS 29 and MIT/UConn/UMass Semantics Workshop I, and the participants of the UMass semantics reading group. All errors are mine.

[1] See Ohno (1989) for other uses of *mo*. I briefly touch upon one of them in section 7.

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discussed in the literature (for example, Kuroda 1965, Hoji 1985, Nishigauchi 1986, 1990, Ohno 1989, Brockett 1994, von Stechow 1996), it has not received as much attention as *wh*-questions in the language.

This paper discusses two analyses of the *wh-mo* construction in (2). The standard analysis relates the sentences in (1) and the sentences in (2) by assuming that *mo* in (2) also quantifies over what is denoted by the wh-phrase *dono gakusei* 'which student'. There is an alternative analysis, which gives rise to the same truth conditions in most cases. In this analysis, the sentences in (1) and the sentences in (2) are related by assuming that *mo* always quantifies over what is denoted by its sister constituent. Thus in (2), the universal quantification is over mothers or teachers.

The purpose of this paper is to show that the alternative analysis has advantages over the standard analysis. Section 2 introduces one version of the standard analysis. Section 3 introduces an alternative way of looking at the *wh-mo* construction. In section 4, I present a first argument for the alternative analysis based on the simplicity of the syntax-semantics mapping. I present a further argument for the alternative analysis in section 5 that has to do with certain locality effects. Section 6 discusses properties of the *wh-mo* construction that may present a challenge to any analysis. In section 7, I make brief notes about related constructions. Section 8 concludes the paper.

2. The Standard Analysis: The *Wh-mo* Construction as "Inverse Linking"

A standard view is that in sentence (2b), repeated here as (3), *mo* quantifies over what is denoted by the *wh*-phrase *dono gakusei* 'which student', which is embedded in *mo*'s sister.[2] If Mary, John and Sue are the students, the sentence means (4).

(3) [[Dono gakusei-ga ø syootaisita] sensei]-mo kita. = (2b)
which student-Nom invited teacher -MO came
'The teacher(s) that whichever student invited came.'

(4) $\forall x[x \in \{\text{Mary, John, Sue}\} \rightarrow$ the teachers that x invited came]

According to this view, the *wh-mo* construction involves a universal quantifier that takes sentential scope, even though its restriction is embedded in NP.

This state of affairs is somewhat reminiscent of what is known as "inverse linking" in English (May 1985), exemplified in (5).

(5) One apple in every basket is rotten.

The sentence is known to have a reading in which *every* takes the widest scope, as shown in (6). This reading can be derived from, for instance, a Logical Form like (7), in which *every basket* is extracted out of the larger DP.

(6) $\forall x[x \in$ basket $\rightarrow$ there is one rotten apple in x]

(7) $[_{IP}$ [every basket]$_1$ $[_{IP}$ $[_{DP}$ one apple in t_1] is rotten]] (LF)

[2]See, among others, Nishigauchi (1986, 1990) and Ohno (1989).

Von Stechow (1996) in fact proposes that the *wh-mo* construction is a kind of inverse linking construction, analogous to (5). The meaning of sentence (3) in (4) is claimed to be obtained from the LF in (8).

(8) $[_{IP}\,[_{moP}$ [Dono gakusei-ga $]_1$ [t_1 syootaisita sensei]-mo] kita] (LF)
which student-Nom invited teacher -MO came

In (8), *dono gakusei-ga* 'which student-Nom' is extracted out of the complex NP, in a similar way to the LF in (7) for the inverse linking construction. I will refer to this analysis as the inverse linking analysis.

3. An Alternative: The P-set Analysis

An alternative analysis that I am going to present arguments for in the next two sections assumes that the domain of quantification for *mo* is provided directly by its sister constituent. This is schematically shown in (9).

(9) [.....wh.....]-mo VP
domain ∀ scope

Assuming again that Mary, John and Sue are the students, in sentence (2b), the set in (10) is available for *mo* to quantify over.

(10) {the teachers that Mary invited, the teachers that John invited, the teachers that Sue invited}

Informally speaking, this set is obtained by replacing *dono gakusei* 'which student' with all the individuals who are students (Hamblin 1973, Rooth 1985). I call this set a p-set following Rooth (1985). Once this p-set is available, then *mo* can locally quantify over this set, and we obtain the correct meaning in (11).

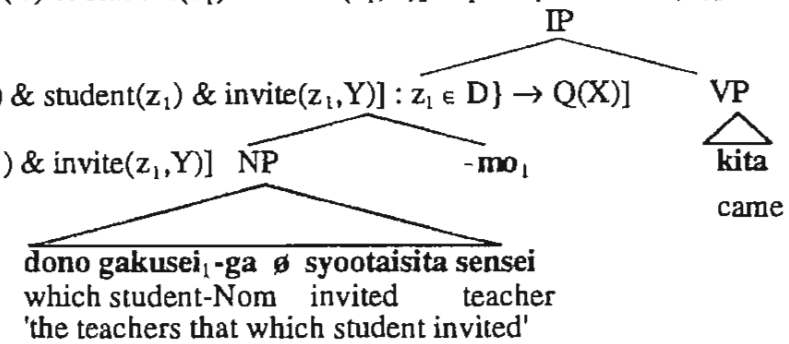
(11) $\forall X[X \in$ {the teachers that Mary invited, the teachers that John invited, the teachers that Sue invited} $\rightarrow$ X came]

One version of the p-set analysis can be spelled out as follows. Let's assume (i) that *wh*-phrases introduce free variables and (ii) that p-sets in this context are obtained by means of an unselective binding relation between *wh*-free variables and the higher operator *mo*.[3] (12) illustrates how the meaning of sentence (2b) is derived. *Dono gakusei* 'which student' introduces a variable, and *mo*'s sister NP is a definite description with a free variable in it.[4] *Mo* forms a set by abstracting over this variable, and it quantifies over the resulting set.

[3]As far as the data discussed in this paper are concerned, the predictions made by this version of the p-set analysis and those made by a version in which *wh*-words denote sets of individuals (Hamblin 1973, Rooth 1985) seem to be indistinguishable. Thanks to Irene Heim for useful comments. See also Ramchand (1997).

[4]The assumption that the head of the relative clause *sensei* 'teacher', which is a bare noun, is treated like *the teacher* in English will be discussed in section 6.

(12) $\forall X[X \in \{\iota Y[\text{teachers}(Y) \,\&\, \text{student}(z_1) \,\&\, \text{invite}(z_1,Y)] : z_1 \in D\} \rightarrow \text{came}(X)]$



Mo is interpreted generally as in (13). ($g' \approx^{1,\ldots,n} g$ indicates that assignment g' is like assignment g, except possibly for values assigned to the variables 1, ..., n.)

(13) $\| \text{NP } \mathbf{mo}_{1,\ldots,n} \|^g = \lambda Q \forall X[\exists g'[g' \approx^{1,\ldots,n} g \,\&\, X = \| \text{NP} \|^{g'}] \rightarrow Q(X)]$

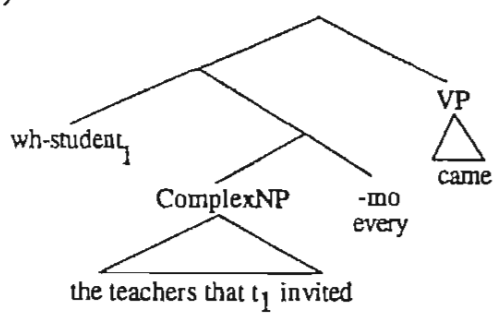
4. A First Argument for the P-set Analysis

An immediate consequence of the p-set analysis is that it achieves a straightforward syntax-semantics mapping. The universal particle *mo* quantifies over what is denoted by its sister constituent in the examples in (2) as well as in the simple examples in (1). Thus, the structure available in overt syntax is preserved in the LF representation, which then is mapped into semantics rather straightforwardly.

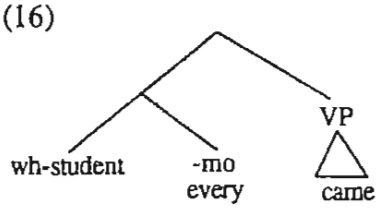
In contrast, some stipulative assumptions are required in the inverse linking analysis. Recall that (7), repeated here as (14), is the meaning assigned to sentence (2b) according to the inverse linking analysis. Its LF in (8) is now represented in the form of a simplified tree in (15).[5] Let's compare (15) with the LF in (16) for the simple example in (1b) *Dono gakusei-mo kita* 'every student came'.

(14) $\forall x[x \in \{\text{Mary, John, Sue}\} \rightarrow \text{the teachers that x invited came}]$ = (7)

(15)



(16)



In (15), *mo* first combines with part of its scope, and then with its restrictor, 'student'. In (16), on the other hand, *mo* first combines with its restrictor, and then with its scope, just

[5]The LF representation in (15) is based on von Stechow (1996), which is the only previous work that provides an explicit analysis of the syntax-semantics mapping of the *wh-mo* construction. The problems that I point out in the text with respect to this particular version of the inverse linking analysis may be avoided if we modify some of the assumptions, for example, in such a way that the *wh*-phrase is adjoined to *mo*, as Irene Heim (p.c.) pointed out to me.

like *every* in English. Thus we need to assume two radically different *mo*s and make sure, for instance, that the *mo* that is used in (15) is not used in (16). Further, since the scope of *mo* is discontinuous in (15), a special mechanism is necessary.

5. A Further Argument for the P-set Analysis: Wh-island Effects

This section presents empirical evidence for the p-set analysis and against the inverse linking analysis. Sentence (2b) shows that the association of a *wh*-phrase and *mo* can be made across a complex NP island, as schematically shown in (17a). (17b) and (17c) show that this association can in fact cross another complex NP island or adjunct island. Examples of these are given in (18) and (19).

(17) a. [..... wh .....]$_{CNP}$-mo

b. [..... [..... wh .....]$_{CNP}$ .....]$_{CNP}$-mo

c. [..... [..... wh .....]$_{Adjunct}$ .....]$_{CNP}$-mo

(18) [[[[Dono T.A.-ga ø osieta] gakusei]-ga ø syootaisita]$_{CNP}$ sensei]$_{CNP}$-mo
[[[[which T.A.-Nom taught] student]-Nom invited]$_{CNP}$ teacher]$_{CNP}$-MO
kita.
came
'The teacher(s) that the student(s) whichever T.A. taught invited came.'

(19) [[ø [Taro-ga nani-o katta-kara]$_{Adjunct}$ okotta] hito]$_{CNP}$-mo
[[[Taro-Nom what-Acc bought-because] got_angry] person]-MO
damatteita.
said_nothing
'The people who got angry because Taro bought whatever said nothing.'

Recall that in the inverse linking analysis, a *wh*-phrase and *mo* are related by movement. This means that island constraints do not apply at a level at which extraction of a *wh*-phrase out of a complex NP takes place. The following data is problematic to this analysis. As schematically shown in (20), the association of a *wh*-phrase and *mo* is sensitive to the presence of *wh*-islands. A relevant example is given in (21).[6]

(20) * [..... [..... wh .....]$_{WH}$ .....]$_{CNP}$-mo

(21) [[ø [Taro-ga nani-o doko-de katta ka]$_{WH}$ sitteiru] hito]$_{CNP}$-mo
[[[Taro-Nom what-Acc where-at bought Q] know] person]-MO
damatteita.
said_nothing

(22) a. * 'For every thing x, the person who knew where Taro bought x said nothing.'
b. * 'For every place y, the person who knew what Taro bought at y said nothing.'
c. 'The person who knew where Taro bought what also said nothing.'

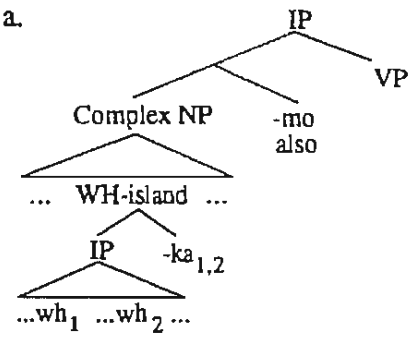
In (21), the readings shown in (22a) and (22b) in which *nani* 'what' or *doko* 'where' is associated with *mo* across the *wh*-island are not available. The sentence only has the

[6]A similar example is noted in Nishigauchi (1986, 1990).

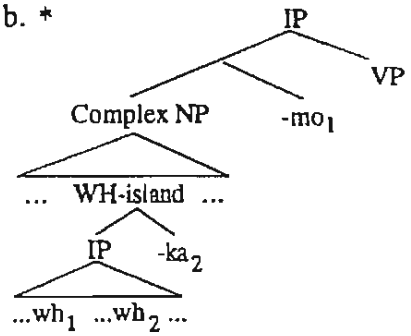
reading in (22c), in which *mo* means 'also'. The inverse linking analysis has no account for why only *wh*-island effects show up.[7]

On the other hand, the fact that only *wh*-island effects show up is expected in the p-set analysis. Notice that it is only in the case of a *wh*-island that there is a question particle *ka* intervening between a *wh*-phrase and *mo*. If we assume that *wh*-questions in Japanese are interpreted in such a way that the question particle *ka* unselectively binds all the free variables associated with *wh*-in-situ in its scope, what is expected for sentence (21) is the reading in (22c).[8] In sentence (21), the question particle *ka*, being an unselective binder, binds all the *wh*-free variables in its scope, and *mo* has no variable left to bind, as shown in (23a). This representation corresponds to the reading in (22c). The representation in (23b), on the other hand, is not available. This is why neither reading (22a) nor reading (22b) is available.

(23) a.



b. *



I have presented two arguments for the p-set analysis and against the inverse linking analysis. In the next section, I introduce properties of the *wh-mo* construction that I have not discussed, which may present a puzzle to any analysis.

6. "Weak" Readings and the Domain Restriction Requirement

So far, I have assumed that the head of the relative clause *sensei* 'teacher' in (2b), a bare noun with neither definite/indefinite nor singular/plural specification, denotes a maximal individual who are teachers, making use of the semantics similar to that of definites in English (Link 1983). In certain cases, however, this assumption seems problematic. The definite-like interpretation of the head noun *ringo* 'apple' in (24) incorrectly predicts that for this sentence to be true, Taro must have tried all the apples from each basket that Yoko had put apples in. For this sentence to be true, however, it is sufficient if Taro tried some apple(s) out of each basket.

(24) Taro-wa [[Yoko-ga dono kago-ni ø irete oita] ringo]-mo azimisita.
Taro-Top Yoko-Nom which basket-in put Aux apple -MO tried
'Taro tried some apple(s) that Yoko had put in whichever basket.'

I will call this type of interpretation a "weak" reading of the *wh-mo* construction.[9] One might suspect that the weak reading of (24) may be due to indefiniteness of the head noun

[7]This is a simplified statement. I discuss in Shimoyama (in preparation) why pied-piping does not help here.

[8]For ideas in various forms that make use of unselective binding in *wh*-questions, see, for example, Baker (1970), Nishigauchi (1986, 1990), Pesetsky (1987), Berman (1991), Aoun and Li (1993), Cole and Hermon (1994), Tsai (1994), Reinhart (1998), Toyoshima (1996) and Hagstrom (1998). See also Heim (1982).

[9]The availability of weak readings in certain sentences was first pointed out by Ohno (1989).

ringo 'apple'.[10] This idea seems plausible at a first sight, given that the noun lacks definite/indefinite specification. Then we have a set like (25) for *mo* to quantify over, in a situation in which there are three baskets in the domain.

(25) {||**some apples that Yoko put in basket 1**||,
||**some apples that Yoko put in basket 2**||,
||**some apples that Yoko put in basket 3**||}

This way of getting the weak reading, however, misses another property observed in the *wh-mo* construction. Suppose that Yoko put apples in basket 1 and basket 2, and Satoshi put apples in basket 3; Taro tried an apple from basket 1 and an apple from basket 2.

(26)

(= apple that Taro tried)

Sentence (24) is true in this scenario. However, if *mo* quantified over the set in (25), we predict that the sentence is false, because the last member of the set in (25), combined with the rest of the sentence in (24), asserts that there are some apples that Yoko put in basket 3 that Taro tried.

That speakers judge (24) to be true in the above scenario indicates that they restrict the domain of baskets so that they only look at those baskets that Yoko put some apples in. It seems that what is involved is an existence presupposition (that there are apples that Yoko put in basket x) and accommodation of it. It is not obvious, however, where the existence presupposition is coming from, given that *ringo* 'apple' in (24) is not specified for (in)definiteness. It could be that the NP is interpreted, for instance, like (i) a strong indefinite (SOME apples that ...), (ii) a partitive (some of the apples that ...), or (iii) a definite (the apples that ...).

For illustration, let's take the third option and assume that *ringo* 'apple' in (24) is interpreted like a definite, which denotes a maximal individual, giving rise to the set in (27) as a domain for *mo*.

(27) {the apples that Yoko put in basket 1, the apples that Yoko put in basket 2,
the apples that Yoko put in basket 3}

Assuming that maximal individuals are only defined on non-empty sets, the last member of the set in (27) "the apples that Yoko put in basket 3" is not defined since the corresponding set, the set of apples that Yoko put in basket 3 is an empty set. Thus the whole set in (27) ends up undefined. In order to make sense of the sentence, we are forced to look at the smaller set in (28), which is a well-defined set. *Mo* quantifies over this set.

(28) {the apples that Yoko put in basket 1, the apples that Yoko put in basket 2}

[10]This idea is due to Ohno (1989) and von Stechow (1996).

In this approach, the "weakness" of the weak reading cannot be coming from the NP itself. Sentence (24) should be interpreted as something like (29), where the existential interpretation of the NP comes from the verb (cf. Carlson 1977).

(29) $\forall X[X \in$ {the apples that Yoko put in basket 1, the apples that Yoko put in basket 2} $\rightarrow X \cap$ tried_by_Taro $\neq \emptyset]$

The question of what the optimal way is of achieving both weak readings and the domain restriction correctly is left for future research. It should be examined in the context of a more general question of how bare NPs in Japanese are interpreted in general, independently of the *wh-mo* construction. Carlson's (1977) analysis of bare plurals in English as names of kinds may give us some insight.

7. Notes on Related Constructions

My analysis of the *wh-mo* construction closely parallels Rooth's (1985) analysis of association with focus. Additional support for this parallel comes from the fact that the *wh-mo* construction is not the only context where the particle *mo* makes use of a p-set obtained from its sister constituent. As I briefly mentioned in section 5, the particle *mo* is interpreted as 'also' or 'even' when there is no *wh*-phrase in its scope, and is focus-sensitive. This is shown in (30), which differs minimally from (2b) in that the *wh*-word *dare* 'who' is replaced by *Taro*. With a phonological prominence on *Taro*, (30) presupposes that there is someone x other than Taro such that the teacher(s) that x invited came.

(30) [[[TARO]$_F$-ga ø syootaisita] sensei]-mo kita.
[[Taro-Nom invited] teacher]-MO came
'The teacher(s) that [TARO]$_F$ invited also came.'

A pair similar to (2b) and (30) is also found in a clausal counterpart of the nominal *wh-mo* construction I focused on in this paper. In (31), *mo* is attached to a (tenseless) clausal constituent, which contains *dare* 'who' in (31a) and focused *Sue* in (31b). These sentences seem to involve quantification over situations.

(31) a. Taro-wa [dare-ga denwasi-te]-mo deru.
Taro-Top [who-Nom call-TE] -MO answer
'No matter who calls, Taro answers.'

b. Taro-wa [[SUE]$_F$-ga denwasi-te]-mo deru.
Taro-Top [Sue-Nom call-TE] -MO answer
'Even when [SUE]$_F$ calls, Taro answers.'

Whether the universal *mo* and *mo* 'also/even' in (30) and (31b) should or can receive a uniform analysis is left for future research.

We saw in section 5 that the association of *wh* and *mo* is sensitive only to *wh*-islands. Exactly the same pattern is found in *wh*-questions in Japanese, which can be called the *wh-ka* construction. This is schematically shown in (32), and the corresponding examples are given in (33).[11]

[11](32b,c) are ungrammatical when *naze* 'why' is involved.

(32) a. [..... wh .....]$_{IP}$-ka

b. [..... [..... wh .....]$_{CNP}$ .....]$_{IP}$-ka

c. [..... [..... wh .....]$_{Adjunct}$ .....]$_{IP}$-ka

d. * [..... [..... wh .....]$_{WH}$ .....]$_{IP}$-ka

(33) a. Taro-wa nani-o tabemasita ka?
Taro-Top what-Acc ate Q
'What did Taro eat?'

b. Taro-wa [[dare-ga katta] mochi]$_{CNP}$ -o tabemasita ka?
Taro-Top who-Nom bought rice cake -Acc ate Q
'Who$_x$ did Taro eat rice cakes that x bought?'

c. Taro-wa [dare-ga kita-kara]$_{Adjunct}$ kaerimasita ka?
Taro-Top who-Nom came-because left Q
'Who$_x$ did Taro leave because x came?'

d. Taro-wa [dare-ga nani-o tabeta ka]$_{WH}$ tazunemasita ka?
Taro-Top who-Nom what-Acc ate Q asked Q
(i) 'Did Taro ask who ate what?'
(ii) ?*/?? 'Who$_x$ did Taro ask what x ate?'
(iii) * 'What$_x$ did Taro ask who ate x?'

Previous analyses take the presence of the *wh*-island effect in questions to be evidence that a *wh*-phrase and its scope are related by movement. The challenge for the movement analysis is to explain the lack of other island effects (see Nishigauchi 1986, 1990, Watanabe 1992a,b, Richards 1997 and Hagstrom 1998 among many others). This picture changes if we take the in-situ analysis briefly introduced in section 5. The patterns in (33b) and (33c) are expected, and the challenge now is to explain the pattern in (33d). The account for the *wh*-island effect in the *wh-mo* construction in section 5 extends to this case. Namely, in (33d), the intervening *ka*, as an unselective binder, binds all the *wh*-free variables in its scope.[12]

8. Conclusion

I have shown that the p-set analysis of the *wh-mo* construction has advantages over the more traditional view, represented here as the inverse linking analysis. In particular, first, the p-set analysis, which sees nothing inverse linking about the construction, achieves a simpler picture of the syntax-semantics mapping. Second, it accounts for why only *wh*-island effects show up in this construction. Many new and old questions remain, which should be examined in the future.

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[12]Toyoshima (1996) has independently reached a very similar conclusion.

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