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Scope Encoding of Indefinites in Japanese[1]

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1. Introduction: frozen scope in IO-DO

It has been claimed that, in English, the direct object (DO) cannot take scope over the indirect object (IO) in IO-DO order, whereas in DO-IO order, either object can take scope over the other (Larson 1990, Aoun and Li 1993, Bruening 2001). Thus, in (1a), in IO-DO order, the scope is 'frozen' in that only the surface scope reading is available, whereas, in (1b), in DO-IO order, there is no scope-freezing effect.[2] The scope-freezing effect in IO-DO order also holds in Japanese, as shown in (2) (Kuno 1973, Hoji 1985, among others).

(1) a. The teacher assigned one student every problem.
   Scope-freezing: √IO>DO, *DO>IO
 b. The teacher assigned one problem to every student.
   No scope-freezing: √IO>DO, √DO>IO (Larson 1990)

(2) a. John-ga [sannin-no onna]-ni [futari-no otoko]-o syookaisita.
   John-NOM [three-GEN woman]-DAT [two-GEN man]-ACC introduced
   '(lit.) John introduced to three women two men.'
   Scope-freezing: √IO>DO, *DO>IO

 b. John-ga [futari-no otoko]-o [sannin-no onna]-ni syookaisita.
   John-NOM [two-GEN man]-ACC [three-GEN woman]-DAT introduced
   'John introduced two men to three women.'
   No scope-freezing: √IO>DO, √DO>IO[3] (Hoji 1985)

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1. The earlier version of this paper has been presented in Nakanishi (2001a,b). I would like to thank Maribel Romero for valuable discussions and her insights. I am also grateful to Tonia Bleam, Benjamin Bruening, David Embick, Klaus von Heusinger, Ruth Kempson, and Satoshi Tomioka for their helpful comments. Thanks are also due to the audience at WCCFL 20, FAJL 3, and the Choice Function Workshop at ESSLLI 01. Finally, I thank my Japanese and English informants, who patiently answered my endless questions. Of course, all errors are mine.

2. The scope-freezing effect seems to hold most robustly when the IO in IO-DO behaves as an indefinite.

3. Crucially, the inverse reading IO>DO in (2b) is a distributive reading (distinct from the reading DO>IO), not a cumulative reading. In particular, the sentence in (2b) is true when there are three women and six men (two men for each woman) involved. In English, on the other hand, in sentences with two numeral quantifiers, the inverse distributive readings are generally unavailable (see, for example, Beghelli and Stowell 1997).

Bruening (2001) accounts for the scope-freezing effect in English by claiming that Quantifier Raising (QR) obeys superiority. However, frozen scope in Japanese is observed with pseudo-scope relations achieved by choice function interpretation (Reinhart 1997), which crucially does not involve movement. In particular, I show that frozen scope obtains even if a scope island is involved, where QR should not apply. Thus, Bruening's analysis cannot explain the whole array of scope-freezing effects in Japanese. Instead, I argue that frozen scope is due to the specificity of the indefinite IO in IO-DO. This specificity is semantically encoded as a choice function interpretation (Kratzer 1998). Furthermore, I claim that the choice function approach can account for the scope-freezing effects by reducing them to a case of weak crossover (WCO): to obtain the DO>IO reading in IO-DO, the DO has to cross over a coindexed hidden index associated with the IO, yielding the WCO configuration. In particular, I examine the original frozen scope example, the unavailability of pair-list readings in *wh*-questions, and the failure of variable binding, and claim that they can be reduced to WCO effects. The choice function approach can also account for the data from antecedent-contained deletion in English, again by appealing to WCO. Thus, by using WCO, the current approach can dispense with Bruening's restriction that QR obeys Superiority, and maintain the traditional view of QR.

The structure of the paper is as follows: in section 2, I summarize Bruening's (2001) syntactic approach. In section 3, I introduce the alternative choice function approach explored here. In section 4, I present novel data which show that frozen scope in Japanese is observed even if QR is inoperative. In section 5, I compare 'specificity' of the indefinite IO in IO-DO in Japanese and of *a certain NP* in English. In section 6, based on Kratzer's (1998) claim that *a certain NP* introduces a variable over choice functions, I account for frozen scope in Japanese based on choice function approach. In section 7, I show that a WCO configuration is created when a quantifier is raised over a choice function with a hidden index. In section 8, based on this configuration, I argue that various data on frozen scope are merely a case of WCO. In section 9, I claim that the choice function approach can further capture an antecedent-contained deletion in English. In section 10, I discuss two further issues. Section 11 is the conclusion.

2. Syntactic approach to frozen scope in English (Bruening 2001)

In English, Bruening (2001) shows that, although the DO in IO-DO cannot take scope over the IO, it can take scope over the subject, as in (3):

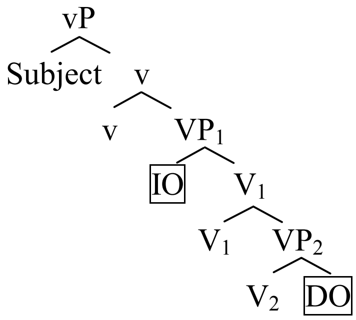
(3) A (different) teacher gave me every book. √DO>S (Bruening's (28))

Given that the DO cannot take scope over the IO in IO-DO, we must allow both the IO and the DO to undergo QR, and at the same time prohibit the DO from taking scope over the IO.[4] Bruening claims that both objects in IO-DO undergo QR attracted by a P-feature on v (Chomsky 1999), but the DO cannot undergo QR higher than the IO does due to Superiority. In the structure in (4a), the IO first undergoes QR, adjoining to the specifier of vP. Then the DO undergoes QR, "tucking in" beneath IO obeying Superiority (cf. Richards 1997). Thus,

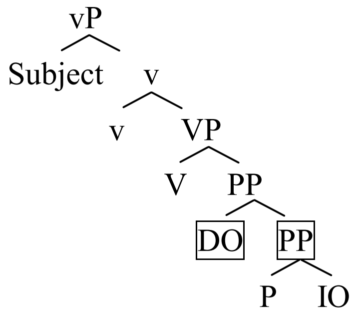
4. Bruening's further argument for QR of both objects is presented in section 9.

the DO never takes scope over the IO. In the structure for DO-IO in (4b), assuming that QR can pied-pipe the prepositional phrase, moving either the DO or the PP first will obey Superiority. Thus, there is no scope-freezing.

(4) a. IO-DO (Bruening's (59))



b. DO-IO (Bruening's (61))[5]



3. Choice function approach

In this section, I summarize general issues related to indefinites and introduce the choice function approach to indefinites.

By claiming that QR obeys Superiority, Bruening unifies QR with overt syntactic movements such as *wh*-movement, which are claimed to obey Superiority (cf. Richards 1997). For example, Bruening's approach captures the well-known observation that covert QR correlates with overt *wh*-movement, as shown in (5) (Reinhart 1997, among others).

(5) a. A doctor will interview every new patient. √every>a
Which patients will a doctor interview *e*?
b. A doctor should worry if we sedate every new patient. *every>a
*Which patients should a doctor worry if we sedate *e*? (Reinhart 1997)

In (5a), QR as well as *wh*-movement is allowed when there is no island involved. In (5b), both QR and *wh*-movement are blocked by the island.

However, it is well known that indefinite descriptions behave differently from genuine quantifiers in that the former can take logical wide scope escaping syntactic islands, as shown in (6a), whereas the latter cannot, as in (6b) (Farkas 1981, Fodor and Sag 1982, Abusch 1994, Reinhart 1997). The same claim holds for Japanese, as shown in (7):[6]

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5. Note that the structure given in (4b) is one of the several alternatives of a structure for DO-IO proposed by Bruening (2001).

6. Japanese does not have indefinite/definite articles which correspond to *a/the* in English. To identify indefinites, Maribel Romero (p.c.) suggested a diagnosis based on a sluiced *wh*-phrase (Chung et al. 1995, Reinhart 1997). In English, indefinites, but not definites, can be an appropriate antecedent for a sluiced *wh*-phrase, as in (i). The diagnosis applies to Japanese, given that an NP with a demonstrative, which is definite, is not an appropriate antecedent for a sluiced *wh*-phrase, as in (ii).

(i) a. John met a student, but I don't know which one.
b. #John met the student, but I don't know which one.

(ii) # John-wa [kono otoko]-o mita rasii ga, watasi-wa dono-otoko-ka sira-nai.
John-NOM [this man]-ACC saw seem while I-TOP which-man-Q know-NEG
'It seems that John saw this man, but I don't know which man.'

(6) a. If a woman comes to the party, John will be happy. √a woman>if
b. If each woman comes to the party, John will be happy. *each>if

(7) a. [Futari-no josei]-ga paatii-ni kita-ra John-wa yorokobu-daroo.
[two-GEN woman]-NOM party-to come-if John-TOP happy-will
'If two women come to the party, John will be happy.' √two>if

b. [Hotondo-no josei]-ga paatii-ni kita-ra John-wa yorokobu-daroo.
[most-GEN woman]-NOM party-to come-if John-TOP happy-will
'If most women come to the party, John will be happy.' *most>if

How can we account for the island-insensitivity of indefinites? One approach is to claim that QR of indefinites is not clause-bound. However, this claim cannot capture the fact that, although plural numeral indefinites can violate islands, they do not allow a distributive interpretation (Ruys 1992). It is theoretically possible to interpret the plural indefinite distributively or collectively. However, the distributive reading is unavailable when the indefinite takes scope outside of the island, as shown in (8). This is unexpected under the island-free QR approach, which predicts that the distributive operator can be inserted where QR applies, allowing a distributive interpretation. Thus, the island-free QR cannot capture the island-insensitive indefinites.

(8) English: If three relatives of mine die, I will inherit a house. (Ruys 1992)
Japanese: [Sannin-no sinseki]-ga sinda-ra, ie-o soozoku-dekiru.
[three-GEN relative]-NOM die-if house-ACC inherit-can
'If three relatives (of mine) die, (I) can inherit a house.'
* distributive (There are three relatives of mine such that if each of them dies, I will inherit a house (it is possible to inherit up to three houses).)
√ collective (There are three relatives of mine such that if all of them die, I will inherit a house (hence, I can inherit one house).)

Another approach is to use a choice function (Reinhart 1997). According to Reinhart (1997:372), 'a function is a choice function (CH(f)) if it applies to any non-empty set and yields a member of that set.'[7] For example, in (7a), the choice function variable introduced by the indefinite *two women* can be existentially closed at the highest level, as shown in (9). Crucially, the indefinite can take scope over the island without movement.

(9) $\exists$f [CH (f) $\wedge$ [come (f (two women)) $\rightarrow$ happy (John)]]
'There is some choice function f, such that John will be happy if two women, which f picks out from the set of women, come to the party.'

Thus, if the NP is an appropriate antecedent for a sluiced *wh*-phrase, it must be indefinite rather than definite. In this paper, 'indefinites' in Japanese are NPs which are felicitously used in this diagnosis. I.e., sentences can be followed by 'but I don't know who'.

Furthermore, bare nouns in Japanese can be interpreted either as singular or plural. To disambiguate singular/plural distinctions, in this paper, I use numeral quantifiers as indefinites in Japanese. Note that, as shown in footnote 3 above, numeral quantifiers in English and Japanese behave differently.

7. In Reinhart's analysis, a choice function is of type <et,e>, which I adopt here.

Opinions vary on how to treat choice function variables. Reinhart (1997) and Winter (1997) claim that choice function variables may freely be bound with widest, intermediate or narrow scope, whereas Matthewson (1999), modifying Kratzer (1998), claims that choice function variables are always existentially closed at the highest level (i.e., with widest scope).[8] Matthewson's approach, but not Reinhart's (1997) and Winter's (1997), can account for the fact that intermediate reading is available easily when a bound variable is present, whereas, without a bound variable, it is much harder or impossible to obtain the intermediate reading, as shown in (10).[9]

(10) a. Every professor rewarded every student who read *a book I had recommended*.
*intermediate(every professor>a book>every student)
b. [Every professor]$_i$ rewarded every student who read *a book he$_i$ had recommended*. √intermediate

In (10a), the intermediate reading is very difficult or impossible to obtain, whereas it is fine in (10b). In (10a), the choice function simply picks out one book from the set of books I had recommended. In (10b), the choice function may pick up a different book from each set of books recommended by a professor, thus yielding the effect that the books may vary with each professor. For example, Professor Smith had chosen *Logical Form* from a set of books he had recommended (say, *Logical Form* and *Syntax of Scope*), Professor Sean had chosen *Minimalist Program* from a set of books he had recommended (say, *LGB*, *Barriers,* and *Minimalist Program*), etc.

Japanese shows the same effect, as shown in (11) (see also the discussion in section 5.2 below). For this reason, I consider that choice function variables are existentially closed at the top, following Matthewson.[10]

(11) a. [Subete-no sensei]-ga [[*koochoo-ga suisensita hon*]-o
[all-GEN teacher]-NOM [[principal-NOM recommended book]-ACC

yonda [subete-no gausei]]-o hometa.
read [all-GEN student]]-ACC praised

'Every teacher praised every student who read a book the principal had recommended.' *intermediate

b. [Subete-no sensei]$_i$-ga [[*zibun$_i$-ga suisensita hon*]-o
[all-GEN teacher]-NOM [[self-NOM recommended book]-ACC

yonda [subete-no gausei]]-o hometa.
read [all-GEN student]]-ACC praised

8. Kratzer (1998) claims that choice function variables remain free. However, this claim might cause the undesirable undergeneration of intermediate readings, thus I do not consider her approach in this paper (Chierchia 1999, Matthewson 1999, Romero 2000).
9. There are examples which allows the intermediate reading without a bound variable (cf. the example in (23) below). These examples can be accounted for by introducting a hidden variable (see section 7 below).
10. Chierchia (1999) chooses Matthewson's restricted existential closure approach over Reinhart/Winter's based on weak crossover data. However, he further claims that intermediate existential closure must be allowed in downward entailing contexts. See footnote 18 below.

'Every teacher praised every student who read a book he had recommended.'
√intermediate

4. Frozen scope revised: frozen scope outside islands

Given that indefinites are island-insensitive, the question to be addressed is what happens when a ditransitive sentence with an indefinite IO and an indefinite DO is within an island, i.e. the *if*-clause, as shown in (12). Our interests are the readings where the indefinite takes scope over the island. Given the above property of indefinites, both the IO and the DO should be able to take scope outside the island freely. However, as shown in the table in (13), there is a restriction in IO-DO order.[11] The paraphrases of each reading are given in (14).

(12) a. *If* [S IO DO V], ...
[Yonin-no kyaku]-ni [nidai-no kuruma]-o miseta-ra,
[four-GEN customer]-DAT [two-GEN car]-ACC show-if

Taro-wa boonasu-o mora-eru.
Taro-TOP bonus-ACC get-can

'If (Taro) shows four customers two cars, Taro can get a bonus.'

b. *If* [S DO IO V], ...
[Nidai-no kuruma]-o [yonin-no kyaku]-ni miseta-ra,
[two-GEN car]-ACC [four-GEN customer]-DAT show-if

Taro-wa boonasu-o mora-eru.
Taro-TOP bonus-ACC get-can

'If (Taro) shows two cars to four customers, Taro can get a bonus.'

(13)

	(11a) *If* [S IO DO V]	(11b) *If* [S DO IO V]
a. IO > D > *if* > DO	*	*
b. DO > D > *if* > IO	*	*
c. IO, DO > *if*	√	√
d. IO > *if* > DO	**√**	**√**
e. IO > *if* > D > DO	√	√
f. DO > *if* > IO	***** ***(frozen scope)***	**√**
g. DO > *if* > D > IO	* *(frozen scope)*	√

(14) a. IO > D > *if* > DO
'There are four customers such that, for each of them, if Taro shows them any two cars, Taro can get a bonus.'
b. DO > D > *if* > IO

11. 'D' stands for a distributive operator. Logical readings with 'D' express a distributive interpretation of plural indefinites.

‘There are two cars such that, for each of them, if Taro shows them to any four customers, Taro can get a bonus.’

c. IO, DO > *if*
‘There are four customers and two cars such that, if Taro shows the four customers the two cars, Taro can get a bonus.’

d. IO > *if* > DO
‘There are four customers such that, if Taro shows them any two cars, he can get a bonus.’

e. IO > *if* > D > DO
‘There are four customers such that, if Taro shows each of them any two car, Taro can get a bonus.’

f. DO > *if* > IO
‘There are two cars such that, if Taro shows them to any four customers, Taro can get a bonus.’

g. DO > *if* > D > IO
‘There are two cars such that, if Taro shows each of them to any four customers, Taro can get a bonus.’

In the previous section, we have seen that a distributive operator cannot be inserted outside of islands. Thus, the readings in (13a) and (13b) are unavailable. Furthermore, without a distributive operator, the readings IO>DO>*if* and DO>IO>*if* cannot be distinguished, since, without a distributive operator, both readings must involve exactly four customers and exactly two cars. This reading is available in both (12a) and (12b), i.e., both objects together can take scope outside of the island in these sentences.

‘*If* [S IO DO V]’ in (12a) lacks both distributive and non-distributive readings of DO>*if*>IO, as shown in (13f,g). The distributive reading in (13f) involves certain two cars and any eight customers (four customers for each car), and the non-distributive reading DO>*if*>IO in (13f) involves certain two cars and any four customers. The unavailability of the distributive reading in (13g) can be accounted for by Bruening’s approach in the following way. Suppose if the indefinite DO undergoes QR within the *if*-clause, then some mechanism for island-insensitive indefinites applies, allowing the DO to take scope over *if*. Bruening claims that the DO in IO-DO cannot QR higher than the IO does due to Superiority, thus he predicts that a distributive operator cannot be inserted below the DO. However, Bruening’s approach cannot be applied to the non-distributive reading in (13f). For this reason, I focus on the non-distributive reading in this paper.

Thus, the following two non-distributive readings are crucially relevant here: first, the reading IO>*if*>DO in (13d) where the IO takes logical wide scope outside of the *if*-clause and the DO does not, and, second, the reading DO>*if*>IO in (13f) where the DO takes logical wide scope outside of the *if*-clause and the IO does not. Crucially, in IO-DO, only the former reading is available, whereas in DO-IO, both readings are available. Thus, scopal effects obtained when a syntactic island is intervening also show the scope-freezing effect: only IO>DO reading is available in IO-DO. Given that the effect here does not involve movement, it cannot be due to Superiority, which applies only to syntactic movement. Instead, something else has to be responsible for this effect.

5. ‘Specificity’ of *a certain NP* and the indefinite IO in IO-DO

In this section, I claim that the indefinite IO in IO-DO in Japanese is ‘specific’ in a similar way as English *a certain NP*, and that this specificity semantically translates as a choice function interpretation (cf. Kratzer 1998).

5.1 *a certain NP* in English (Kratzer 1998)

Kratzer (1998) claims that ‘*a certain* NPs are always specific, and that specific indefinites are interpreted with the help of choice functions’ (1998:168). In general, *a certain NP* takes wide scope (Hintikka 1986, Enç 1991). Indeed, it prefers the widest scope reading over conjunction, as shown in (16), although *a/an NP* does not have such a preference, as shown in (15). However, a bound variable can create the impression of narrow scope, as shown in (17), which is correctly predicted by the choice function analysis (see (10) above):

(15) Mary visited a store, and Susan did, too.

√same: $\exists x\, [STORE\,(x) \wedge VISIT\,(m, x) \wedge VISIT\,(s, x)]$
√different: $\exists x[STORE(x) \wedge VISIT(m, x)] \wedge \exists y[STORE(y) \wedge VISIT(s, y)]$

(16) *a certain NP* without bound variable
Mary visited ***a certain store***, and Susan did, too.

√same: $\exists f\, [CH\,(f) \wedge VISIT\,(m, f\,(store)) \wedge VISIT\,(s, f\,(store))]$
??different: $\exists f\, [CH\,(f) \wedge VISIT\,(m, f_m\,(store)) \wedge VISIT\,(s, f_s\,(store))]$[12]

(17) *a certain NP* with bound variable
Mary visited ***a certain store*** in her neighborhood, and Susan did, too.

$\exists f$ [CH (f) $\wedge$ VISIT (m, f (store in m’s neighborhood)) $\wedge$ VISIT (s, f (store in s’s neighborhood))]

√same (when m and s live in the same neighborhood)
√different

5.2 The indefinite IO in IO-DO in Japanese

The IO in IO-DO in Japanese seems to behave in the same way as *a certain NP* in English in coordinate constructions. As shown in (18a), the IO in IO-DO prefers a wide scope interpretation over conjunction, although the IO in DO-IO and the DO in both orders do not have such a preference, as shown in (18b) and (19), respectively.[13,14]

12. In (15), the “different” reading by a skolemized choice function is theoretically possible (see (23) below). However, it is not easily obtained lacking enough context to evoke it. Compare this example with (17), where a context involving a bound variable pronoun helps to obtain a skolemized reading.

13. Tanya Reinhart (p.c.) pointed out that the same contrast seems to hold for Hebrew.

14. Given that Japanese does not have indefinite/definite articles which correspond to *a/the* in English, it might be possible to hypothesize that the reason why the elided IO in (18a) is interpreted as the same as the antecedent IO is because it is definite. However, this hypothesis is untenable because the sentence in (18a) can be followed by a sluiced sentence ‘but I don’t know which student’, which shows that the IO must be indefinite (see footnote 6 above; see also Matthewson 1999:107).

(18) a. While S_1-**IO**-DO_3-V, it seems that S_2-**Ø**-DO_3-V
Taro-ga **[Penn-no gakusei]-ni** John-o syookaisita-to
Taro-NOM [Penn-GEN student]-DAT John-ACC introduced-COMP

kiita kedo Jiro-mo **Ø** John-o syookaisita-rasii.
heard while Jiro-too John-ACC introduced-seem

'(lit.) While (I) have heard that Taro introduced to a Penn student John, it seems that Jiro introduced (to a Penn student) John, too.'
√same, ??different

b. While S_1-DO_3-**IO**-V, it seems that S_2-DO_3-**Ø**-V
Taro-ga John-o **[Penn-no gakusei]-ni** syookaisita-to
Taro-NOM John-ACC [Penn-GEN student]-DAT introduced-COMP

kiita kedo Jiro-mo John-o **Ø** syookaisita-rasii.
heard while Jiro-too John-ACC introduced-seem

'While (I) have heard that Taro introduced John to a Penn student, it seems that Jiro introduced John (to a Penn student), too.'
√same, √different

(19) a. While S_1-IO_3-**DO**-V, it seems that S_2-IO_3-**Ø**-V
Taro-ga John-ni **[gengogaku-no hon]-o** miseta-to
Taro-NOM John-DAT [linguistics-GEN book]-ACC showed-COMP

kiita kedo Jiro-mo John-ni **Ø** miseta-rasii.
heard while Jiro-too John-DAT showed-seem

'While (I) have heard that Taro showed John a book on linguistics, it seems that Jiro showed John (a book on linguistics), too.'
√same, √different

b. While S_1-**DO**-IO_3-V, it seems that S_2-**Ø**-IO_3-V
Taro-ga **[gengogaku-no hon]-o** John-ni miseta-to
Taro-NOM [linguistics-GEN book]-ACC John-DAT showed-COMP

kiita kedo Jiro-mo **Ø** John-ni miseta-rasiiyo.
heard while Jiro-too John-DAT showed-seem

'While (I) have heard that Taro showed a book on linguistics to John, it seems that Jiro showed (a book on linguistics) to John, too.'
√same, √different

Based on their similarities, I claim that the indefinite IO in IO-DO should be interpreted as a choice function, just like *a certain NP* in English.[15] Indeed, if the indefinite IO is a

15. In Japanese, the subject can easily take scope over the IO, whereas the inverse reading is much harder. Thus, it is too strong to claim that the IO in IO-DO is always specific, which is semantically encoded as a choice function interpretation. Rather, the IO in IO-DO is specific with respect to the DO. The IO may not be specific with respect to the subject. Thus, when we consider the scope interaction between the IO and the subject, the IO may not be interpreted as a choice function. As a next step, it is necessary to examine the scope interaction among the subject, the IO, and the DO.

generalized quantifier, then both readings should be equally easy to obtain. If the IO is interpreted as a choice function, the "different" reading should be harder.[16] Furthermore, with a bound variable, the "different" reading can be easily obtained, as shown in (20), which is predicted by the choice function analysis of the IO:

(20) While S_1-**IO**-DO_3-V, it seems that S_2-**Ø**-DO_3-V
Yamada sensei-ga **[zibun-no gakusei]-ni** John-o syookaisita-to
Yamada prof.-NOM [self-GEN student]-DAT John-ACC introduced-COMP

kiita kedo Kita sensei-mo **Ø** John-o syookaisita-rasii.
heard while Kita prof.-too John-ACC introduced-seem

'(lit.) While (I) have heard that Prof. Yamada$_i$ introduced to a self$_i$'s student John, it seems that Prof. Kita$_j$ introduced (to self$_j$'s student) John, too.'
√same, √different

In this section, I showed that the indefinite IO in IO-DO in Japanese seems to have a similar kind of specificity as *a certain NP* in English, which is semantically encoded as a choice function interpretation. The IO in DO-IO and the DO in both orders, on the other hand, are interpreted as generalized quantifiers unless they scope out of islands.

6. Choice function approach to frozen scope in Japanese

In this section, I show that the proposal in the previous section can account for frozen scope data presented in (12) above (cited again in (21)). The representations of the logically possible readings IO>*if*>DO and DO>*if*>IO under choice function approach are given in (22):[17]

(21) a. *If* [S IO DO V], ...
[Yonin-no kyaku]-ni [nidai-no kuruma]-o miseta-ra,
[four-GEN customer]-DAT [two-GEN car]-ACC show-if

Taro-wa boonasu-o mora-eru.
Taro-TOP bonus-ACC get-can

'If (Taro) shows four customers two cars, Taro can get a bonus.'
√IO>*if*>DO, *DO>*if*>IO

b. *If* [S DO IO V], ...
[Nidai-no kuruma]-o [yonin-no kyaku]-ni miseta-ra,
[two-GEN car]-ACC [four-GEN customer]-DAT show-if

Taro-wa boonasu-o mora-eru.
Taro-TOP bonus-ACC get-can

'If (Taro) shows two cars to four customers, Taro can get a bonus.'
√IO>*if*>DO, √DO>*if*>IO

16. For speakers who permit the "different" reading in (18a), the specificity of the IO in IO-DO is not so strong, and thus a choice function variable might be existentially closed under conjunction.
17. In (22), $|x|$ stands for the number of atoms in x.

(22) a. IO>*if*>DO
$\exists f\,[CH(f) \wedge [\exists y[CAR(y) \wedge |y|=2 \wedge SHOW(t, y, f(four\ customers))] \rightarrow GET(t, b)]]$

There is a group of four customers chosen by f, such that, if Taro shows them any two cars, he can get a bonus.

b. DO>*if*>IO
$\exists g\,[CH(g) \wedge [\exists x[CUSTOMER(x) \wedge |x|=4 \wedge SHOW(t, g(two\ cars), x)] \rightarrow GET(t, b)]]$

There is a group of two cars chosen by g, such that, if Taro shows them to any four customers, he can get a bonus.

Consider the IO-DO order in (21a) first. The indefinite IO in this order is interpreted as a variable over choice functions. Assuming that the variable is existentially closed at the top, the IO should have a pseudo-wide scope over the *if*-clause. The DO in IO-DO is interpreted as a generalized quantifier unless it is island-free. Given these claims, we predict that the reading in (22a) is available in IO-DO, because the IO is interpreted as a choice function and the DO is interpreted as a quantifier. The reading in (22b), however, is unavailable, because the IO is not interpreted as a choice function, while the DO is.[18]

In DO-IO order, there is no constraint on the IO. In other words, the IO as well as the DO can be freely interpreted as a variable over choice functions when they are island-free. Thus, both readings in (22) are available.

In sum, I showed that the choice function approach can account for novel data demonstrating that frozen scope holds even if QR is inoperative. In particular, I proposed a new approach appealing to the specificity of the indefinite IO in IO-DO. This property is semantically encoded as a choice function interpretation in a similar way as *a certain NP* in English. In the remaining of this paper, I show that the choice function approach can account for frozen scope data which do not involve islands. In particular, I argue that, in the current approach, the scope-freezing effects can be reducd to a case of weak crossover (WCO): to obtain the DO>IO reading in IO-DO, the DO has to cross over a coindexed hidden index associated with the IO, yielding the WCO configuration.

7. Choice Functions and WCO

Before moving onto the proposal, let us introduce skolemized choice functions. We have seen in section 3 that the intermediate reading of indefinites can be obtained when a bound variable is present. However, it has been pointed out that the intermediate reading is available even without a bound pronoun, as in (23).[19]

(23) Each husband had forgotten a certain date.

18. As mentioned in footnote 10 above, Chierchia (1999) shows that, in downward entailing contexts such as the *if*-clause, intermediate existential closure should be allowed to obtain the right truth conditions. If we accept this view, we can account for the fact that '*If* [S IO DO V]' has the reading *if*>IO>DO, although the indefinite IO is semantically encoded as a choice function interpretation: the IO can take narrower scope than the *if*-clause because the intermediate existential closure is allowed. Once the intermediate existential closure is permitted, the question arises why DO>*if*>IO is unavailable. Several possible accounts arise, which I leave for future research.

19. Having afterthoguts such as 'his wife's birthday' would help to obtain the intermediate reading.

Kratzer accounts for such examples by using choice functions with a hidden index (skolemized choice functions). As shown in (24), the skolemized choice function f_x selects a different choice function for each individual x.[20] For example, *Husband A* might pick up *Date A* from the set of dates, and *Husband B* might pick up *Date C*, and so on.

(24) a. $\exists f[SCH(f) \wedge \forall x[husband(x) \rightarrow had\ forgotten(x, f_x(date))]]$
'There is a skolemized choice function f_x, such that, for every husband x, x had forgotten the date that f_x picks out from the set of dates.'

b. $f_{Husband\ A}$ ({*Date A, B, C*}) = *Date A*
$f_{Husband\ B}$ ({*Date A, B, C*}) = *Date C*

Further evidence for a hidden index comes from Chierchia's (1999) argument on WCO. He introduces Abusch's (1994) contrasts on conditionals in (25), and accounts for the contrasts using skolemized choice functions.

(25) a. Every professor gets a headache if *some student* is in class.
√intermediate [italics indicates stress]
b. If some student comes to class, every professor gets a headache.
*intermediate

In (25a), the intermediate reading is available with a contrastive stress pattern on the indefinite, whereas, in (25b), the reading is unavailable with the preposed *if*-clause. Suppose that a choice function is skolemized with the help of stress and that a choice function variable is existentially closed at the top. Then the reading of (25a) can be expressed as in (26a). Chierchia proposes that the hidden index of the indefinite is represented at LF by some sort of null pronominal element, which is marked as a superscript on the indefinite determiner, as shown in (26b).

(26) a. $\exists f[SCH(f) \wedge \forall x[professor(x) \rightarrow [in\ class\ (f_x(student)) \rightarrow gets\ a\ headache(x)]]]$
b. [[every professor]$_1$ gets a headache [if a^1 student is in class]]
(Chierchia's (45))

In the same vein, the LF representation of (25b) is shown in (27). Unlike (26b), the matrix subject does not c-command the indefinite. To bind the index of the indefinite, the subject has to be raised at LF. This will give rise to a canonical WCO configuration. Thus, the intermediate reading is unavailable in (25b).

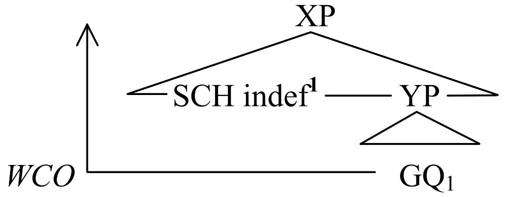
(27) ↑ if a^1 student is in class [every professor]$_1$ gets a headache
└──────────────┘ *WCO*

The schema in (28) shows that, when an indefinite is interpreted as a skolemized choice function, a generalized quantifier which is c-commanded by the indefinite cannot take scope

20. Skolemized choice functions are also used to solve a same-set problem, which is extensively discussed in Section 8.3.

over the indefinite due to WCO violation. Thus, only the surface reading where the indefinite takes scope over the quantifier is available.

(28)



√SCH indef>GQ, *GQ>SCH indef

8. Frozen Scope Revisited

In this section, based on the WCO argument in the previous section, I show that the choice function approach proposed above can account for Bruening's various data on frozen scope. Thus, I argue that frozen scope is merely a case of WCO.

Before examining the data from frozen scope, I will make explicit my assumptions about the structures of the IO-DO order in English and Japanese, since it becomes relevant to the later discussion on WCO. Without getting into the details, I take the widely accepted view and assume that there exists a structure in which the IO is base-generated somewhere higher in the structure than the DO (Marantz 1993, Pesetsky 1995 for English; Takano 1998 for Japanese; see also the discussion in section 10.2). In particular, I assume that, in IO-DO, the IO c-commands the DO in the base-generated structure.[21] In the DO-IO order, on the other hand, I do not assume any particular structure, since the current approach is compatible with any structure.[22]

8.1 Original frozen scope example

The first example to be considered is the original frozen scope data shown in (29): in the IO-DO order, the scope is frozen in that the DO cannot take scope over the IO. Under the choice function approach, the IO in IO-DO is interpreted as a choice function variable, whereas the DO is interpreted as a generalized quantifier, which can be represented as in (30a). In this representation, a choice function picks up one student from the set of students, as the example in (30b) shows. This is equivalent to the IO>DO reading in that there is only one student who was shown every book by John.

(29) John showed a student every book. √IO>DO, *DO>IO

(30) a. $\exists f[CH(f) \wedge \forall x[book(x) \rightarrow show\ (j, x, f(student))]]$
There is some choice function f, such that John showed every book to a student, which f picks out from the set of students.

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21. As shown in (4a) above, Bruening (2001) also assumes a structure where the IO is above the DO for the IO-DO order.

22. As will be clear later in the discussion, the current approach does not require any specific structure for the DO-IO order. The only assumption we should make is that the IO is higher in the structure than the DO in IO-DO. Bruening's approach, on the other hand, requires that the two objects in DO-IO be sisters, so that either of them can undergo QR first, obeying Superiority. In the IO-DO order, Bruening requires the IO to be higher in the structure than the DO. Given that opinions vary on what should be the base generated structure(s) of ditransitives, the flexibility to structures in the current approach might have an advantage over Bruening's.

b. f ({*Student A*, *B*, *C*, … }) = *Student B*

The DO>IO reading can be paraphrased as follows: for each book, there is a student who was shown that book by John. Thus, for example, for any two books, the students who were shown those books may be different from each other. In other words, students may covary with books. In terms of choice functions, this reading can be obtained by using a skolemized choice function, as in (31a). With a hidden index, it is possible to yield a different student for each book, as the example in (31b) indicates. Suppose that the set of books consists of *Book A*, *B*, and *C*. *Book A* is shown to *Student A*, and *Book B* is shown to *Student C*. Thus, for the choice function indefinite to yield narrow scope, it has to be skolemized.

(31) a. $\exists f[SCH(f) \wedge \forall x[book(x) \rightarrow show\ (j, x, f_x(student))]]$
There is some skolemized choice function f_x, such that, for every book x, John showed x to a student that f_x picks out from the set of students.

b. f_{BookA} ({*Student A*, *B*, *C*}) = *Student A*
f_{BookB} ({*Student A*, *B*, *C*}) = *Student C*

As far as the semantic representations are considered, both the IO>DO and DO>IO readings are unproblematic. Thus, we would predict that both readings should be available. However, the latter reading crashes when we consider operations at LF. In the IO>DO reading, the DO undergoes QR over the IO, since nothing prevents it in the choice function approach, as shown in (32a). Although the DO ends up being higher in the structure than the IO, the IO still takes wide scope because the IO is interpreted as a choice function, as in (30). In the DO>IO reading, the DO again undergoes QR over the IO. The difference from the previous reading is that the choice function is skolemized, as shown in (31). Thus, the QR of the DO creates a weak crossover configuration, as in (32b).

(32) a. IO>DO: $[_{IP}$ John showed $[_{VP}$ [every book]$_1$ $[_{VP}$ a student t_1]]

b. DO>IO: *$[_{IP}$ John showed $[_{VP}$ [every book]$_1$ $[_{VP}$ a^1 student t_1]]
WCO

In the DO-IO order, both objects can be generalized quantifiers, thus each can undergo QR higher than the other, yielding scope ambiguity. Furthermore, since none of the objects are interpreted as a choice function, there is no possibility of WCO effects. Thus, both readings can be obtained.

8.2 Pair-list reading

The second set of data comes from pair-list readings in ditransitives. It has been claimed that the questions in (33) admit (at least) two kinds of answers (Chierchia 1993 for English; Nishigauchi 1990 for Japanese): the individual answer in (34a) and the pair-list answer in (34b).[23]

(33) a. Which book did every student read? √P-L

23. It is well-known that Japanese is different from English in that *wh*-movements are not overt and happen after Spell-Out. Despite this difference, Japanese *wh*-questions show the same ambiguity as English (Nishigauchi 1990).

b. Minna-wa dono hon-o yonda-no?
everyone-TOP which book-ACC read-Q
'(lit.) Everyone read which book?' √P-L

(34) a. Individual Answer: Harry Potter.
b. Pair-List Answer: John read Les Miserable, Bill read King Lear, …

In this paper, I present an analysis for the pair-list reading along the line with Chierchia's (1993) analysis which appeals to functional interpretations. The proposed analysis reduces the scope-freezing effects to WCO effects (see also Hornstein 1995). In (33), semantically, the individual answer can be easily obtained by considering the *which*-phrase as an individual x. To obtain the pair-list answer, on the other hand, we have to assume that the *which*-phrase introduces a functional variable. It is possible to treat the *which*-phrase as a skolemized choice function, as shown in (35a).[24] Here a hidden index is necessary to obtain the reading where a book selected by a choice function varies depending on which student is relevant, as shown in (35b), which is exactly what we need for the 'pair-list' reading.[25]

(35) a. $\lambda p.\exists f\,[SCH(f) \wedge p{=}\forall x[student(x) \rightarrow read(x,f_x(book))]]$
b. f_{John} ({*Les Miserable, Harry Potter, King Lear*}) = *Les Miserable*
f_{Bill} ({*Les Miserable, Harry Potter, King Lear*}) = *King Lear*

Having introduced the choice function approach to the pair-list answer, let us look at Bruening's frozen scope data in (36a): in the IO-DO order, the pair-list answer is unavailable.[26] The semantic interpretation is given in (36b).

(36) a. Which student did John give t every book? *P-L
b. $\lambda p.\exists f\,[CH(f) \wedge p{=}\forall x[student(x) \rightarrow give(j,f_x(book),x)]]$

Although the semantics is fine, the LF is not, in the same way as the original frozen scope data. As shown in (37), the weak crossover configuration is created if the DO undergoes QR above the IO. Thus, the pair-list answer is not possible.

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24. Chierchia (1993) uses skolem functions to account for the pair-list reading (see also Engdahl 1986). However, other authors use skolemized choice functions for *wh*-phrases (Reinhart 1992, Romero 1999), which is in accordance with Chomsky's (1995) copy theory of movement. In this theory, everything but the operator phrase is deleted in the operator position Spec CP. The operator restrictions are interpreted in the trace position, as show in (i). This is exactly how the choice function captures *wh*-questions: an operator is bound at the top and restrictors are interpreted in situ.

(i) LF: [which ~~book~~] [$_{IP}$ every student read ~~which~~ book]

Everything that Chierchia (1993) does using skolem functions can be carried over to skolemized choice functions: the hidden index in skolemized choice function does the job of the hidden index in plain skolem functions. In this paper, I adopt the skolemized choice function strategy.
25. Following standard convention, I assume that the denotation of questions is a set of possible answers (Hamblin 1973, Karttunen 1977).
26. The extraction of IO in (36a) is restricted to some varieties of English (Bruening 2001: footnote 5).

(37) *[$_{CP}$ which$_2$ [$_{IP}$ John give [$_{VP}$ [every book]$_1$ [$_{VP}$ [t_2^1 student] t_1]]
WCO

The next question to be addressed is whether the pair-list reading can be obtained in the DO-IO order. Williams (1988) and Hornstein (1995) report that it cannot, as shown in (38a).[27] The current analysis predicts this judgment in the following way: to obtain the pair-list reading, the *wh*-phrase must be interpreted as a skolemized choice function, which is co-indexed with the IO, as in (38b). As shown in (39), the LF representation of (38) creates the same WCO configuration as the example of IO-DO.

(38) a. What did you give t to everybody? *P-L (Williams 1988)

b. $\lambda p.\exists f\,[CH(f) \wedge p{=}\forall x[person(x) \rightarrow give(you,f_x(thing),x)]]$

(39) *[$_{CP}$ which$_2$ [$_{IP}$ you give [$_{VP}$ [to everybody]$_1$ [$_{VP}$ [t_2^1 thing] t_1]]
WCO

In the same vein, Chierchia (1993) compares the lack of pair-list readings in questions with standard WCO in declaratives: the WCO violation in (39) is parallel to the one in (40). Interestingly, he notes that, in some examples, a WCO configuration does not affect the acceptability of the sentence, as in (41a). In such a case, the corresponding *which*-question in (41b) is predicted to also avoid the WCO violation and thus have the corresponding pair-list reading. As Chierchia points out, the prediction is born out, as shown in (41).

(40) ?? John gave his$_1$ paper to [every student]$_1$. (Chierchia's (75))

(41) a. John returned his$_1$ paper to [every student]$_1$.
b. Which paper did John return to every student? √P-L

The examples above suggest that the (un)availability of pair-list reading and the (un)grammaticality of standard WCO configurations pattern together.

Bruening (2001), on the other hand, gives the opposite judgment for DO-IO. In particular, he claims that a pair-list reading in *wh*-questions is unavailable in the IO-DO order, as in (42a), whereas the DO-IO order has the reading, as in (42b).

(42) a. Which student did John give t every book? *P-L
b. Which book did John give t to every student? √P-L

Bruening accounts for the contrast based on May's analysis that a pair-list reading arises when the quantifier undergoes QR to a position where it takes scope over the *wh*-phrase (May 1985). Thus, the unavailability of a pair-list reading in IO-DO must be because the quantificational DO cannot undergo QR to a position above the IO. For Bruening, the data from *wh*-questions shows the same point as the original frozen-scope data.

However, Bruening's approach cannot capture the parallelism pointed out by Chierchia (1993). As we saw, Chierchia's point is that the pair-list reading is unavailable whenever a

27. See below for the opposite judgment presented in Bruening (2001).

corresponding standard crossover example is unacceptable. Thus, the pair-list reading must be related to WCO effects. The choice function approach can capture the parallelism in the same way as Chierchia does using skolem functions. However, since Bruening's approach to *which*-phrases has nothing to do with WCO, such a parallelism is unexpected.

8.3 Bound variables

Bruening presents further data for the scope-freezing effect using bound variables. It has been claimed that quantifiers can only bind variables that fall within their scope (May 1985). It follows that, if one quantifier takes scope over the other, the former should be able to bind a variable contained within the latter. Given these assumptions, (43a) shows that the DO cannot take scope over the IO in IO-DO, because the DO cannot bind a variable contained in the IO. In DO-IO in (43b), on the other hand, the IO can take scope over the DO, since the IO binds a variable within the DO. Japanese shows the same contrast, as in (44).

(43) a. * Mona sent a professor who'd reviewed it_1 every $book_1$. *DO>IO
b. Robert sent a student who'd taken her_1 course to every $professor_1$.
√IO>DO (Bruening's (12))

(44) a. * Mona-ga [$sore_1$-o hihyoosita sensee]-ni [subete-no hon]$_1$-o okutta.
Mona-NOM [it-ACC criticized teacher]-DAT [all-GEN book]-ACC sent
'Mona sent a professor who'd reviewed it_1 every $book_1$.' *DO>IO

b. John-ga [sono $hito_1$-no seeto-ga kaita ronbun]-o
John-NOM [that person-GEN student-NOM wrote paper]-ACC

[subete-no sensee]$_1$-ni watasita.
[all-GEN teacher]-DAT gave
'John gave a paper which his_1 student wrote to every $professor_1$.' √IO>DO

Note that there is a potential problem of WCO in these examples in that raising of the lower quantifier creates a WCO configuration. Despite this problem, the sentences in (43b) and (44b) are acceptable, while the sentences in (43a) and (44a) are worse than a mere WCO violation. Bruening observes that, in English, there seems to be a difference between the pronoun occurring postnominally, as in (43), and occurring prenominally, as in standard examples of WCO such as *His_i mother likes $everyone_i$*. Note that a postnominal pronoun is deeply embedded, whereas a prenominal pronoun is not embedded. In Japanese, bound pronouns occur pronominally both in (44) and in standard examples of WCO. The difference is that the pronoun is deeply embedded in (44), whereas it is not in standard WCO examples. Thus, I assume that deeply embedded pronouns are not counted for WCO both in English and in Japanese.[28]

It is again possible to account for the frozen scope data by using choice functions. The claim is that, in IO-DO, the IO is interpreted as a choice function and the DO is a generalized quantifier. To obtain the DO>IO reading, we need to use a skolemized choice function, as

28. Note that, as shown in (41a), there are some not well-understood examples in which even a non-embedded pronoun is not counted for the WCO effect. I assume that deeply embedded pronouns are always insensitive to WCO, whereas non-embedded pronouns vary in their sensitivity.

shown in (45a). With the help of a hidden index, (43a) and (44a) can mean that, for every book, there is a professor who had reviewed it and Mona sent each professor the book he had reviewed. In other words, for each professor, there is a book which he had reviewed and was sent by Mona, which is the DO>IO reading. For example, as shown in (45b), *Book A* might be reviewed by *Professors A*, *B*, and *F*. Among them, Mona chose to send *Book A* to *Professor A*. *Book B* might be reviewed by *Professors B*, *C*, *E*, and *F*. Mona chose to send *Book B* to *Professor C*, and so on.

(45) a. $\exists f[SCH(f) \wedge \forall x[book(x) \rightarrow send\ (m, x, f_x(\text{professor who'd reviewed x}))]]$[29]

There is some skolemized choice function f_x, such that, for every book x, Mona sent x to a professor who'd reviewed x, which f_x picks out from the set of professors who'd reviewed x.

b. f_{BookA} ({*Professor A*, *B*, *F*}) = *Professor A*
f_{BookB} ({*Professor B*, *C*, *E*, *F*}) = *Professor C*

Although there is no problem with the semantic representation of the DO>IO reading, the representation in LF is problematic. As I discussed above, the deeply embedded pronoun is not counted for WCO. However, the hidden index of a choice function at the IO is counted for WCO: the hidden index is not embedded. Thus, it should be susceptible to WCO effects. Thus, raising the DO above the IO creates a WCO configuration in the same way as other frozen scope examples, as shown in (46). For this reason, the DO>IO reading is unavailable in the IO-DO order.

(46) DO>IO: *... [$_{VP}$ [every book]$_1$ [$_{VP}$ a^1 prof. who'd reviewed it$_1$ t$_1$]]
WCO

However, there is a twist in this example: given that there is an overt bound variable, one could argue that it may be possible to obtain the DO>IO reading without using a skolemized choice function. Consider the semantic representation in (47), where the IO is interpreted as a plain choice function.

(47) $\exists f[CH(f) \wedge \forall x[book(x) \rightarrow send\ (m, x, f(\text{professor who'd reviewed x}))]]$

There is some choice function f, such that Mona sent every book to a professor who'd reviewed x, which f picks out from the set of professors who'd reviewed x.

Given this semantic representation, (43a) and (44a) can mean that there is a professor who had reviewed every book and Mona sent that professor all the books, which is the IO>DO reading. However, since the specification of the set relevant to the choice function includes a bound variable, professors may covary with books. For example, for *Book X*, the set of professors who'd reviewed it includes *Professors S*, *T*, and *W*. For *Book Y*, the relevant professors are *S*, *X*, *Y*, and *Z*, and so on. Thus, it might be possible to obtain the DO>IO reading without using a skolemized choice function as in (45). Without a hidden index, there is no WCO effect in

29. *A professor who'd reviewed it* can be represented as follows: $\lambda y.\ professor(y) \wedge review(y,x)$.

LF representation, as shown in (48). Note that an embedded bound pronoun is not counted for WCO. This would wrongly predict that the DO>IO reading is possible in the IO-DO order.

(48) … $[_{VP}$ [every book]$_1$ $[_{VP}$ a prof. who'd reviewed it$_1$ t_1]]
no WCO

However, this analysis is untenable given the following 'same-set' problem. Kratzer (1998) and Chierchia (1999) claim that, even when there is an overt bound variable, a hidden index is required. Consider, in (49), a situation where two professors had recommended the same set of books.

(49) [Every professor]$_1$ rewarded every student who read *a book he*$_1$ *had recommended*.

Since f is a function, it would have to give a unique value, i.e., the two professors have to choose the same book. However, intuitively, it is possible for them to choose a different book. This problem can be solved if we use a skolemized choice function: the skolemized choice function f_x selects a different choice function for each individual x, as shown in (50). Adopting this analysis, I assume that a hidden index is required even if there is an overt bound pronoun.

(50) $f_{\text{Prof. A}}$ ({King Lear, Hamlet}) = King Lear
$f_{\text{Prof. B}}$ ({King Lear, Hamlet}) = Hamlet

Thus, to obtain the DO>IO reading in IO-DO, it is necessary to use a skolemized choice function as in (45). The skolem index is introduced by the indefinite article in (46) and, hence it is an embedded index susceptible to WCO. It follows that this reading induces a WCO violation, thus it is prohibited.

In the DO-IO examples (43b) and (44b), both objects can be generalized quantifiers. Thus, the IO can raise over the DO. Since the co-indexed pronoun *it* is deeply embedded within the DO, the WCO violation is circumvented and the binding obtains.

8.4 Summary

In this section, I have shown that the scope-freezing effect in IO-DO can be reduced to a case of WCO. In IO-DO, the IO is interpreted as a choice function and the DO is a generalized quantifier. The IO>DO reading is easily obtained in this approach. To obtain the DO>IO reading, on the other hand, the IO must be interpreted as a choice function with a hidden index, which is co-indexed with the DO. It follows that raising the DO above the IO creates a WCO configuration. Thus, the DO>IO reading is unavailable. In DO-IO, both the DO and the IO can be generalized quantifiers. It follows that they can freely raise above the other object without creating a WCO configuration. Thus, both the DO>IO and IO>DO readings are obtained.

9. ACD

In this section, I show that the current choice function approach can also account for the data from antecedent-contained deletion (ACD) in English (Bouton 1970, Sag 1976).[30] An example of ACD is given in (51a), where the elided material is contained within its antecedent. In this paper, I adopt May's (1985) QR account of ACD and assume that ACD is resolved by QR. In (51a), for example, the quantifier *every suspect Beck did* raises. As a result, the elided VP is not contained within its antecedent anymore, as shown in (51b). The matrix VP serves as an appropriate antecedent for the ellipsis.

(51) a. Kollberg recognized every suspect Beck did.
b. [every suspect Beck did [$_{VP}$ e]]$_i$ [Kollberg [$_{VP}$ recognized e_i]]

Bruening (2001) shows that scope is frozen in the IO-DO order even when ACD is involved, as in (52). Based on the QR account, he concludes that both objects raise without changing their scope relation, as discussed in section 2.

(52) Ozzy gave someone everything that Belinda did. *DO>IO

In the choice function approach, the IO *someone* in IO-DO is interpreted as a choice function. Recall from the discussion in the previous section that the IO>DO reading is obtained by a plain choice function. The semantic representation is given in (53).

(53) $\exists f[CH(f) \wedge \forall x[\ [thing(x) \wedge give(b,x,f(person))] \rightarrow gave\ (o, x, f(person))\ ]]$

There is some choice function f, such that Ozzy gave everything that Belinda did to someone which f picks out from the set of people.

The quantificational DO must undergo QR to resolve ACD. According to the current analysis, the DO may or may not raise higher than the position of the IO, as in (54).[31, 32] However, even

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30. Takahashi (1996) discusses ACD in Japanese. However, I am not convinced that Japanese has ACD, since the examples Takahashi uses are not acceptable for me and my informants. For this reason, I restrict the discussion on ACD to English.

31. In (54) and (55), the choice function IO may stay in-situ. Even so, ACD can be resolved as long as the DO moves out of the VP. Furthermore, even if the IO is in-situ, the scope interpretation can be accounted for in the same way as (54) and (55). This is because the IO is interpreted as a (skolemized) choice function regardless of its position.

32. It is important to note that choice function indefinites can also undergo QR. In fact, they must raise when they host ACD. This is supported by a previous study such as Legate's (1999), who has shown that choice function indefinites can undergo QR in the same way as other quantifiers (cf. Kennedy 1997: fn.15). Indeed, QR of choice function indefinites can account for examples such as (i).

(i) John believed that Bill had seen a certain film that I did. (Kennedy 1997:fn.15)
a. ACD: √ embedded (saw), * matrix (believed that Bill had seen)
b. Scope: √ wide (a certain>believe), ?? narrow (believe>a certain)

In (i), the indefinite receives a choice function interpretation, and thus it can take scope over the island without movement. However, to revolve ACD, it has to raise out of the embedded VP. If we assume that QR is clause-bound, which is a standard assumption as shown in section 3, the choice function indefinite in (i) should not raise to the matrix clause. Thus, only the embedded VP can be an antecedent of the ellipsis, not the matrix VP.

if the DO raises over the choice function IO, there is no covariation effect (see section 5.1). Thus, regardless of whether the DO is above or below where the IO is, we obtain the IO>DO reading.

(54) a. someone$_2$ [everything Belinda did]$_1$ [$_{VP}$ gave t$_2$ t$_1$]] IO>DO

b. [everything Belinda did]$_1$ someone$_2$ [$_{VP}$ gave t$_2$ t$_1$]] IO>DO

To obtain the DO>IO order, the IO must be interpreted as a skolemized choice function, as discussed in section 5. Again, the DO can possibly raise above the IO, but this will create a WCO configuration, as shown in (55b).

(55) a. someone$_2$ [everything Belinda did]$_1$ [$_{VP}$ gave t$_2$ t$_1$]] IO>DO

b. [everything Belinda did]$_1$ someone$_2^{\mathbf{1}}$ [$_{VP}$ gave t$_2$ t$_1$]] *DO>DO

WCO

Thus, the choice function approach can account for frozen scope with ACD without requiring any more restrictions on QR than the standard view of QR (May 1985).[33] This suggests that it is possible to dismiss Bruening's claim that QR obeys Superiority.

10. Further Issues

Before concluding the paper, I remark on two further issues. First, what about the cases where the IO in IO-DO is a definite NP or a quantificational NP other than an indefinite? Second, why is the IO in IO-DO specific?

10.1 Non-indefinite IO

I showed that the indefinite IO in IO-DO is a specific indefinite, which semantically translates as a choice function interpretation. I suggest that this specificity of IO in IO-DO is manifested as partitivity when the IO is a definite NP or a quantificational NP. For example, in IO-DO in (56a), most girls should be included in the children. The DO-IO order in (56b), however, allows both this reading and the reading where most girls are excluded from the children.[34] This example shows that the IO in IO-DO is interpreted as partitives.

(56) [Nanninka-no kodomo]-ga heya-ni haittekita.
[some-GEN child]-NOM room-to entered
'Some children came into the room.'

a. IO-DO: Watasi-wa [hotondo-no onnanoko]-ni keeki-o ageta.
I-TOP [most-GEN girl]-DAT cake-ACC gave

Crucially, this example shows that the resolution of ACD does not necessarily correlate with the scope of a quantifier: in the case of indefinites, the resolution of ACD is done by QR and still the wide scope reading can be derived by a choice function interpretation.

33. Although I do not have space to discuss Fox's (1995) Scope Economy Principle, which allows QR only when there is some semantic effect, it seems that Fox's principle is compatible with the current analysis.

34. Interestingly, my informants express the situation where most girls are included in the set of children using the IO-DO order rather than the DO-IO order.

'I gave most girls a cake.'

b. DO-IO: Watasi-wa keeki-o [hotondo-no onnanoko]-ni ageta.
I-TOP cake-ACC [most-GEN girl]-DAT gave
'I gave a cake to most girls.'

Enç (1991) claims that partitivity and the functional interpretation of *a certain NP* can be unified under some definition of specificity. Following Enç, I claim that a specific NP evokes a set where the NP is a member. In this way, the partitive IO and the choice function IO can be unified.

Furthermore, I show that the IO in IO-DO is specific even when it is a negative polarity item (NPI), which seems to be inherently non-specific.[35] The 'specificity' of the IO in IO-DO can be observed when the DO is a quantifier (cf. Sohn 1995:151). In this case, the IO should be able to take wide or narrow scope with respect to the DO. However, in IO-DO, the IO must take scope over the DO, as shown in (57a), whereas scope is ambiguous in DO-IO as shown in (57b). Thus, even when the IO is NPI, we observe the same scope-freezing effect as other cases.

(57) a. Taro-wa **dare-ni-mo** [takusan-no hito]-o syookaisi-nakat-ta.
Taro-TOP anyone-DAT [many-GEN people]-ACC introduce-NEG-PAST
'(lit.)Taro didn't introduce to anyone many people.'

√IO>DO (There is no one to whom Taro introduced many people.)
*DO>IO (There were many people who John didn't introduce to anyone.

b. Taro-wa [takusan-no hito]-o **dare-ni-mo** syookaisi-nakat-ta.
Taro-TOP [many-GEN people]-ACC anyone-DAT introduce-NEG-PAST
'Taro didn't introduce many people to anyone.'

√IO>DO, √DO>IO

10.2 Specificty of the IO in IO-DO

The second issue to be addressed is why the IO in IO-DO is specific. One possibility is to claim that the specificity of IO in IO-DO is derivative from its structural position: the IO in IO-DO is in the specifier position of applicative, whereas the IO in DO-IO and the DO in both orders are not (cf. Marantz 1993). In the structure of IO-DO given in (58), the DO is the complement of the verb, whereas the IO is not, being outside of the VP, in particular, in the SpecApplP. The head of ApplP, which contains a ∅-morpheme in the case of ditransitives in Japanese, introduces the semantics of specificity, such that the semantic properties of the IO in IO-DO can be accounted for (Bruening 2001; cf. Marantz 1993). Thus, the IO in IO-DO receives specific interpretation in the SpecApplP, whereas the DO and the IO in DO-IO, which are not at SpecApplP, do not.

(58) $[_{vP}$ Subject v $[_{ApplP}$ IO Appl $[_{VP}$ DO V]]][36]

35. Japanese has an NPI-creating suffix *-mo*. *-Mo* attaches to 'indeterminate pronouns' (Kuroda 1965) such as *dare* 'who' and *nani* 'what' (see Aoyagi and Ishii 1994).
36. The structure in (58) is the same as Bruening's structure in (4a).

This proposal can be extended to cross-linguistic asymmetries of affectedness: in various languages, it has been claimed that the IO in IO-DO receives an affected interpretation that is lacking in its DO-IO counterpart (Oehrle 1976, among others). In particular, the IO in IO-DO must be a possessor of the referent of the DO. This claim also applies to Japanese: (59) entails that the present reached Mary and that she came to possess it (Sadakane and Koizumi 1995). This follows from the assumption that the head of Appl is responsible for the semantics of affectedness.

(59)	John-ga	Mary-ni	purezento-o	age-ta.
	John-NOM	Mary-DAT	present-ACC	give-PAST
	'John gave Mary a present.'			

Related to this issue is the pragmatics of ditransitives. I point out that the current proposal on the specificity of the IO in IO-DO points toward the same direction as previous studies of pragmatics: the IO in IO-DO is 'nondominant' (i.e., generally definite) (Erteschik-Shir 1979), 'more topicworthy' (Thompson 1995), or 'the possessor of the DO' (Gropen, Pinker at al. 1989), whereas the IO in DO-IO does not necessarily satisfy these properties. Thus, it is not surprising to find that the IO in IO-DO has a different semantics from the IO in IO-DO and the DO in both orders.

11. Conclusion

In this paper, I presented novel data demonstrating that frozen scope holds even if QR is inoperative. Since Bruening's (2001) approach hinges on a constraint on QR, it cannot account for such data. Instead, I proposed a new approach appealing to the specificity of the indefinite IO in IO-DO. This property is semantically encoded as a choice function interpretation in a similar way as *a certain NP* in English. Furthermore, I showed that the choice function approach can reduce Bruening's various data on frozen scope to WCO effects. By doing so, the current approach makes it possible to dismiss Bruening's claim that QR obeys Superiority and to maintain the standard view of QR.

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