1

Scope Inversion in Japanese: Contrastive Topics Require Scalar Implicatures

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1.1 Introduction

Japanese has a scope inversion phenomenon by a Contrastive Topic (CTopic) marking that is similar to the Korean Contrastive Topic marking see (see Lee, 2000) and the Topic-Focus contour observed in German (see Büring, 1997, among others). For instance, the example 1a which contains two logical operators, quantifier and negation, is ambiguous. If we change the nominative marker *ga* into *wa* as in 1b, we only have negation wide scope reading. (Note: availability of $\neg\forall$ reading of (1a) varies among individuals).

(1) a. Mary-ga zen'in-ni choko-o age-nakat-ta
Mary-Nom everyone-Dat chocolate-Acc give-Neg-Past
' as for everyone Mary did not give a chocolate to them.'
'it is not the case that Mary gave a chocolate to everyone.'

b. Mary-ga zen'in-ni-wa choko-o age-nakat-ta
Mary-Nom everyone-Dat-Top chocolate-Acc give-Neg-Past
* 'as for everyone Mary did not give a chocolate to them.'
'it is not the case that Mary gave a chocolate to everyone.'

Another observation on the CTopic marker *wa* is that it induces implicatures. In this paper, first I will show what kind of implicatures Contrastive

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Topics generate. Second, I will summarize Büring's (1997) account on German. Büring (1997) claims that a sentence which contains a topic must 'have reasonable implicatures' and thus when a topic-marked sentence is ambiguous, only the reading which has implicatures can survive. I adopt the same explanation to explain the Japanese data, in other words, only the $\neg\forall$ reading in has implicatures therefore it is only the available reading for (1b). Based on the prosodic pattern of German, Büring (1997) further provides a mechanism of Focus and Topic value to elicit implicatures. Since Japanese has a different pattern of prosody, however, it is not clear whether his system can be applied to Japanese case illustrated above. Third, I will present alternative account on Japanese based on Sauerland's (2001) mechanism of computing implicatures. I claim that a Contrastive Topic presupposes a particular set of scalar alternatives, namely stronger propositions than the assereted one. Thus, if one of the possible propositions of the ambiguous sentence fails to have this set of scalar alternatives, it causes a presupposition failure. This is the source of disambiguation.

1.2 Implicatures

It is observed that Contrastive Topics always induce implicatures. In (2), for instance, compared to the utterance without CTopic-marking, *John-ga kita*. 'John-nom came', (2b) includes the speaker's indication that the asserted proposition is the most informative answer that he or she can give. Similarly, CTopic-marking of numerals as in (3b) seem to have an effect similar to 'at least N', namely it specifies the number the speaker is certain of and indicates the uncertainty of bigger numbers (Teramura, 1991).

(2) a. Who came to the party?

b. JOHN-wa ki-ta
John-CTop come-Past
As for John, he came (Implicature: I don't know about others)

(3) a. How many people came to the party?

b. 3-nin-wa kita
3-Class-CTop came
3 people came (Implicature: I don't know whether more than three came)

I claim that the scope inversion is due to this property of CTopic: CTopic always induces implicatures. If a sentence contains a CTopic, only the reading that has implicatures can survive. In (4), $\neg\forall$ reading implies "Some people came", while the assertion of $\forall\neg$ exhaustively entails or contradicts all the variants of the asserted proposition, "Some people didn't come" "Most people came", etc. and therefore no propositions are left to be implied. Consequently, ¬∀ is the only available reading for (4). The same reasoning can be made to explain why CTopic-marked quantifiers like *minna* 'everyone' cannot appear in affirmative context. Since (5) has only one logical operator, *minna*, there is only one possible proposition "Everyone came". This proposition is the strongest proposition among the possible alternatives, therefore no implicature can be derived. Therefore, (5) is infelicitous since the asserted proposition is not compatible with the property of CTopic-marking.

(4) MINNA-wa ko-nakat-ta
Everyone-CTop come-Neg-Past

a. It is not the case that all the people came.
(Implicature: Probably some people came. (available reading))

b. All the people are such that they didn't come. (no implicatures (unavailable reading))

(5) # Minna-wa kita.
Everyone-CTop came (no implicatures)

The next question is how we computer the implicatures. In the next section, I summarize the system developed by Büring (1997) for a scope inversion in German.

1.3 Büring 1997

German has a scope inversion effect similar to the Japanese case. For instance, sentence (6a) can be disambiguated by a specific prosody as in (6b) (Féry, 1993, Büring, 1997, Krifka, 1998, among others). Büring (1997) calls the rising accent on *alle* a Topic accent and the falling accent on *nicht* a Focus accent.

(6) a. Alle Politiker sind nicht korrupt
all politicians are not currupt

i. No politician is corrupt. (∀¬)
ii. It is not the case that all politicians are corrupt.(¬∀)

b. /ALLE Politiker sind NICHT\ korrupt
all politicians are not currupt

It is not the case that all politicians are corrupt.(¬∀ only)

Büring (1997) provides the following analysis in the framework of Rooth's (1985, 1992) *Alternative Semantics for Focus*. By having the Topic-Focus prosody, (6b) elicits three different types of semantic values: first it has the ordinary semantic value $[\![(6b)]\!]^o$. Second, the Focus accent generates the focus semantic value $[\![(6b)]\!]^f$, which is a set of propositions obtained by replacing the focused element with some type-identical alteratives to it (*not* and identity function). Third, the Topic accent generates the topic semantic value $[\![(6b)]\!]^t$, which is a set of sets of propositions obtained by replacing the topical element with alternatives (generalized quantifiers).

(7) a. $[\![(6b)]\!]^o$=It is not the case that all politicians are corrupt

b. $[\![(6b)]\!]^f$=$\{$All politicians are corrupt, It is not the case that all politicians are corrupt$\}$

c. $[\![(6b)]\!]^t$=$\{\{$All politicians are corrupt, It is not the case that all politicians are corrupt$\}$,
$\{$Most politicians are corrupt, It is not the case that most politicians are corrupt$\}$,
$\{$Some politicians are corrupt, It is not the case that some politicians are corrupt$\}$,
$\{$No politicians are corrupt, It is not the case that no politicians are corrupt$\}\}$

Büring (1997) explains the availability of the $\neg\forall$ reading by means of the notion of Residual Topic ("a set of disputable propositions induced by a Topic"):

(8) If a sentence S with a Topic accent is uttered given some Context CX, and there is no disputable Residual Topic the sentence establishes, the utterance of S in CX infelicitous.

In the $\neg\forall$ reading of (6b), there are Residual Topics since the proposition asserting that not all politicians are corrupt can cross out only one set of propositions in the Topic value. It neither entails nor excludes other sets of propositions. In other words, we are still able to ask whether there are some corrupt politicians or how many are not corrupt.

(9) $[\![\neg\forall]\!]^t$

a. [[not]$_F$ [[all]$_T$ politician [[corrupt]]]]

b. $\{\cancel{\neg\ \text{all(politician)}(\lambda x.\text{corrupt}(x)),\ \text{all(politician)}(\lambda x.\text{corrupt}(x))}\}$,
$\{\neg$ most(politician)(λx.corrupt(x)),
most(politician)(λx.corrupt(x))$\}$,
$\{\neg$ some(politician)(λx.corrupt(x)),
some(politician)(λx.corrupt(x))$\}$,
$\{\neg$ one(politician)(λx.corrupt(x)),
one(politician)(λx.corrupt(x))$\}$

On the other hand, the $\forall\neg$ reading is not available for (6b), there is no room for dispute in this reading. If all politicians are such that they are not corrupt, all sets of propositions in the topic value are either entailed or contradicted.

All propositions in the Topic value are crossed out since none of them is disputable.

(10) $[\![\forall\neg]\!]^t$

a. [[all]$_T$ politician [[not]$_F$ [corrupt]]]

b. $\{$~~all(politician)($\lambda x.\neg$corrupt(x))~~, ~~all(politician)($\lambda x.$corrupt(x))~~$\}$,
$\{$~~most(politician)($\lambda x.\neg$corrupt(x))~~,
~~most(politician)($\lambda x.$corrupt(x))~~$\}$,
$\{$~~some(politician)($\lambda x.\neg$corrupt(x))~~,
~~some(politician)($\lambda x.$corrupt(x))~~$\}$,
$\{$~~one(politician)($\lambda x.\neg$corrupt(x))~~,
~~one(politician)($\lambda x.$corrupt(x))~~$\}$

Accordingly, (10) does not satisfy (8), and thus the quantifier wide scope reading of (6b) is not available. The quantifier narrow scope reading is possible since (9) has disputable propositions.

Büring (1997) notes that the scope inversion is not obligatory for all quantifiers. For instance, (11) remains ambiguous even with Topic Focus contour.

(11) Zwei /DRITTEL Politiker sind NICHT\ korrupt
Two [thirds]$_T$ of the politicians are [not]$_F$ corrupt

Since both readings have disputable questions as follows:

(12) a. It is not the case that two thirds of the politicians are corrupt

b. ...and it might or might not be the case that there are in fact no corrupt politicians

(13) a. Two thirds of the politicians are non-corrupt

b. ...and it might or might not be the case that some corrupt

As shown above, in Büring's (1997) system, it is crucial that negation is in Focus to make a set of propositions (Focus value). A sentence with Topic marking seeks for disputable questions in its Topic value, which is derived from the Focus value. In the next section, it is considered whether Büring's (1997) can be directly applied to the Japanese case.

1.4 Japanese

In Section 1.2, following Büring (1997), I have proposed that the scope inversion phenomenon discussed in this paper is due to the requirement on Contrastive Topics: Contrastive Topics always induce implicatures. In Section 1.3, we have seen that Büring (1997) characterized implicatures as disputable propositions in Topic values generated by Focus accent on the negation and Topic accent on the quantifier. In Japanese, it is not clear whether the negation is Focus-marked in the CTopic sentences.

When negation is in Focus, the stress falls onto the verb in Japanese as follows:

(14) a. John-ga ki-ta-no?
John-Nom come-Past-QP
'Did John came?'

b. Iiya, KO-nakat-ta.
No, come-Neg-Past
'No, (he) did NOT.'

In the case of scope inversion, no focus is marked on negation in Japanese. When a sentence (15b) is uttered, *zen'in* 'everyone' receives a stress as indicated by capitals. However, neither the verb stem nor the negation morpheme *nakat* indicates any phonological or morphological difference relative to non-Topic counterpart (15a).

(15) a. John-wa zen'in-o tasuke-nakat-ta
John-Nom Everyone-Acc help-Neg-Past
'John didn't help anyone'
'it is not the case that John helped everyone'

b. John-wa MINNA-wa tasuke-nakat-ta
John-Nom Everyone-Top help-Neg-Past
*'John didn't help anyone'
'it is not the case that John helped everyone'

Similarly, it is observed that English also has a scope inversion by intonation Jackendoff (1972) but the phonological marking is not on the negation but at the end of the sentence .

(16) a. All the men didn't come$\backslash$. ($\forall\neg$)

b. All the men didn't come$/$. ($\neg\forall$)

It is possible to assume that the negation does not have a particular prosodic pattern as in German although it is in Focus. Rather than generalizing Büring's (1997) analysis to Japanese data, however, I will offer an alternative analysis that captures the same kind of intuition (uncertainty or disputability of alternatives) without assuming that negation is in Focus.

1.4.1 Presupposition Failure: Sauerland 2001

I employ the mechanism developed by Sauerland (2001) to compute implicatures and propose that, if a sentence contains a CTopic, it presupposes a particular subset of scalar alternatives (also see Oshima, 2002).

Sauerland (2001) states that a scalar alternative becomes an implicature 'only if the scalar alternative is stronger than the assertion.' In our case, since

CTopic-marked sentences always induce implicatures, a CTopic-marked sentence must have a scalar alternative stronger than the assertion in order to be interpreted properly. I formulate this condition as in (17), when a sentence contains a CTopic, it presupposes a set of scalar alternatives ψ such that ψ entails the asserted proposition but the asserted proposition does not entail ψ.

(17) CONTRASTIVE(<B, F>)
$\exists F'[F' \in$ALT$_C$(F) & B(F') entails B(F) & B(F) doesn't entail B(F')]
(presupposition))

Let us start with the acceptable reading for (4), the negation wide scope reading, $\neg\forall x$[[person(x)][come(x)]] has a scalar alternative $\neg$some(x)[[person(x)][come(x)]]. $\neg$some(x)[[person(x)][come(x)]] entails $\neg\forall x$[[person (x)][come(x)] but not the other way around. Therefore, the existence of the scalar alternative $\neg$some(x)[[person(x)][come(x)]] makes $\neg\forall$ reading compatible with the presupposition.

(4) MINNA-wa ko-nakat-ta
Everyone-CTop come-Neg-Past

a. It is not the case that all the people came.
(Implicature: Probably some people came. (available reading))

b. All the people are such that they didn't come. (no implicatures (unavailable reading))

(18) B=$\lambda\wp \in D_{<<e,t>,t>}.\neg\wp(\lambda y.$come$(y))$

(19) F=λP.$\forall x$[person(x)][P(x)]

(20) F'=λP.some(x)[person(x)][P(x)]

(21) a. $\neg\forall x$[[person(x)][come(x)]] (=B(F))

b. scalar alternative: $\neg$some(x)[[person(x)] [come(x)]] (=B(F'))

c. B(F') entails B(F)

d. B(F) doesn't entail B(F')

Further, the following operation of the CTopic-marking induces implicatures.[1]

[1] In Sauerland (2001), the negation of the scalar alternative that is stronger than the asserted proposition becomes an implicature.

(1) $\neg\alpha'$ is an implicature of α if the following three hold: Sauerland (2001)

a. α' is a scalar alternative of α

b. α' entails α

c. α doesn't entail α'

For instance, some(x)[[person(x)] [come(x)]] is an implicature of $\neg\forall x$[[person(x)][come(x)]]. This computation of implicature, however, becomes inappro-

(22) CONTRASTIVE(<B, F>) $\Leftrightarrow$

a. F(B) (assertion)

b. $\forall$ F'[F'$\in$ALT$_C$(F) & B(F') entails B(F) & B(F) doesn't entail B(F')] $\rightarrow$ $Poss$($\neg$B(F'))] (implicature)

Following (22), $Poss$(some(x)[[person(x)][come(x)]]) (double negations cancel each other), is an implicature of $\neg\forall x$[[person(x)][come(x)]] as we saw in (17a).

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priate for Japanese CTopic-marking when other types of scalar is considered.

As mentioned in Section 1.2, the impressions we get from the following examples are "the speaker is not sure whether people other than John came" or "the speaker is not sure whether more than 3 people came"

(2) John-wa kita
John-top came

(3) 3-nin-wa kita
3-class-top came
$\approx$ At least 3 people came

If we adopt Sauerland's (2001) mechanism directly, the computed implicature would be too strong compared with the actual intuition. For example, (2) would imply "Mary didn't come" and (3) would imply "it is not the case that 4 people came" rather than "the speaker is not sure."

(4) $[_{\mathrm{CT}}$ John$]$ came

a. John $<<$ John and Mary $<<$ John, Mary and Bill

b. λP.P(John)(come(x)) (=α)

i. scalar alternative: λP.P(John & Mary)(come(x)) $(= \alpha')$

ii. α' is a scalar alternative of α

iii. α' entails α

iv. α doesn't entail α'

v. Implicature:
$\neg\lambda$P.P(John & Mary)(come(x)) $(= \neg\alpha')$

(5) $[_{\mathrm{CT}}$ Three$]$ people came

a. $1 << 2 << 3 << 4$

b. $|\{x$: person(x)$\cap$come(x)$\}| = 3$ (=α)

i. scalar alternative: $|\{x$: person(x)$\cap$come(x)$\}| = 4$ $(= \alpha')$

ii. α' is a scalar alternative of α

iii. α' entails α

iv. α doesn't entail α'

v. Implicature:
$|\{x$: person(x)$\cap$come(x)$\}| \neq 4$ $(= \neg\alpha')$

Therefore, we need to add an epistemic logic operator (or consider Indeterminate value of Kleene's strong three-valued logic as Oshima (2002) did) to avoid computing implicatures that are too strong.

On the other hand, a scalar alternative of the quantifier wide scope reading (23) is given in (23a). The negation of (23a) cannot be a scalar implicature since (23a) does not entail the asserted proposition. We get the same result for other scalar alternatives, few(x)[[person(x)][¬come(x)]], most(x)[[person(x)][¬come(x)]], more-than-half(x)[[person(x)][¬come(x)]], etc. Therefore, this reading causes a presupposition failure and thus is unavailable for (4).

(23) $\forall x$ [[person(x)][¬ come(x)]]) (=B(F))

a. scalar alternative: some(x)[[person(x)][¬come(x)]] (=B(F'))

b. B(F') doesn't entail B(F)

c. B(F) entails B(F')

1.4.2 Topic in affirmatives

As mentioned briefly in Section 1.2, some quantifiers with Topic marking are infelicitous in affirmative context as in 5.

(5) # zen'in-wa kita.
Everyone-Top came

This can be directly followed by my analysis as follows. (5) has only one possible reading, namely (24), because it only contains one logical operator. None of the scalar alternatives of (24), entails (24). Therefore, Proposition (24) with CTopic is not compatible with the presupposition. Since 24 is the only possible reading for (5), the sentence (5) is infelicitous in any context.

(24) $\forall x$ [[person(x)][come(x)]] (=B(F))

a. scalar alternative: some(x)[[person(x)][come(x)]] (=B(F'))

b. B(F') doesn't entail B(F)

c. B(F) entails B(F')

1.4.3 Proportional and Cardinal *Many*

The interesting contrast between cardinal 'many', *takusan*, and proportional 'many', *ooku*, is explained in this analysis as well. *Takusan* behaves just like *minna* 'everyone', in other words, if it is CTopic-marked, the sentence is disambiguated into the negation-wide-scope reading in negative context and it is infelicitous in affirmative context. On the other hand, the sentence which contains the CTopic-marked *ooku* remains ambiguous in negative context and it is felicitous in affirmative context.

(25) a. TAKUSAN-no-hito-wa ko-nakat-ta
Many-people-CTop come-Neg-Past
It is not the case that many people came. (¬many only)

b. OOKU-no-hito-wa ko-nakat-ta
Many of the people are such that they didn't come. (many¬)
It is not the case that many of the people came. (¬many)

(26) a. # Takusan-no-hito-wa ki-ta.
Many-people-CTop come-Past
'Many people came'

b. Ooku-no-hito-wa ki-ta.
Many-people-CTop come-Past
'Many of the people came'

Some scalar alternatives such as no(x)[[person(x)][¬come(x)]],some(x) [[person(x)][¬come(x)]], etc. do not entail many(x)[[person(x)][¬come(x)]] regardless of *many* being cardinal or proportional. The contrast here is due to the fact that $\forall x$[[person(x)][¬come(x)]] does not entail many$_{card}$(x) [[person(x)][¬come(x)]] but $\forall x$[[person(x)][¬come(x)]] does entail many$_{prop}$ (x)[[person(x)] [¬come(x)]].

The asserted proposition of the quantifier-wide-scope reading of (25a) can be written as (27). $\forall x$[[person(x)][¬come(x)]] does not entail many$_{card}$ [[person(x)][¬come(x)]]. Suppose that there are 80 people in the domain and we say "many people" only when there are more than 100 people. In this situation, $\forall x$[[person(x)][¬come(x)]] is true but many$_{card}$[[person(x)][¬come(x)] is false.

(27) many$_{card}$[[person(x)][¬come(x)]] (=B(F))

a. scalar alternative: $\forall x$[[person(x)][¬come(x)]] (=B(F'))

b. B(F') doesn't entail B(F)

c. B(F) entails B(F')

As a result, many$_{card}$¬ reading of (25a) causes a presupposition failure and thus it cannot be an available reading for (25a).

On the other hand, $\forall x$[[person(x)][¬come(x)]] entails many$_{prop}$[[person (x)][¬come(x)]] since, by definition, the number of being proportionally many cannot overwhelm the number of all the individuals. Therefore, many$_{prop}$ ¬ reading of (25b) induces an implicature, namely $Poss$(¬$\forall x$ [[person(x)][¬ come(x)]]).

1.5 Conclusion

Scope inversion in both Japanese and German can be attributed to the same property of Contrastive Topic: a sentence containing Contrastive Topic induces implicatures. The mechanism for the computation of implicatures, however, is still controversial. Büring's (1997) system generates implicatures by forming a Focus value which is realized on negation. In Japanese, on the other hand, there is no overt realization of Focus on negation. Rather than generalizing Büring's (1997) system, this paper characterized the property of Contrastive Topic as presupposition of a stronger scalar alternatives using Sauerland's (2001) mechanism and attributed the scope inversion to presupposition failure.

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