# Clausal embedding under TO in Japanese as speech acts*

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**Abstract**

We identify several puzzles, some novel, that are posed by clausal embedding under the Japanese complementizer TO. To resolve these puzzles, we present a unified syntax and semantics for TO and clausal embedding under it. Syntactically, we claim that TO-clauses are adjuncts. Interpretationally, we claim that TO embeds speech acts.

## 1 A syntax for *to* clauses

In (1), the TO-clause appears to be selected by the matrix attitude predicate *omou* 'think', and TO seems to be a standard declarative complementizer, similar to English *that*.

(1) Yoko$_k$-wa [**kanojo**$_k$-no jooshi-ga hannin da **to**] **omot**-te iru.
Yoko-TOP she-GEN boss-NOM culprit COP TO think-TE ASP.NPST
'Yoko thinks that her boss is the culprit.'

But, TO-clauses can also be 'unselected', as in (2), unlike English *that*-clauses (cf. [29, 9, 20]).

(2) Yoko$_k$-wa [**kanojo**$_k$-no uta-ga soto-ni kikoeru **to**] mado-o shimeta.
Yoko-TOP she-GEN song-NOM outside-DAT can.be.heard TO window-ACC closed
'Yoko closed the window, thinking that her singing can be heard from outside.'

Since TO-clauses do not need to be the complement of the matrix verb, they can appear in sentences in which another clause led by the complementizer KOTO serves as the complement:

(3) Yoko-wa [Sota-wa mada neteiru **to**] [kare-ga ookii oto-de ongaku-o kake-te
Yoko-TOP Sota-TOP still asleep TO he-NOM large volume-with music-ACC play-TE
iru **koto**]-o hiteishi-ta.
ASP.NPST KOTO-ACC deny-PST
'Yoko denied that Sota is playing loud music, saying/thinking that Sota is still asleep.'

Moreover, in some selected cases like (4), the propositional proform *soo* 'so' can appear in the complement of V, despite that, semantically-speaking, the attitude verb *shinjiru* 'believe' appears to get its propositional argument from the TO-clause. But if TO were replaced with KOTO as in (5), the result would be unacceptable with *soo*. The KOTO-clause appears to be the complement of V in way that the TO-clause is not.

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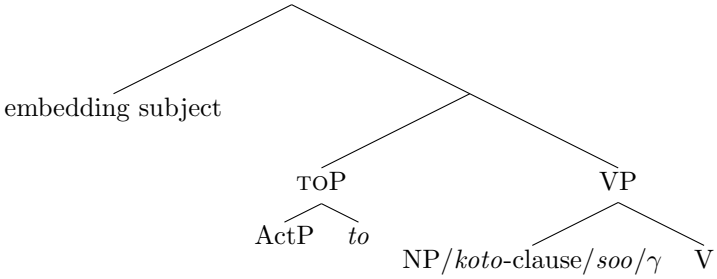
(4) Yoko-no chiimu-ga katsu **to soo** shinji-te iru.
Yoko-GEN team-NOM win.NPST TO so believe-TE ASP.NPST
'(I) believe that Yoko's team will win.'

(5) Yoko-no chiimu-ga katsu **koto**-o (***soo**) shinji-te iru.
Yoko-GEN team-NOM win.NPST KOTO-ACC so believe-TE ASP.NPST
'(I) believe that Yoko's team will win.'

Especially in cases like (2)-(4), the TO-clause appears to be a VP adjunct. We adopt the VP adjunct analysis for all TO-clauses, and argue that this analysis helps to explain puzzling facts about cases where the TO-clause looks at first glance like it is the complement of an attitude verb. We present a schematic syntactic structure in (6) (cf. similar structures in [33, 9]).

(6) Schematic syntactic structure for sentences with TO-clauses




## 2 An interpretation for selected and unselected *to*-clauses

TO is sometimes described as a declarative complementizer (e.g. [18]). Others have treated it as a quotative marker (e.g. [26]). Given the unselected cases above, and other relevant properties below, we think the latter view is on the right track. However, while it is true that TO *can* embed direct quotations, it does not *have to*. First, notice that if (1) and (2) involved direct quotations, then the bolded pronouns coindexed with the matrix subjects would need to be first person, but they are not. Second, (7) demonstrates the ability to form matrix *wh*-questions from within the TO-clause, which would be impossible if this were a direct quotation.

(7) Yoko$_k$-wa [**kanojo**$_k$-no jooshi-ga **itsu** modoru to] ii-mashi-ta ka?
Yoko-TOP she-GEN boss-NOM when return.NPST TO say-POL-PST Q
'When did Yoko say that her boss would return?'

Thus we build on Saito's view, arguing that TO embeds *speech act phrases* (ActPs). This analysis will be crucial in explaining data from section 3. To implement this, we use an event semantics (building on [4, 9], a.o.). TO takes an ActP as input (we use the variable '$S$' to range over speech acts), and acts as a speech report verb, as in (8).

(8) $[\![\text{to}]\!] = \lambda S.\lambda x.\lambda e.\lambda w.\ \exists e'[\text{utterance}(e', w)\ \&\ \text{agent}(e', x)\ \&\ \text{content}(e', w) = S\ \&\ e' \star e]$

We assume utterance events can be verbal or mental, and that their content is the content of the speech act (cf. [17]). (8) introduces an existentially bound event $e'$ that is the event of the embedded speech act. The final conjunct pertains to how $e'$ relates to the matrix event $e$. Note that '$\star$' cannot be mere temporal overlap: $e$ and $e'$ overlap temporally in (9), and yet it is infelicitous (cf. [10, 9]). We tentatively conclude that '$\star$' must enforce a stronger, causal relation between the two events.

(9) ??Yoko-wa [kyoo shokuba-de yat-ta koto-wa tadashikat-ta **to**] saba-o
Yoko-WA today work.place-at do-PST thing-WA right-PST TO mackerel-ACC
oobun-ni ireta.
oven-in put.in.PST
'Yoko put the mackerel in the oven, (while) thinking she did the right thing at work today.'

Given (6) and (8), the TOP and VP nodes will be of the same type, $\langle e\langle v\langle st\rangle\rangle\rangle$, thus combinable via predicate modification. Once combined with the matrix subject, and with the event existentially closed, the predicted interpretation for the unselected case in (2) will be as in (10). We leave ActPs unanalyzed here, as a full theory of speech acts is beyond the scope of this work. What matters is that speech acts are contentful events, attributable to an agent.

(10) $[\![(2)]\!] = \lambda w.\ \exists e[\text{closing}(e,w)\ \&\ \text{agent}(e,\textit{yoko})\ \&\ \text{patient}(e,\textit{the window})$
$\&\ \exists e'[\text{utterance}(e',w)\ \&\ \text{agent}(e',\textit{yoko})\ \&\ \text{content}(e',w) = [\![[_{ActP}$ kanojo-no uta-ga soto-ni kikoeru$]\!]\ \&\ e' \star e]]$

Turning now to our analysis of selected cases like (1), recall that the propositional argument of an attitude verb is sometimes delivered overtly by a KOTO-clause as in (3), or by a pronoun *soo* as in (4). When the propositional argument of the attitude comes from a TO-clause as in (1), we propose that the complement of V is a silent pronoun $\gamma$ (as seen in (6)) that picks up its content from the speech act embedded in the TO-clause in the preceding part of the sentence (this analysis takes inspiration from the use of silent propositional anaphora in the focus literature, e.g. [25], as well as the polar particle literature, [13, 23]). Assuming a semantics for *omou* 'think' as in (11), the interpretation for (1) is as in (12).

(11) $[\![\text{omou}]\!] = \lambda p.\lambda x.\lambda e.\lambda w.\ \text{believe}(e,w)\ \&\ \text{exp}(e,x)\ \&\ \forall w' \in \text{content}(e,w)[p(w') = 1]$

(12) $[\![(1)]\!] = \lambda w.\ \exists e[\text{believe}(e,w)\ \&\ \text{exp}(e,\textit{yoko})$
$\&\ \forall w' \in \text{content}(e,w)[\textit{her boss is the culprit in } w']$
$\&\ \exists e'[\text{utterance}(e',w)\ \&\ \text{agent}(e',\textit{yoko})\ \&\ \text{content}(e',w)$
$= [\![[_{ActP}$ kanojo-no jooshi-ga hannin da$]\!]\ \&\ e' \star e]]$

## 3 Two interpretational puzzles explained by our analysis

The utility of the silent pronoun analysis becomes more apparent when considering (13) and (14), which introduce another interesting empirical property: TO enables polar interrogatives marked by the Q-particle *ka* to be 'selected by' predicates that do not select for interrogatives, *antirogative* predicates, like *omou* 'think' and *kitaisuru* 'hope'. Despite the acceptability of (13) and (14), since *omou* is antirogative, it cannot combine with the polar question meanings of these TO-clauses. Intuitively, interrogatives embedded under TO convey a weaker meaning than declaratives embedded under TO, as in (1). We refer to this weakening effect as *hedging*, and we indicate it in the English translation of (13) via the epistemic modal 'might'.

(13) Yoko$_k$-wa [kanojo$_k$-no jooshi-ga hannin **ka to**] **omot**-te iru.
Yoko-TOP she-GEN boss-NOM culprit Q TO think-TE ASP.NPST
'Yoko thinks that her boss **might** be the culprit.'

(14), which contains a negation, also has a hedging effect relative to (1). At the same time, (14) is not as hedged as the embedded positive interrogative in (13). The examples form a scale

then, with the embedded declarative (1) the least hedged, the embedded positive interrogative (13) the most hedged, and the embedded negative polar interrogative (14) in the middle. This is why we translate the declarative as unmodalized, the positive interrogative with 'might', and the negated version with 'probably'.

(14) Yoko$_k$-wa [kanojo$_k$-no jooshi-ga hannin ja **nai ka to**] **omot**-te i-ru.
Yoko-top she-GEN boss-NOM culprit COP.WA NEG Q TO think-TE ASP-NPST
'Yoko thinks that that her boss is **probably** the culprit.'

To analyze these facts, we hypothesize that the pronoun $\gamma$ is able to pick up the speaker bias associated with questions embedded under TO. For a positive polar question like in (13), the idea is that the matrix subject's mental utterance of the question is motivated by positive evidential bias of the sort discussed in the literature on biased questions, which takes this bias to be a pragmatic inference ([2, 24, 28, 30, 14]. We model the bias here as a modalized proposition, *that her boss might be the culprit.* We do not necessarily believe that the bias actually *is* a modalized proposition (though such an analysis could be given in principle); rather, bias is a pragmatic implicature, and a modalized proposition is a reasonably close approximation of that meaning that allows us to explore the compositional interpretation of the matrix clause. Following [32, 4, 1], when a modal is embedded under a representational attitude, the worlds made accessible by the attitude serve as the domain for the modal. *Might* then imposes existential quantification on that domain, leading to the following interpretation for (13):

(15) $[\![(13)]\!] = \lambda w.\ \exists e[\text{believe}(e, w)\ \&\ \exp(e, yoko)$
$\&\ \exists w' \in \text{content}(e, w)[\textit{her boss is the culprit in } w']$
$\&\ \exists e'[\text{utterance}(e', w)\ \&\ \text{agent}(e', yoko)\ \&\ \text{content}(e', w)$
$= [\![[_{ActP}\ \text{kanojo-no jooshi-ga hannin ka?}]]\!]\ \ \&\ e' \star e]]$

The only difference (besides the content of the embedded speech act) is in the force of quantification over of the doxastically accessible worlds made available by the matrix attitude *omou* (existential in (15), universal in (12)). This difference in strength captures the intuitive difference discussed above, thus providing the desired interpretation for (13).

As for (14), the fact that it falls in the middle of the hedging scale between (1) and (13) as discussed above is unsurprising on the view that what is embedded in (14) is a positively biased negative polar question. High negation questions have been show to convey a relatively strong positive speaker bias in various languages ([24, 3]). Positive speaker bias in negative polar questions has been studied in Japanese ([28, 5, 8, 7, 19, 27]). If the embedded TO-clause in (14) contains a positively biased negative polar question, and if $\gamma$ is picking up the biases of the questions embedded under TO, then we expect (14) to convey a hedge relative to (1), but less of a hedge than (13). We represent the stronger bias of negative polar questions in the metalanguage by a stronger, but non-maximal, modal like *probably* or *good possibility*, as analyzed in the graded modality of [11, 12] (the graded distinction could just as well be cast in terms of a probability semantics for modals, as in [15]). The interpretation of (14) then requires that there is a world $w'$ among the doxastically accessible worlds such that the propositional prejacent of the question holds in all of the accessible worlds $w''$ more optimal than $w'$.[1]

[1] Following [12], the context $c$ provides the function $g$, which takes the world of evaluation $w$ as input, and produces the ordering source necessary to induce an ordering on the accessible worlds (being lower on the ordering means being more optimal):

(i) $\forall w, w' \in \text{content}(e, w)[w \leq_{g(w)} w' \Leftrightarrow \{p \in g(w) \mid w \in p\} \supseteq \{p \in g(w) \mid w' \in p\}]$

(16) $[\![(14)]\!] = \lambda w.\ \exists e[\text{believe}(e, w)\ \&\ \exp(e, yoko)$
$\&\ \exists w' \in \text{content}(e, w)$
$[\forall w'' \in \text{content}(e, w)[w'' \leq_{g(w)} w' \rightarrow \textit{her boss is the culprit in } w'']]$
$\&\ \exists e'[\text{utterance}(e', w)\ \&\ \text{agent}(e', yoko)$
$\&\ \text{content}(e', w) = \text{content}([\![[_{SAP}\ \text{kanojo}_k\text{-no jooshi-ga hannin ja nai}_{tc}\ \text{ka?}]]\!])\ \&\ e' \star e]]$

The result is as desired: the interpretation for (14) in (16) is stronger than the interpretation for (13) in (15) since, if every accessible $w''$ that is at least as optimal as a specific $w'$ is one in which her boss is the culprit, then there is an accessible world in which her boss is the culprit, namely $w'$. And the interpretation for (1) in (12) is stronger than (16) since it says every accessible world is one which her boss is the culprit, thus there is one such that every world at least as optimal as it is one in which her boss is the culprit. So we have derived the scale of strength among the arguments of *omou* in our examples: (from strongest to weakest) (1) > (14) > (13).

One final interesting empirical property is that a TO-clause combined with *kitaisuru* 'hope' produces a stronger attitude than a KOTO-clause combined with *kitaisuru*, or English *hope that*. Suppose Yoko has no idea if her boss is the culprit, but she hopes he is. In such a context, the English sentence 'Yoko hopes that her boss is the culprit' is felicitous and true, but the Japanese sentence in (17) is not because it implies that Yoko takes the prejacent to be a much stronger likelihood than having no idea either way, as indicated by the English translation.

(17) $\text{Yoko}_k$-wa [$\text{kanojo}_k$-no jooshi-ga hannin da **to**] **kitaishi**-te ir-u.
Yoko-top she-GEN boss-NOM culprit COP.NPST TO hope-TE ASP-NPST
'Yoko hopes **and also strongly suspects** that her boss is the culprit.'

This generalization is further supported by the contrast in (18): The use of TO requires a high degree of confidence on the part of Yoko that the rain will stop, which in turn makes the continuation 'she's now almost given up' inappropriate. The acceptability of KOTO in (18) shows that these facts cannot be captured by proposing a stronger semantics for Japanese *kitaisuru* than English *hope*.

(18) Yoko-wa [ame-ga yam-u {**koto**-o/**??to**}] kitaishi-te-wa i-ru-kedo,
Yoko-WA rain-NOM stop-NPST KOTO-ACC/TO hope-TE-WA ASP-NPST-though
moo hotondo akirame-te i-ru.
already almost give.up-TE ASP-NPST
'Though Yoko hopes that the rain will stop (??and she strongly suspects it will), she's now almost given up.'

To explain these facts, we need a semantics for *kitaisuru*. The following is a simplified semantics for emotive doxastics based on [1] (see also [6, 31, 22, 21]).

(19) $[\![\text{kitaisuru}]\!] = \lambda p.\lambda x.\lambda e.\lambda w.\ \text{hope}(e, w)\ \&\ \exp(e, x)$
$\&\ \neg\forall w' \in \text{content}(e, w)[p(w') = 1]$ uncertainty requirement
$\&\ \exists w' \in \text{content}(e, w)[p(w') = 1]$ doxastic requirement
$\&\ p >_{DES_{x,w}} \neg p$ preference requirement

The content of a hoping event is a set of doxastically accessible worlds. Thus the uncertainty requirement in (19) is that the prejacent $p$ doesn't hold throughout the doxastically accessible worlds ($p$ is not maximally believed). The doxastic requirement in (19) is that the prejacent $p$

is doxastically possible (not believed to be false). The preference requirement in (19) is that $p$ is preferred to $\neg p$ by $x$ in $w$.[2] The predicted interpretation for (17) is as follows:

(20) $[\![(17)]\!] = \lambda w.\ \exists e[\text{hope}(e, w)\ \&\ \text{exp}(e, yoko)$
$\&\ \neg\forall w' \in \text{content}(e, w)[\textit{her boss is the culprit in } w']$ uncertainty requirement
$\&\ \exists w' \in \text{content}(e, w)[\textit{her boss is the culprit in } w']$ doxastic requirement
$\&\ \textit{her boss is the culprit} >_{DES_{x,w}} \neg\ \textit{her boss is the culprit}$ preference requirement
$\&\ \exists e'[\text{utterance}(e', w)\ \&\ \text{agent}(e', yoko)$
$\&\ \text{content}(e', w) = \text{content}([\![[_{SAP}\ \text{kanojo}_k\text{-no jooshi-ga hannin da}]]\!])\ \&\ e' \star e]]$

The asymmetry between the Japanese (17) and the English translation of it is that the prejacent merely needs to be doxastically possible in English, but that Yoko must believe it to be a stronger likelihood than that in Japanese. The semantics in (19) doesn't capture this fact about Japanese, since it merely requires the prejacent to be doxastically possible. However, it would be hasty to revise the semantics for *kitaisuru* 'hope' for two reasons. First, if we change the complementizer in (17) from TO to KOTO, then the doxastic requirement for the prejacent weakens to something indistinguishable from English, a fact that was further confirmed by the minimal pair in (18). This suggests that the weak doxastic requirement in the semantics in (19) is on the right track for Japanese after all. Second, the contribution of the TO-clause in (20) can account for the asymmetry, since it attributes an assertion of "Her boss is the culprit" to Yoko. We assume a commitment-based view of assertion ([16]), which bears an indirect relationship with the agent's beliefs: in many cases, an agent's choice to commit to vindicate the truth of a proposition $p$ will coincide with the agent's belief in $p$. But nothing requires this—the agent can commit to $p$, and so assert it, even if $p$ is merely very likely according to their beliefs. We can model this as an entailment from an agent's commitment to their beliefs as follows:

(21) If A commits to $p$, then $\exists\mathcal{O}$ such that $\mathcal{O}$ is an optimal subset of A's doxastically accessible worlds & $\mathcal{O} \subseteq p$

This entailment swamps the doxastic requirement of (19), making the Japanese (17) doxastically stronger than its English translation, as desired. At the same time, whenever a TO-assertion is embedded under *kitaisuru* 'hope', the uncertainty requirement of (19) will force $\mathcal{O}$ to be a *proper* subset of A's doxastically accessible worlds. This explains why Yoko's attitude about $p$ in (17) is doxastically stronger than the English translation, and stronger than if the complementizer were KOTO, while at the same time explaining why Yoko's doxastic attitude about $p$ in (17) is not maximally strong.

# 4 Conclusion

We have provided a unified analysis of 'selected' and 'unselected' TO-clauses that produces empirically adequate, compositionally-derived interpretations for various empirical facts, including two novel observations: (i) TO-embedding of declaratives and biased polar interrogatives produces a scale of strength among attitude arguments; and (ii) that TO+*kitaisuru* is stronger than a vanilla semantics for 'hope' would predict.

[2] Definition of $>_{DES_{x,w}}$ [1, p. 20]:

(i) $\forall w, w', w'' \in \text{content}(e, w)[w' >_{DES_{x,w}} w'' \Leftrightarrow w'$ is more desirable to $x$ in $w$ than $w'']$

(ii) $\forall p, q \subseteq W[p >_{DES_{x,w}} q \Leftrightarrow \forall w'' \in q[\exists w' \in p[w' >_{DES_{x,w}} w'']]\ \&\ \exists w' \in p[\forall w'' \in q[w'' \not>_{DES_{x,w}} w']]]$

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