

# Clausal embedding under TO in Japanese as speech acts\*

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## 1 Introduction

- (1) displays a Japanese sentence with an embedded declarative clause
- (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.'
- (2) *Template for Japanese sentences in this talk*  
<matrix subject> [<embedded clause> <complementizer> ] <matrix verb>
- TO in (1) seems like a typical declarative complementizer (like e.g. *that* in English)
  - (3) features an embedded interrogative clause, indicated by the Q particle *ka*
- (3)  $Yoko_k$ -wa [kanojo $_k$ -no jooshi-ga hannin **ka**] {shit/\*omot/\*kitaishi}-te iru.  
Yoko-TOP she-GEN boss-NOM culprit Q know/think/hope-TE ASP.NPST  
'Yoko {knows/\*thinks/\*hopes} whether her boss is the culprit.'
- Unsurprisingly, the embedded interrogative in (3) is acceptable under the responsive predicate *shiru* 'know', but not under antirogative predicates like *omou* 'think' and *kitaisuru* 'hope'
  - Now consider (4), which features an interrogative embedded under TO
- (4)  $Yoko_k$ -wa [[kanojo $_k$ -no jooshi-ga hannin **ka**] **to**] {omot/kitaishi}-te iru.  
Yoko-TOP she-GEN boss-NOM culprit Q TO think/hope-TE ASP.NPST  
'(Lit.) Yoko {thinks/hopes}, is her boss the culprit.'  
'Yoko {thinks/is hopeful} that her boss might be the culprit.'
- **Surprisingly**, the embedded interrogative in (4) is **acceptable** under the antirogative matrix verbs *omou* 'think' and *kitaisuru* 'hope'<sup>1</sup>

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<sup>1</sup>N.b., we know that what's embedded here and in following examples is not a direct quotation because the 3rd person pronoun *kanojo* 'she' is coreferential with the matrix subject.

- One possible explanation: the clause embedded under TO in (4) is not actually interrogative:
  - Yoon 2011, 2013: (*nai*) *ka to* is a kind of subjunctive marker
  - Mizuno 2022: *to* is a declarative complementizer, *ka* is a “modally functioning Q particle” that contributes doxastic uncertainty
- Our view: TO can embed **genuine interrogatives** (as well as other clause types)

### Key components of our analysis

- TO embeds main clause phenomena—speech acts attributed to the embedding subject—including questions
  - Clauses embedded under TO do **not** compose directly with embedding attitude verbs
  - Instead, embedding verbs compose with **propositional content** that arises from the speech act embedded under TO
  - Preview: antirogrative verbs in (4) compose with the bias of the TO-embedded question
- This analysis enables explanations of other interesting facts about TO-embedding (graded hedging, strong emotive doxastics)

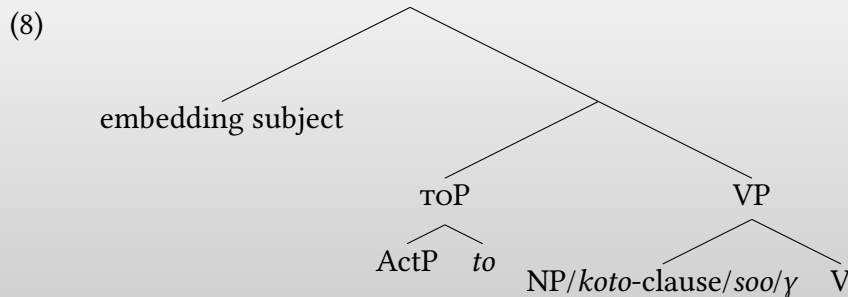
## 2 TO-clauses can be syntactic adjuncts

- (1) demonstrated a TO-clause that appeared to be selected by the matrix predicate
  - TO-clauses can also be ‘unselected’, as in (5), unlike English *that*-clauses (cf. Tomioka & Kim 2016; Kim 2018; Özyıldız 2019).
- (5) Yoko<sub>k</sub>-wa [kanojo<sub>k</sub>-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.’
- TO-clauses can also appear in sentences in which another clause serves as the complement
- (6) 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.’
- In some cases, like (7), 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 replace TO with KOTO, and the result is unacceptable with *soo*.

- (7) [Yoko-no chiimu-ga katsu {to/\*koto-o}] soo shinji-te iru.  
 Yoko-GEN team-NOM win.NPST TO/KOTO-ACC so believe-TE ASP.NPST  
 ‘(I) believe that Yoko’s team will win.’

- The KOTO-clause appears to be the complement of V in way that the TO-clause is not.
- See a schematic syntactic structure in (8) (cf. similar structures in Kim (2018); Yamada (2019)).

### Schematic syntactic structure for sentences with to-clauses



## 3 An interpretation for ‘unselected’ TO-clauses

- Building on Saito’s (2012) view of TO as a quotative marker and Kim’s (2018) analysis of unselected cases, we analyze TO as embedding *speech act phrases* (ActPs).
- 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 (9).

(9)  $[[to]] = \lambda S.\lambda x.\lambda e.\lambda w. \exists e' [utterance(e', w) \ \& \ agent(e', x) \ \& \ content(e', w) = S \ \& \ e' \star e]$

- We assume utterance events can be verbal or mental, and that their content is the content of the speech act (cf. Maier 2017).
- (9) introduces an existentially bound event  $e'$  that is the event of the embedded speech act.
- ‘ $\star$ ’ in the final conjunct stands in for a family of rhetorical relations between  $e'$  and the matrix event  $e$ . In a case like (5), this is a causal relation<sup>2</sup>

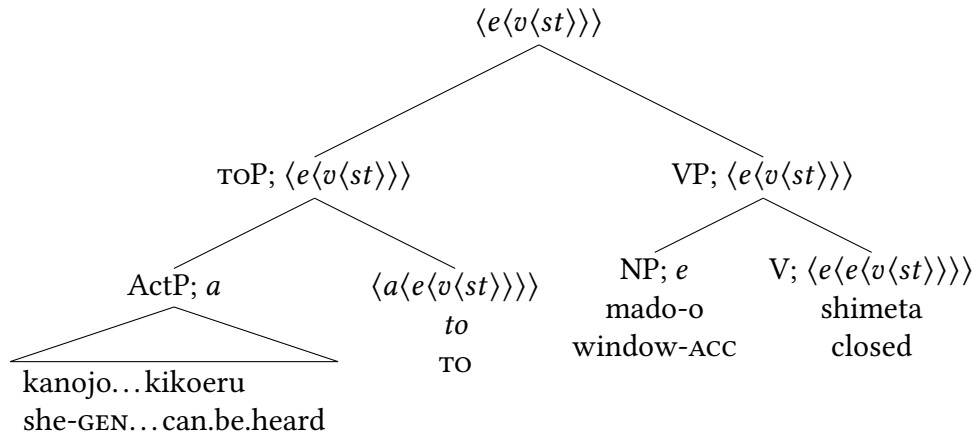
<sup>2</sup>(i) shows that ‘ $\star$ ’ cannot be mere temporal overlap:  $e$  and  $e'$  overlap temporally in (i), and yet it is infelicitous (cf. Kim & Tomioka (2014); Kim (2018))

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

- (5) *Yoko<sub>k</sub>-wa* [*kanojo<sub>k</sub>-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.’

- A partial structure for (5) is in (10).
- TOP and VP nodes are of the same type,  $\langle e\langle v\langle st \rangle \rangle \rangle$ , so combinable via predicate modification<sup>3</sup>

- (10) *Partial structure for (5) with types*



- Once combined with the matrix subject, and with the event existentially closed, the predicted interpretation for an unselected case like (5) is as in (11)

- (11)  $\llbracket (5) \rrbracket = \lambda w. \exists e[\text{closing}(e, w) \ \& \ \text{agent}(e, \text{yoko}) \ \& \ \text{patient}(e, \text{the window})$   
 $\ \& \ \exists e'[\text{utterance}(e', w) \ \& \ \text{agent}(e', \text{yoko}) \ \& \ \text{content}(e', w) = \llbracket [\text{ActP } \text{kanojo-no uta-ga soto-}$   
 $\ \text{ni kikoeru}] \rrbracket \ \& \ e' \star e]$

- 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.

## 4 Extending the analysis to ‘selected’ TO-clauses

- We saw that the propositional argument of an attitude verb is sometimes delivered overtly by a KOTO-clause as in (6), or by a pronoun *soo* as in (7).
- Consider again a case in which the propositional argument seems to come directly from the TO-clause, like (1)

- (1) *Yoko<sub>k</sub>-wa* [*kanojo<sub>k</sub>-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.’

<sup>3</sup>The semantic types assumed are  $e$  for individuals,  $v$  for events,  $s$  for worlds, and  $a$  for speech acts ( $a$  is a place holder for the type of speech acts in whichever theory of them one adopts).

### Silent pronoun $\gamma$

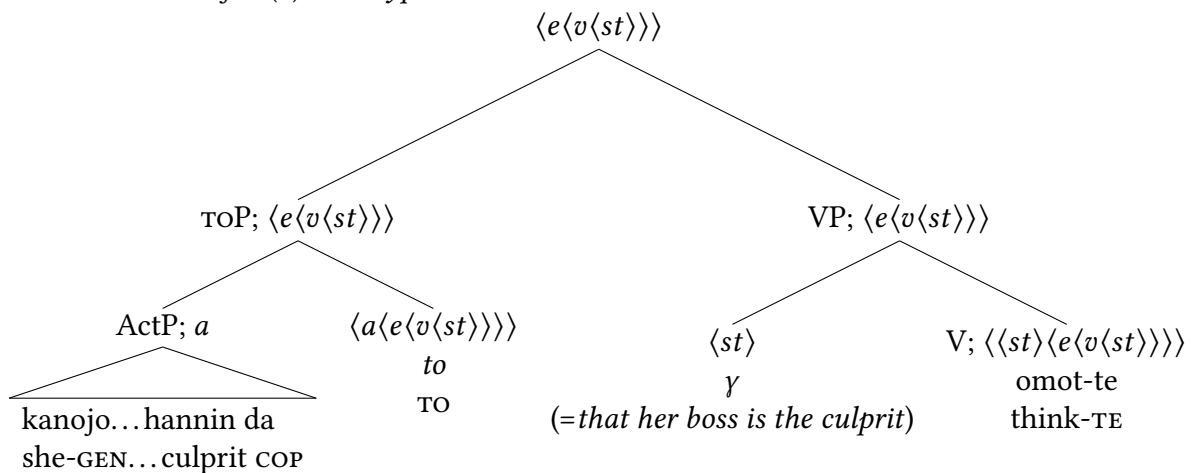
- In selected cases like (1), we propose that the complement of V is a silent pronoun  $\gamma$  that picks up propositional content from the speech act embedded in the TO-clause in the preceding part of the sentence<sup>a</sup>
- In (1), TO embeds an assertion;  $\gamma$  picks up the proposition asserted, *that Yoko's boss is the culprit*

<sup>a</sup>This analysis takes inspiration from the use of silent propositional anaphora in the focus literature, e.g. Rooth 1992.

- Assuming a semantics for *omou* 'think' as in (12), a partial structure is displayed in (13), and the interpretation for (1) is as in (14).

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

(13) *Partial structure for (1) with types*



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

## 5 Explaining TO-embedded interrogatives combined with antirogrative predicates

- Recall: TO allows polar interrogatives to combine with antirogrative predicates like *omou* 'think' as in (15)

(15) Yoko<sub>k</sub>-wa [kanojo<sub>k</sub>-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.'

- Intuitively, interrogatives embedded under TO like in (15) convey a weaker meaning than declaratives embedded under TO like in (1).
- We refer to this weakening effect as *hedging*, and we indicate it in the English translation of (15) via the epistemic modal ‘might’.

To capture this hedging effect, we hypothesize that the pronoun  $\gamma$  is able to pick up biases associated with questions embedded under TO

- Positive polar questions can have positive evidential bias (Büring & Gunlogson 2000, a.o.)
- (16) a. A and B are in the basement. A thought that they were home alone because Yoko went out earlier, but then she hears a noise upstairs, and says to B:  
b. Yoko kaet-te ru (ka)?  
Yoko return-TE ASP.NPST Q  
‘Is Yoko home?/Has Yoko returned?’  
↪ Evidential bias: *that Yoko might be home*

- We model the bias in (15) as a modalized proposition, *that her boss might be the culprit*<sup>4</sup>
- When a modal is embedded under a representational attitude, the worlds made accessible by the attitude serve as the domain for the modal (Yalcin, 2007; Hacquard, 2010; Anand & Hacquard, 2013)
- *Might* then imposes existential quantification on that domain, leading to the following interpretation for (15)

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

- The difference in the **force of quantification** over the doxastically accessible worlds— $\forall$  in (14),  $\exists$  in (17)—explains the hedging effect

## 5.1 A consequence: the graded hedging scale

- Positively biased negative polar questions convey a strong bias for the positive answer (Romero & Han, 2004; Goodhue, 2022, a.o.)
- This is so in Japanese as well (Ito & Oshima, 2016; Shimoyama et al., 2019)

- (18) Context: A is eating an orange. B has already eaten one from the same bag and it was exceptionally sweet. B says to A:

<sup>4</sup>We don’t necessarily believe that bias actually *is* a modalized proposition; 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.

- (19) Amak-u **nai**<sub>tc</sub>?      ↑ (\*↓)      (tc='tonally compressed')  
sweet-INF **NEG**<sub>tc.NPST</sub>  
'Isn't it sweet?'  
↪ Speaker bias: *that the orange is probably sweet*

- Positively biased negative polar questions can be embedded under TO as well:

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

- Like (15), (20) also has a hedging effect relative to (1)
- But (20) is not as hedged as the embedded positive interrogative in (15)
- The examples form a scale:

- (21) *Graded hedging scale (from strongest to weakest)*  
declarative (1) > negative polar interrogative (20) > positive polar interrogative (15)

- To capture this, we can represent the speaker bias of the TO-clause in (20) in the metalanguage by a stronger, but non-maximal, modal like *probably* or *good possibility*
- This explains why we observe graded hedging as in (21): *S believes p* unilaterally entails *S believes probably p*, and *S believes probably p* unilaterally entails *S believes might p*<sup>5</sup>

### Key component of our analysis enabling this explanation

Antirogatives compose with bias arising from TO-embedded questions; this in turn depends on the view that TO embeds speech acts

## 6 Another puzzle: the doxastic strength of TO-clauses combined with *kitaisuru* 'hope'

- A TO-clause combined with *kitaisuru* 'hope' produces a doxastically stronger attitude than English *hope that*.
  - (22a) is felicitous and true in the context of (22).
  - (22b) is not; it implies that Yoko takes the prejacent to be a stronger likelihood than having no idea either way, as indicated by the English translation.
- (22) Context: Yoko has no idea if her boss is the culprit, but she hopes he is.
- a. Yoko hopes that her boss is the culprit.

<sup>5</sup>Theories of graded modality can deliver these entailments (e.g. Kratzer, 1981, 1991; Lassiter, 2017).

b. ??Yoko<sub>k</sub>-wa [kanojo<sub>k</sub>-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.'

- One might wonder if this shows a strength/meaning difference between the verbs *kitaisuru* and *hope* themselves
- But combining *kitaisuru* with a different, nominalizing 'complementizer', KOTO, returns a weaker meaning, more comparable to the English one

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

- In (23), 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.
- Cf. the unacceptability of (24)

(24) ??Though Yoko hopes that the rain will stop, and she strongly suspects it will, she's now almost given up.

- On the other hand, KOTO is acceptable in (23), suggesting that we shouldn't propose a stronger semantics for Japanese *kitaisuru* than English *hope*

### Explanation for the asymmetry

- TO in (22b) and (23) attributes an assertion of the clause embedded under TO to the matrix subject Yoko; KOTO and English *that* do not
- Thus, when TO is used, Yoko has a stronger commitment to her boss being the culprit in (22b) and to the rain stopping in (23) than KOTO or *that* deliver<sup>a</sup>

<sup>a</sup>See appendix for detail on how TO-clause assertions interact with the semantics of *kitaisuru* 'hope'.



## 7 Conclusion

### Our analysis provides:

- a single semantics for TO that derives correct interpretations for ‘selected’ TO-clauses like (1) and ‘unselected’ TO-clauses like (5);
- an explanation for how TO-interrogatives combine with antirogative predicates;
- and explanations for two novel puzzles:
  1. Why TO-embedding of declaratives and polar interrogatives produces a graded hedging scale
  2. Why TO-embedding of declaratives combined with *kitaisuru* is stronger than a vanilla semantics for emotive doxastics would predict
- Key to our analysis was allowing embedding verbs to compose with propositional content arising from speech acts embedded under TO

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## A Appendix

### A.1 How TO embedding strengthens *kitaisuru* ‘hope’

- We adopt the following semantics for emotive doxastics based on Anand & Hacquard (2013) (see also Heim (1992); Villalta (2008); Portner & Rubinstein (2013); Portner (2018)).

$$(25) \quad \begin{aligned} \llbracket \textit{kitaisuru} \rrbracket &= \lambda p. \lambda x. \lambda e. \lambda w. \text{hope}(e, w) \ \& \ \text{exp}(e, x) \\ &\& \ \neg \forall w' \in \text{content}(e, w) [p(w') = 1] && \text{uncertainty requirement} \\ &\& \ \exists w' \in \text{content}(e, w) [p(w') = 1] && \text{doxastic requirement} \\ &\& \ p >_{DES_{x,w}} \neg p && \text{preference requirement} \end{aligned}$$

- The content of a hoping event is a set of doxastically accessible worlds.
- The uncertainty requirement in (25) is that the prejacent  $p$  doesn’t hold throughout the doxastically accessible worlds ( $p$  is not maximally believed).
- The doxastic requirement in (25) is that the prejacent  $p$  is doxastically possible (not believed to be false).
- The preference requirement in (25) is that  $p$  is preferred to  $\neg p$  by  $x$  in  $w$ .<sup>6</sup>
- The predicted interpretation for (22b):

$$(26) \quad \begin{aligned} \llbracket (22b) \rrbracket &= \lambda w. \exists e [\text{hope}(e, w) \ \& \ \text{exp}(e, \textit{yoko}) \\ &\& \ \neg \forall w' \in \text{content}(e, w) [\textit{her boss is the culprit in } w'] && \text{uncertainty requirement} \\ &\& \ \exists w' \in \text{content}(e, w) [\textit{her boss is the culprit in } w'] && \text{doxastic requirement} \\ &\& \ \textit{her boss is the culprit} >_{DES_{x,w}} \neg \textit{her boss is the culprit} && \text{preference requirement} \\ &\& \ \exists e' [\text{utterance}(e', w) \ \& \ \text{agent}(e', \textit{yoko}) \\ &\& \ \text{content}(e', w) = \text{content}(\llbracket [_{SAP} \textit{kanojo}_k\text{-no jooshi-ga hannin da} \rrbracket]) \ \& \ e' \star e]] \end{aligned}$$

- The asymmetry between (22b) and the English “Yoko hopes that her boss is the culprit” 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 (25) doesn’t capture this, since it merely requires the prejacent to be doxastically possible

<sup>6</sup>Definition of  $>_{DES_{x,w}}$  (Anand & Hacquard, 2013, p. 20):

- (i)  $\forall w, w', w'' \in \text{content}(e, w) [w' >_{DES_{x,w}} w'' \Leftrightarrow w' \text{ is more desirable to } x \text{ in } w \text{ than } w'']$
- (ii)  $\forall p, q \subseteq W [p >_{DES_{x,w}} q \Leftrightarrow \forall w'' \in q [\exists w' \in p [w' >_{DES_{x,w}} w'']] \ \& \ \exists w' \in p [\forall w'' \in q [w'' \not>_{DES_{x,w}} w']]]$

- The contribution of the TO-clause in (26) 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 (MacFarlane 2011)
- Commitment bears an indirect relationship with belief
- 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 a perhaps defeasible or contextual entailment from an agent’s commitment to their beliefs as follows:

(27) If A commits to  $p$ , then  $\exists O$  such that  $O$  is an optimal subset of A’s doxastically accessible worlds &  $O \subseteq p$

- This entailment swamps the doxastic requirement of (25), making the Japanese (22b) 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 (25) will force  $O$  to be a *proper* subset of A’s doxastically accessible worlds
- This explains why Yoko’s attitude about  $p$  in (22b) 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 (22b) is not maximally strong

## A.2 Toward an explanation of necessity modals under emotive doxastics

- Anand & Hacquard (2013) note the impossibility of embedding epistemic necessity modals under emotive doxastics like *hope* in some languages, and argue it is due to the uncertainty requirement in (25)
- Since the prejacent  $p$  does not hold throughout the doxastic state, when the epistemic necessity modal quantifies universally over that state, it finds non- $p$  worlds, resulting in a clash
- Interestingly, Japanese seems to be an exception. *must* can appear with *kitaisuru* ‘hope’ when embed under TO:

(28) Jo-wa [Bo-ga katsu **nitigainai** to] kitaisiteiru.  
Jo-TOP Bo-NOM win **must** TO hope  
(lit.) #‘Jo hopes that Bo must win.’

(Mizuno, 2022, 420)

- Meanwhile, epistemic necessity modals cannot be embedded under KOTO under *kitaisuru*:

(29) ??Jo-wa [Bo-ga katsu **nitigainai** koto]-o kitaisiteiru.  
Jo-TOP Bo-NOM win **must** KOTO-ACC hope  
(lit.) #‘Jo hopes that Bo must win.’

- Why this asymmetry? We believe it may be explained by the special nature of TO-clause embedding
- When TO embeds an assertion, the matrix subject makes a commitment to  $p$ , which by hypothesis means  $p$  holds throughout  $O$  as in (27)
- In (28),  $O$  provides the domain of quantification for the modal, which requires  $p$  to hold throughout  $O$ , but not throughout the doxastically accessible worlds, thus meeting the uncertainty requirement in (25) while also rendering the use of the modal acceptable<sup>7</sup>
- In (29), there is no domain for the modal to quantify over besides the entire domain of doxastically accessible worlds provided by *kitaisuru*, resulting in infelicity as explained by Anand & Hacquard (2013)
- That said, more work is needed on the empirical facts surrounding modal embedding under attitudes in Japanese

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<sup>7</sup>Cf. Mizuno (2022), who argues that TO is a declarative complementizer, while *ka* is a ‘modally-functioning Q particle’ that is the morphological exponent of the uncertainty requirement in (25). Mizuno’s account cannot explain why (22b) and (23), which lack *ka*, express something weaker than full certainty, nor can it explain why epistemic necessity is unacceptable in (29).