Uegaki 2021 The doubt-whether puzzle

1. The empirical picture

English:

(1) Ann doubts that they serve breakfast. (Declarative)
(2) Ann doubts whether they serve breakfast. (PolQ)

(3) *Ann doubts whether they serve breakfast or not. (PolQvN)
(4) *Ann doubts whether they serve coffee or tea.(AltQ)
(5) *Ann doubts who has passed the test. (Constituent wh)

(Dixon, 2005: 239):

(6) I don't doubt that he is sick. ~ 'I believe that he is sick.'
(7) She doesn't doubt that they serve breakfast. ~ 'She believes that they serve breakfast.'

(8) ??I don't doubt whether he is sick.
(9) ??She doesn't doubt whether they serve breakfast.

Crosslinguistically:

In many Romance languages, the counterparts of *doubt* (with a possible exception of Spanish) do not easily allow a PolQ complement. This restriction is not categorical.

(10)

Italian: *dubitare* + PolQ complement[15]

a. **Dubito** se potevamo accendere un fiammifero in che
doubt.1SG if can.IMP.1PL light a match in the
atmosphere.
atmosphere
'I doubt if we can light a match in the atmosphere.'

b. **Dubito** se apprezzerete nel loro giusto valore le
doubt.1SG if appreciate.FUT.2PL in their proper value the
cause delle mie sofferenze.
cause of=the my sufferings
'I doubt if you will appreciate the causes of my sufferings in their proper value.'

Another point of variation concerns PolQvN complements.

(11)

Japanese

Hana-wa [chikyuu-ga marui-**ka-dooka**] **utagatteiru**.
Hana-TOP earth-NOM round-COMP_{int}-or.not doubt.ASP.
'Hana doubts whether the earth is round'

In some Romance languages, speakers report that the dubitative predicate sound acceptable with PolQvN or AltQ complements:

(12)
Dubito se accettare o no.
doubt.1SG if accept or not
'I doubt whether to accept or not.'

(13)
Dubito se intervenire o stare zitto.
doubt.1SG if intervene or stay silent
'I doubt whether to intervene or shut up.'

(14) **Hypothesized cross-linguistic generalization**
Cross-linguistically, dubitative predicates are in principle compatible with answer mentioning interrogative complements (modulo further language-specific restrictions on permissible types of such complements) in addition to declarative complements. In contrast, they are incompatible with constituent *wh* complements.

Answer mentioning interrogative complements: PolQ, PolQvN, and AltQ . Supposedly, they *mention a specific answer.*

(15) whether they serve breakfast (PolQ)
(16) whether they serve breakfast or not (PolQvN)
(17) whether they serve coffee or tea (AltQ)

2. The desiderata

- (1) and (2) are very similar in meaning

Karttunen (1977): Ann doesn't believe the proposition that they serve breakfast

- (1) and (2), however, are not equivalent (Dixon 2005):

In positive sentences 'I doubt that p' implies disagreement with an assertion which has been made, 'I doubt whether p' can be used when no one suggested that p, but 'the idea has just been floated'.

- The differences between the positive and negative contexts

3. The analysis

3.1 The first attempt

Step 1: In addition to ordinary semantic values we compute highlighted values (Pruitt and Roelofsen

(2011)).

Highlighted semantic values:

(18) $[\![$whether they serve breakfast $]\!]^h$={λw.they serve breakfast in w}
(19) $[\![$that they serve breakfast$]\!]^h$={λw.they serve breakfast in w}

Ordinary semantic values:

(20) $[\![$whether they serve breakfast$]\!]^o$={λw. they serve breakfast in w; λw'. ¬they serve breakfast in w'}
(21) $[\![$that they serve breakfast$]\!]^0$={λw. they serve breakfast in w}

Step 2: 'doubt' $\neg\Box p = \Diamond\neg p$

The assertive content of 'doubt' makes reference to the **highlighted** semantic value of the embedded argument. This explains the similarities between 'doubt that' and 'doubt whether', because they are the same in the two cases

The presuppositional content of 'doubt' makes reference to the ordinary semantic value of 'doubt'. This explains the differences between 'doubt that' and 'doubt whether'.

(22) $[\![$x doubts φ$]\!]^0$(w) is defined only if:
$[\![\varphi]\!]^0 \in$table and $\forall p[p \in [\![\varphi]\!]^0 \rightarrow \exists w'[w' \in Dox_{w,x} \,\&\, p(w)]]$
$[\![$x doubts φ$]\!]^0$(w)=1 iff $\neg\forall w'\ [w' \in Dox_{w,x} \rightarrow \exists q[q \in [\![\varphi]\!]^h \,\&\, q(w')]]$

table refers to the CONVERSATIONAL TABLE in the model of discourse (Farkas and Bruce 2010; Farkas and Roelofsen 2017). This is the stack of proposals made so far in the conversation. A proposal can either be a statement that has been asserted by a conversational participant or a question which has been raised. Either case, a proposal is modelled as a set of propositions, where a statement is a singleton proposition-set and a question is a non-singleton set.

(23) Ann **doubts** that they serve breakfast.
(24) $[\![(23)]\!]^0$(w) is defined only if: {λw. they serve breakfast in w}∈table &
$\forall p[p \in \{\lambda w''.$ they serve breakfast in w''$\} \rightarrow \exists w'[w' \in Dox_{w,Ann} \,\&\, p(w)]]$

$[\![(23)]\!]^0$(w) =1 iff $\neg\forall w'\ [w' \in Dox_{w,\,Ann} \rightarrow \exists q[q \in \{\lambda w''.$ they serve breakfast in w''$\} \,\&\, q(w')]]$

Equivalently:

(25) $[\![(23)]\!]^0$(w) is defined only if:
{λw. they serve breakfast in w}∈table & $\exists w'[w' \in Dox_{w,Ann} \,\&$ they serve breakfast in w]
$[\![(23)]\!]^0$(w) =1 iff $\exists w'\ [w' \in Dox_{w,Ann} \,\&$ ¬they serve breakfast in w']

(26) Ann **doubts** whether they serve breakfast

(27) $[\![(26)]\!]^0(w)$ is defined only if:
{λw. they serve breakfast in w, λw.¬they serve breakfast in w }∈table &
∀p[p∈{λw''. they serve breakfast in w'', λw'''.¬they serve breakfast in w'''}→∃w'[w'∈$Dox_{w, Ann}$ & p(w)]]

$[\![(26)]\!]^0(w)$ =1 iff ¬∀w' [w'∈$Dox_{w,Ann}$ → ∃q[q∈{λw''.they serve breakfast in w''} & q(w')]]

Equivalently:

(28) $[\![(26)]\!]^0(w)$ is defined only if:
{λw. they serve breakfast in w, λw.¬they serve breakfast in w }∈table &
∀p[p∈{λw''. they serve breakfast in w'', λw'''.¬they serve breakfast in w'''}→∃w'[w'∈$Dox_{w, Ann}$ & p(w)]]

$[\![(26)]\!]^0(w)$ =1 iff ∃w' [w'∈$Dox_{w, Ann}$ & ¬they serve breakfast in w']

- the truth conditional value of (23) and (26) is the same
- the presuppositional content is different

The first presupposition captures Dixon's (2005) observation that *doubt that* p presupposes that someone has already asserted p while *doubt whether* p only presupposes that the idea of p has been 'floated'.

3.2 What this proposal captures

3.2.1. This captures the negation facts:

(29) Ann does not **doubt** that they serve breakfast

(30) $[\![(29)]\!]^0(w)$ =1 iff ∀w' [w'∈$Dox_{w, Ann}$ → they serve breakfast in w']
(31) $[\![(29)]\!]^0(w)$ is defined only if ∀p[p∈{λw''. they serve breakfast in w''}→∃w'[w'∈$Dox_{w, Ann}$ & p(w)]]

(32) *Ann does not **doubt** whether they serve breakfast
(33) $[\![(32)]\!]^0(w)$ =1 iff ∀w' [w'∈$Dox_{w, Ann}$ → they serve breakfast in w']
(34) $[\![(32)]\!]^0(w)$ is defined only if ∀p[p∈{λw''. they serve breakfast in w'', λw'''.¬they serve breakfast in w'''}→∃w'[w'∈$Dox_{w, Ann}$ & p(w)]]

3.2.2. Selectional restrictions:

(35) *Ann **doubts** whether they serve breakfast or not.
(36) $[\![$whether they serve breakfast or not$]\!]^h$={λw. they serve breakfast in w; λw'. ¬they

serve breakfast in w'}

The predicted assertive content: 'there is a world compatible with the speaker's beliefs where no proposition in that set is true'

(37) *Ann **doubts** who came.
(38) $[\![\text{who came}]\!]^h = \varnothing$

(39) $[\![(37)]\!]^0(w)$ is defined only if:
$[\![\text{ who came}]\!]^0 \in \text{table}$ and $\forall p[p \in [\![\text{who came}]\!]^0 \rightarrow \exists w'[w' \in \text{Dox}_{w,\text{Ann}} \,\&\, p(w)]]$
$[\![(37)]\!]^0(w)=1$ iff $\neg\forall w'\ [w' \in \text{Dox}_{w,\text{Ann}} \rightarrow \exists q[q \in \varnothing \,\&\, q(w')]]$

(40) $\exists w'\ [w' \in \text{Dox}_{w,\text{Ann}} \,\&\, \neg\exists q[q \in \varnothing \,\&\, q(w')]]$

(41) *Ann **doubts** whether they serve coffee or tea.
(42) $[\![\text{whether they serve coffee or tea}]\!]^h$ = {λw. they serve coffee in w; λw'. ¬they serve tea in w'}

(43) $[\![(41)]\!]^0(w)$ is defined only if:
$[\![\text{whether they serve coffee or tea}]\!]^0 \in \text{table}$ &
$\forall p[p \in [\![\text{whether they serve coffee or tea}]\!]^0 \rightarrow \exists w'[w' \in \text{Dox}_{w,\text{Ann}} \,\&\, p(w)]]$
$[\![(41)]\!]^0(w)=1$ iff $\exists w'\ [w' \in \text{Dox}_{w,\text{Ann}} \,\&\, \neg\exists q[q \in [\![\text{ whether they serve coffee or tea}]\!]^h \,\&\, q(w')]]$

- The truth conditional content: 'it is compatible with Ann's believes that they serve neither coffee nor tea'
- 'Whether they serve coffee or tea' introduces a presupposition that 'they serve coffee or tea'
- This presupposition is projected to the attitude holder's doxastic state.
- It contradicts the assertive content

What about negation of (41)?

'In all worlds compatible with her beliefs they serve tea or they serve coffee'.

3.2.3. The cross-linguistic generalization and variation in the selectional restriction.

It is a cross-linguistically general feature of constituent *wh*-complements that they do not mention or

highlight any specific answer.

This captures the cross-linguistic fact that dubitative predicates are incompatible with constituent *wh*-complements.

There may be language variation in the highlighted values of answer-mentioning interrogative complements. In particular, it is possible that complements that superficially resemble PolQvN or AltQ in certain languages do not have two- membered highlighted values which exhaust the (presupposed) logical space.

3.3 The required modification of the proposal

There are two significant problems with the proposed semantics.

- One is that the unembedded assertion of x *doubts* φ intuitively feels stronger than just the existential statement that x's doxastic state is compatible with not-φ. The intuition is rather that the subject considers it *likely* that φ is false, as argued by, e.g., Anand and Hacquard (2013).

- The other problem is that the entry predicts that the assertion of *doubt-whether* is entailed by its presupposition (the second conjunct).

(44) $[\![$x doubts φ$]\!]^0$(w) is defined only if:
$[\![\varphi]\!]^0 \in$ table and $\forall p[p \in [\![\varphi]\!]^0 \rightarrow \exists w'[w' \in Dox_{w,x} \,\&\, p(w)]]$
$[\![$x doubts φ$]\!]^0$(w)=1 iff $\exists w'\ [w' \in Dox_{w,x} \,\&\, \neg\exists q[q \in [\![\varphi]\!]^h \,\&\, q(w')]]$

If x's beliefs are compatible with all members of the ordinary value of *whether* p (i.e., p and not-p), then it follows that x's beliefs are compatible with not-p.

Both problems can be solved if we replace the assertive component of *doubt- that/whether*-p with a stronger claim that the attitude holder considers not-p more likely than p.

However, if we do that, we will lose the account of the verb's interaction with negation. The negation of the comparative assertion does not contradict the presupposition in the case of *doubt-whether*, making it impossible to account for the unacceptability of *not-doubt-whether*.

Step 3: Exh

(45) $[\![Exh_{IE+II}]\!]^{wg}=\lambda P_{<st,t>}.\lambda p_{<st>}.\ \forall q[q \in IE(p,P) \rightarrow \neg q(w)] \,\&\, \forall r[r \in II(p,P) \rightarrow r(w)]$

(46) IE(p)(C)= $\cap\{C' \subseteq C : C'$ is a maximal subset of C, s.t. $\{\neg q: q \in C'\} \cup \{p\}$ is consistent$\}$

(47) II(p)(C)=$\cap\{C'' \subseteq C: C''$ is a maximal set of C, s.t. $\{r: r \in C''\} \cup \{p\} \cup \{\neg q:$ $q \in IE(p,C)\}$is consistent$\}$

Jeretič (2020) on modals: The exhaustification is assumed to trigger subdomain alternatives, i.e., alternatives for the prejacent with subdomains of modal quantification.

(48)

$[\![\text{EXH}^{\text{IE}+\text{II}}]\!](\{\Diamond_{\{w1\}}p, \Diamond_{\{w2\}}p, \Diamond_{\{w1,w2\}}p\})(\Diamond_{\{w1,w2\}}p)$
$= \Diamond_{\{w1\}}p \wedge \Diamond_{\{w2\}}p \wedge \Diamond_{\{w1,w2\}}p$
$\Leftrightarrow \Box_{\{w1,w2\}}p$

The proposal: the same process applies in the case of *doubt-that/whether*. That is, the assertion of *doubt-that/whether* is a possibility statement: there is a world in x's doxastic state in which p is false.

This possibility statement is strengthened by the exhaustification mechanism, due to the presence of the subdomain alternatives corresponding to subsets of the doxastic state.

This resolves the two problems identified with our lexical entry for *doubt*. The exhaustification gives rise to an interpretation that is stronger than a simple existential doxastic statement.

Also, with the exhaustification, the assertion is now strictly stronger than the second presupposition in the case of *doubt-whether*.

The problem though is that the necessity modal (aka 'x believes that not p') is too strong, this will contradict the presupposition that the doxastic state of x should be compatible with p. The proposal is to prune the singleton alternatives.

(49)

$[\![\text{EXH}^{\text{IE}+\text{II}}]\!](\{\Diamond_{\{w1\}}p, \Diamond_{\{w2\}}p, \Diamond_{\{w3\}}p, \Diamond_{\{w1,w2\}}p, \Diamond_{\{w2,w3\}}p, \Diamond_{\{w3,w1\}}p, \Diamond_{\{w1,w2,w3\}}p\})(\Diamond_{\{w1,w2,w3\}}p)$
$= \Diamond_{\{w1,w2\}}p \wedge \Diamond_{\{w2,w3\}}p \wedge \Diamond_{\{w3,w1\}}p \wedge \Diamond_{\{w1,w2,w3\}}p$

(50)

- $[\![\text{EXH}^{\text{IE}+\text{II}}$ [x doubts that p]$]\!]^o(w)$ presupposes:
  (i) $\{p\} \in \mathsf{table}$; and
  (ii) $\Diamond_{\mathsf{DOX}_x^w}(p)$
- If the above presuppositions are met,
  $[\![\text{EXH}^{\text{IE}+\text{II}}$ [x doubts that p]$]\!]^o(w)$
  $\Leftrightarrow [\![\text{EXH}^{\text{IE}+\text{II}}]\!](\{\Diamond_C(\overline{p}) \mid C \in \mathsf{SubD}_{\mathsf{ns}}(\mathsf{DOX}_x^w)\})(\Diamond_{\mathsf{DOX}_x^w}(\overline{p}))$
  $\Leftrightarrow \bigwedge_{C \in \mathsf{SubD}_{\mathsf{ns}}(\mathsf{DOX}_x^w)}[\Diamond_C(\overline{p})]$

(51)

- $[\![x$ doubts whether $p]\!]^o(w)$ presupposes:
  - (i) $\{p, \overline{p}\} \in \mathsf{table}$; and
  - (ii) $\forall p' \in \{p, \overline{p}\}[\Diamond_{\mathsf{DOX}_x^w}(p')]$
- If the above presuppositions are met,
  $[\![\textsc{exh}^{\text{IE}+\text{II}}$ [x doubts that p]$]\!]^o(w)$
  $\Leftrightarrow [\![\textsc{exh}^{\text{IE}+\text{II}}]\!](\{\, \Diamond_C(\overline{p}) \mid C \in \mathsf{SubD}_{\mathsf{ns}}(\mathsf{DOX}_x^w)\,\})(\Diamond_{\mathsf{DOX}_x^w}(\overline{p}))$
  $\Leftrightarrow \bigwedge_{C \in \mathsf{SubD}_{\mathsf{ns}}(\mathsf{DOX}_x^w)}[\Diamond_C(\overline{p})]$

- not-doubt-that / ?? not- doubt-whether.
- $\text{EXH}_{\text{IE+II}}$ is not applied in a downward-entailing (DE) context, such as under negation.
- the account in principle allows for the possibility that $\text{EXH}_{\text{IE+II}}$ is applied under negation. This captures marked cases of negated doubt-sentences

(52) I don't *doubt* that/whether she will win. In fact, I think her winning is reasonably likely.