TWO SOURCES OF PRESUPPOSITIONS IN QUESTION-EMBEDDING

Wataru Uegaki (Leiden University)
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THE PROBLEM OF PRESUPPOSITIONS IN QUESTION-EMBEDDING
### A goal of the semantics of embedded questions

To provide a uniform analysis of the truth-conditions of ‘NP \( V \)s \( Q \)’ and ‘NP \( V \)s that \( p \)’ (where \( V \) is a responsive predicate; \( Q \) an interrogative complement, \( p \) a declarative complement).

- Recent progress (Ciardelli et al. 2015; Romero 2015; Spector and Egré 2015; Cremers 2016; Theiler et al. 2016; Xiang 2016), following pioneering works (Karttunen 1977; Groenendijk and Stokhof 1984; Heim 1994).
- The presuppositions of these constructions haven’t been examined in a systematic fashion (but see Spector and Egré 2015).

### The goal of this talk

To provide a uniform analysis of the presuppositions of ‘NP \( V \)s \( Q \)’ and ‘NP \( V \)s that \( p \)’.
Existential presupposition of questions

A question presupposes that at least one of its answers is true.

(Belnap 1966; Karttunen and Peters 1976; Comorovski 1989; Dayal 1996, a.o.)

(1) \textbf{Who} (in the class) smokes? \\
\Rightarrow_{\pi} \textbf{Someone} (in the class) smokes.’

(2) \textbf{Which books} did Max read in the weekend? \\
\Rightarrow_{\pi} \text{Max read} \textbf{some book} \text{ in the weekend.} \\
\Rightarrow_{\pi}: \text{‘presupposes’}

Not robust judgments! (Groenendijk and Stokhof 1984, §1.3.3)
Uniqueness presupposition of singular-which questions

A question involving a singular-which phrase of the form ‘Which NP φ?’ presupposes that exactly one NP φ.

(Comorovski 1989; Dayal 1996; cf. Groenendijk and Stokhof 1984, §1.3.3)

(3) Which student (in the class) smokes?
    ⇒π Exactly one student (in the class) smokes.

(4) Which book did Max read in the weekend?
    ⇒π Max read exactly one book in the weekend.

• The judgments are robust even for those who don’t sense the existential presupposition in number-neutral wh-Qs.
• I’ll use uniqueness presupps. to illustrate the behavior of presupposition projection in question-embedding.
(5) a. Max doesn’t know which student smokes.
b. Does Max know which student smokes?
c. If Max knows which student smokes, ...
\[\Rightarrow_{\pi} \text{‘Exactly one student smokes.’}\]

(6) a. Max isn’t certain (about) which student smokes.
b. Is Max certain (about) which student smokes?
c. If Max is certain (about) which student smokes, ...
\[\nleftrightarrow_{\pi} \text{‘Exactly one student smokes.’}\]
\[\Rightarrow_{\pi} \text{‘Max believes that exactly one student smokes.’}\]

(7) No student smokes. But, Max believes that there is a student smoker. Only, he \{isn’t certain/#doesn’t know\} which student smokes.
Presupposition of declarative-embedding cases

(8)  a. Max doesn’t know that Ash smokes.
    b. Does Max know that Ash smokes?
       \[ \Rightarrow_{\pi} \text{‘Ash smokes.’} \]

(9)  a. Max isn’t certain that Ash smokes.
    b. Is Max certain that Ash smokes?
       \[ \Rightarrow_{\pi} \text{‘It is compatible with Max’s beliefs that Ash smokes.’} \]

Goal

Provide a uniform analysis of the presuppositions of ‘NP Vs Q’ and ‘NP Vs that p’. (where V is a responsive predicate; Q an interrogative complement, p a declarative complement)
Problems with existing analyses of uniqueness
Dayal’s (1996) treatment of uniqueness

**Ans-operator: picks out the strongest true answer**

\[
\text{Ans}_w = \lambda Q_{st,t} . \exists p [p \in Q \land p(w) \land \forall p' \in Q [p'(w) \rightarrow p \subseteq p']] 
\]

- Assumes the Hamblin-style denotation for questions.
- \( \text{Ans}_w(Q) \) is defined only if \( Q \) contains a unique strongest true member in \( w \).
- The denotation of a singular *which*-question consists of ‘atomic’ answers. For every \( w \), \( \text{Ans}_w \) is defined for such a question only if exactly one of its answers is true.
Problem with a simple extension of Dayal’s account

(10) which student smokes \( \rightsquigarrow \)
\[
\{ p \mid \exists x[\text{stu}_w(x) \land p = \lambda w'. \text{smk}_{w'}(x)] \}
\]
(\(=: Q\))

(11) Max knows which student smokes \( \rightsquigarrow \)
\[
\text{know}_w(m, \text{Ans}_w(Q))
\]

(12) Max is certain about which student smokes \( \rightsquigarrow \)
\[
\text{certain}_w(m, \text{Ans}_w(Q))
\]

• (11) is defined only if \( \text{Ans}_w(Q) \) is defined
\[
\Leftrightarrow \text{‘Exactly one student smokes.’} \quad \smiley
\]

• (12) is defined only if \( \text{Ans}_w(Q) \) is defined
\[
\Leftrightarrow \text{‘Exactly one student smokes.’} \quad \frown
\]
Uegaki’s (2015) analysis of **be certain**

Uegaki (2015), cf. Theiler et al. (2016)

Question-embedding predicates relate the subject’s attitude representation to \( \text{Ans}(Q) \) in different ways.

\[(13)\] Max knows which student smokes \( \sim \)
\[
\text{know}_w(m, \text{Ans}_w(Q))
\]

\[(14)\] Max is certain about which student smokes \( \sim \)
\[
\forall v [v \in \text{Dox}_m^w \to \text{believe}_w(m, \text{Ans}_v(Q))]
\]

- (13) is defined only if \( \text{Ans}_w(Q) \) is defined
  \( \Leftrightarrow \) ‘Exactly one student smokes.’

- Assuming universal projection out of universally quantified statements (e.g., Chemla 2009), (14) is defined only if
  \[
  \forall v [v \in \text{Dox}_m^w \to \text{Ans}_v(Q) \text{ is defined}]
  \]
  \( \Leftrightarrow \) ‘Max believes that exactly one student smokes.’
Problem with Uegaki (2015)

Uegaki’s analysis assumes that Ans is ‘incorporated’ in the lexical semantics of be certain, i.e., it is question-taking.

Uniform analysis of complementation (Uegaki 2015; Theiler et al. 2016)

A declarative complement denotes the singleton set consisting of the proposition it classically denotes.

(15) Max is certain that Ash smokes \( \supset \)

\[ \forall v \in \text{Dox}^w_m \rightarrow \text{believe}_w(m, \text{Ans}_v(\{A\})) \]

• \( \text{Ans}_v(\{A\}) \) is defined only if \( A(v) \).
• (15) is defined only if \( \forall v \in \text{Dox}^w_m \rightarrow \text{Ans}_v(\{A\}) \) is defined
  \[ \Leftrightarrow \forall v \in \text{Dox}^w_m \rightarrow A(v) \]
  \[ \Leftrightarrow \text{‘Max believes that Ash smokes.’} \]
• (15)’s presup. would be equivalent to its assertion! \footnote{10}
Agree and Two Sources of Presuppositions
Does Max agree with Kim that Ash smokes? 
\[ \Rightarrow_{\pi} \text{Kim believes that Ash smokes.} \]

Does Max agree with Kim on which student smokes?
1. \[ \Rightarrow_{\pi} \text{There is exactly one student such that Kim believes that s/he smokes.} \]
2. \[ \Rightarrow_{\pi} \text{Max believes that there is exactly one student who smokes.} \]

Context: Max believes that there is exactly one student who smokes. He isn’t certain who it is, but he is sure that it is not Ash. Kim believes that Ash smokes. Max doesn’t agree with Kim on which student smokes.
(19) Does Max agree with Kim that Ash smokes? 
\[ \Rightarrow_\pi \text{Kim believes that Ash smokes.} \]

(20) Does Max agree with Kim on which student smokes?

1. \[ \Rightarrow_\pi \text{There is exactly one student such that Kim believes that s/he smokes.} \]
2. \[ \Rightarrow_\pi \text{Max believes that there is exactly one student who smokes.} \]

- **Agree-that**: Presupposes only about Kim’s beliefs.
- **Agree-wh**: Uniqueness projects to both Max’s and Kim’s beliefs in certain ways.
## Two sources of presuppositions

**Two sources of presuppositions in question-embedding**

$V$-$wh$ inherits presuppositions from **two triggers**:

1. the lexical semantics of $V$; and
2. the semantics of $wh$-complements in general.

- The presupposition from 1 is reflected in $V$-$that$, but
- The presupposition from 2 is *not* reflected in $V$-$that$.

In *agree*-*$wh$,

- 1 leads to the presupposition about the belief of the ‘reference’ ($with$) argument;
- 2 leads to the presupposition about the belief of the subject.
### Presupposition trigger 1: embedding predicates

Each question-embedding predicate presupposes existence of an answer that meets a lexically-specific condition:

- **know**: a true answer.
- **be certain**: an answer compatible with the subj’s beliefs.
- **agree with $y$**: an answer believed by $y$.

### Presupposition trigger 2: wh-complements

Each answer in a wh-complement presupposes uniqueness.

### Uniform semantics of complementation

Declarative complements denote singleton proposition-sets.

- Only 1 manifests itself in declarative-embedding cases.
- Both 1 and 2 manifest themselves in int-embedding cases.
- Either 1 or 2 might be entailed by the other.
Proposal 1: Existence presupposition from the Ans-operator
Reformulating Ans

Redefined Ans-operator (cf. Cremers 2016)

\[ \text{Ans}(C_{st,t}) := \lambda Q_{st,t} : \exists p \in Q \cap C. \{ p \in C \cap Q | \neg \exists p' \in Q \cap C[p' \Rightarrow p \land p' \neq p] \} \]

- \text{Ans}(C)(Q) presupposes that there is a member of Q that meets C. If defined,
- \text{Ans}(C)(Q) returns the set of maximally strong members of Q that meets C. (cf. Fox 2013; Xiang 2016)

(21) \textit{know} \sim \lambda Q_{st,t} \lambda x e. \\
\exists p[p \in \text{Ans}(\{ p' | p'(w) \})(Q) \land K_w(x, p)]

(22) \textit{be certain} \sim \lambda Q_{st,t} \lambda x e. \\
\exists p[p \in \text{Ans}(\{ p' | \exists w' \in \text{Dox}_x^w[p'(w')] \})(Q) \land B_w(x, p)]

(23) \textit{agree with y} \sim \lambda Q_{st,t} \lambda x e. \exists p[p \in \text{Ans}(\{ p' | B_w(y, p') \})(Q) \land B_w(x, p)]
ILLUSTRATING THE WORKINGS OF Ans: *know*

**Redefined Ans-operator** (cf. Cremers 2016)

\[
\text{Ans}(C_{st,t}) : = \lambda Q_{st,t} : \exists p \in Q \cap C.
\{ p \in C \cap Q \mid \neg \exists p' \in Q \cap C[p' \Rightarrow p \land p' \neq p] \}
\]

(24) Max *knows* which student smokes \(\sim\)

\[\exists p[p \in \text{Ans}(\{ p' \mid p'(w) \})(Q) \land K_w(m, p)]\]

**Presup:** Some member of \(Q\) is *true*.

**Assertion:** Max knows a max-strong true member of \(Q\).

(25) Max *knows* that Ash smokes \(\sim\)

\[\exists p[p \in \text{Ans}(\{ p' \mid p'(w) \})(\{A\}) \land K_w(m, p)]\]

**Presup:** Some member of \(\{A\}\) is *true*. \(\Leftrightarrow\) ‘Ash smokes’

**Assertion:** Max knows a max-strong true member of \(\{A\}\). \(\Leftrightarrow\) ‘Max knows that Ash smokes’
ILLUSTRATING THE WORKINGS OF Ans: \textit{be certain}

<table>
<thead>
<tr>
<th>Redefined Ans-operator (cf. Cremers 2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{Ans}(C_{s,t}) := \lambda Q_{s,t} : \exists p \in Q \cap C.</td>
</tr>
<tr>
<td>{ p \in C \cap Q \mid \neg \exists p' \in Q \cap C[p' \Rightarrow p \land p' \neq p] }</td>
</tr>
</tbody>
</table>

(26) Max \textbf{is certain} which student smokes \textasciitilde
\[ \exists p [p \in \text{Ans}(\{p' \mid \exists w' \in \text{Dox}_m[w'(w')]\}))(Q) \land B_w(m, p)] \]

\textbf{Presup}: Some member of \textit{Q} is compat. w/ M’s beliefs.
\textbf{Assertion}: Max believes a max-strong member of \textit{Q} compat. w/ their beliefs.

(27) Max \textbf{is certain} that Ash smokes \textasciitilde
\[ \exists p [p \in \text{Ans}(\{p' \mid \exists w' \in \text{Dox}_m[w'(w')]\}))(\{A\}) \land B_w(m, p)] \]

\textbf{Presup}: Some member of \{A\} is compatible with Max’s beliefs. \iff A is compatible with M’s beliefs.
\textbf{Assertion}: Max believes a max-strong member of \{A\} compatible with M’s beliefs. \iff Max believes A.
ILLUSTRATING THE WORKINGS OF Ans: *agree with...*

Redefined Ans-operator (cf. Cremers 2016)

\[ \text{Ans}(C_{\langle st, t \rangle}) := \lambda Q_{\langle st, t \rangle} : \exists p \in Q \cap C. \{ p \in C \cap Q \mid \neg \exists p' \in Q \cap C[p' \Rightarrow p \land p' \neq p] \} \]

(28) **Max agrees with Kim** on which student smokes \(\sim\)

\[ \exists p[p \in \text{Ans}(\{ p' \mid B_w(k, p') \})(Q) \land B_w(m, p)] \]

**Presup**: Some member of \(Q\) is believed by Kim.

**Assertion**: Max believes a max-strong member of \(Q\) believed by Kim.

(29) **Max agrees with Kim** that Ash smokes \(\sim\)

\[ \exists p[p \in \text{Ans}(\{ p' \mid B_w(k, p') \})(\{A\}) \land B_w(m, p)] \]

**Presup**: Some member of \(\{A\}\) is believed by Kim.

\(\Leftrightarrow\) Kim believes \(A\).

**Assertion**: Max believes a max-strong member of \(\{A\}\) believed by Kim. \(\Leftrightarrow\) Max believes \(A\).
Redefining Ans-operator

\[ \text{Ans}(C_{\langle \text{st}, t \rangle}) := \lambda Q_{\langle \text{st}, t \rangle} : \exists p \in Q \cap C. \{ p \in C \cap Q | \neg \exists p' \in Q \cap C[p' \Rightarrow p \land p' \neq p] \} \]

- Dayal’s \textit{Ans} and its reformulation by Cremers (2016) derives the \textit{strongest} answer while our \textit{Ans} returns the set of \textit{maximally strong} answers.
- Hence, Dayal’s and Cremers’s \textit{Ans} presupposes \textit{uniqueness} while our \textit{Ans} presupposes mere \textit{existence}.
- When \( Q \cap C \) is closed under conjunction, this difference is inconsequential; both versions of \textit{Ans} derives the (singleton-set of) \textit{weakly-exhaustive} answer.
- But, \( Q \cap C \) is not always closed under conjunction. In such a case, we see that our \textit{Ans} makes a better prediction than Dayal’s \textit{Ans}. 
(30) **Context:** It’s compatible with Max’s beliefs that Ash smokes. It’s also compatible with Max’s beliefs that Bay smokes. But, it is *not* compatible with Max’s beliefs that both Ash and Bay smoke.

(31) Max is certain which student smokes

(32) $\exists p[p \in \text{Ans}(\{ p' | \exists w' \in \text{Dox}_m^w[p'(w')] \})(Q) \land B_w(m, p)]$

(33) $\text{Ans}(\{ p' | \exists w' \in \text{Dox}_m^w[p'(w')] \})(Q) = \{A, B\}$

- In the given context, (31) is intuitively false.
- This is correctly predicted by our account.
- If Ans presupposed uniqueness, (31) would be presupposition failure because there is no unique strongest answer that is compatible with Max’s beliefs.
Fox (2013) and Xiang (2016) propose an analysis of mention-some readings based on question denotations that are not closed under conjunction.

(34) Where one can get an Italian newspaper? $\sim$

$\{\Diamond A, \Diamond B, \Diamond (A \land B)\}$

- The current formulation of Ans is also compatible with this line of analysis of mention-some.
- The version of Ans presupposing uniqueness would be incompatible with such an analysis.
### Interim Summary

<table>
<thead>
<tr>
<th>Predicate</th>
<th>Presup. of $x$ Vs $Q$</th>
<th>Presup. of $x$ Vs that $p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know</td>
<td>$\exists q \in Q[q(w)]$</td>
<td>$p(w)$</td>
</tr>
<tr>
<td>Be certain</td>
<td>$\exists q \in Q[\exists w' \in \text{Dox}_x^w[q(w')]]$</td>
<td>$\exists w' \in \text{Dox}_x^w[p(w')]$</td>
</tr>
<tr>
<td>Agree with $y$</td>
<td>$\exists q \in Q[\text{B}_w(y, q)]$</td>
<td>$\text{B}_w(y, p)$</td>
</tr>
</tbody>
</table>

- We have already captured the correct presuppositions of $x$ Vs that $p$.
- We need stronger presuppositions for the interrogative-embedding cases. In particular, we need a treatment of uniqueness.
PROPOSAL 2: UNIQUENESS FROM EACH ANSWER
Diagnosing Uegaki’s (2015) problem

- **Uegaki’s (2015) problem**: The analysis of uniqueness in *be-certain-wh* is automatically carried over to *be-certain-that*. This led to an incorrect prediction.

- **Solution**: Treat uniqueness as the presupposition *specific to interrogative complements*.

- Formally, I will do this by encoding the uniqueness presupposition to the interrogative operator ?.
Diagnosing Dayal’s (1996) problem

Two analytic possibilities

1. A question meaning is defined only if the uniqueness is met. If defined, it denotes a set of propositions.

2. A question meaning is a set of propositions, each of which presuppose uniqueness. (Rullmann and Beck 1998)

which student smokes $\sim$

1. $\lambda w: \exists! x [st_w(x) \land smk_w(x)]. \{ p | \exists y[st_w(y) \land p = \lambda w'. smk_{w'}(y)] \}$

2. $\{ p | \exists y[st_w(y) \land p = \lambda w': \exists! x [st_w(x) \land smk_{w'}(x)]. smk_{w'}(y)] \}$

- **Dayal**: Based on **Option 1**. Fails to capture the projection of uniqueness into the subj’s beliefs in *be certain*.

- **Solution**: Choose **Option 2**: uniqueness projects depending on the subj’s attitudes with individual answers.
The interrogative operator \( ? \) applies to the Hamblin denotation of interrogative complements.

\[
(35) \quad ? \leadsto \\
\lambda Q_{\langle st,t \rangle} \cdot \{ p \mid \exists p' \in Q[p = \lambda w' : \exists!p''[p'' \in Q \land p''(w')] \cdot p'(w')] \}
\]

\(1\text{st ver.})

\( (36) \quad \text{which student smokes} \leadsto \\
\{ p \mid \exists x[st_w(x) \land p = \lambda w'. \text{smk}_{w'}(x)] \}
\)

\( (37) \quad ? \quad \text{[which student smokes]} \leadsto \ldots \\
\{ p \mid \exists y[st_w(y) \land p = \lambda w' : \exists!x[st_w(x) \land \text{smk}_{w'}(x)].\text{smk}_{w'}(y)] \}
\)

\( (38) \quad \\
\{ \lambda w' : \text{ex. 1 student smokes in } w' \cdot A \text{ smokes in } w', \lambda w' : \text{ex. 1 student smokes in } w' \cdot B \text{ smokes in } w', \lambda w' : \text{ex. 1 student smokes in } w' \cdot C \text{ smokes in } w', \ldots \}
\)
Projection of uniqueness: know

\[ (39) \quad \text{Max knows which student smokes} \sim \exists p [p \in \text{Ans}(\{ p' \mid p'(w) \})(Q) \land K_w(m, p)] \]

- Each member of \( Q \) presupposes uniqueness.
- Given the existential presupposition of \( \text{Ans} \), there is a member \( p' \) of \( Q \) such that \( p'(w) \)
  \( \Rightarrow \) Uniqueness holds in \( w \).
  \( \Rightarrow \) ‘Exactly one student smokes’
- \( K_w(m, p) \equiv \forall w' \in \text{Epis}^w_m[p(w')] \). Thus, assuming universal projection, uniqueness holds in all \( w' \in \text{Epis}^w_m \).
  \( \Rightarrow \) ‘Max knows that exactly one student smokes’
Projection of uniqueness: *be certain*

\[\exists p \in \text{Ans}(\{ p' \mid \exists w' \in \text{Dox}_m^w[p'(w')] \})(Q) \land \text{B}_w(m, p)\]

- Each member of \(Q\) presupposes uniqueness.

- Given the existential presupposition of \(\text{Ans}\), there is a member \(p'\) of \(Q\) such that \(\exists w' \in \text{Dox}_m^w[p'(w')]\)

\[\Rightarrow \text{Uniqueness holds in some } w' \in \text{Dox}_m^w \text{ (via existential-projection).}\]

\[\Rightarrow \text{‘It is compatible with Max’s beliefs that exactly one student smokes.’}\]

- \(\text{B}_w(m, p) \equiv \forall w' \in \text{Dox}_m^w[p(w')]\). Thus, assuming universal projection, uniqueness holds in all \(w' \in \text{Dox}_m^w\).

\[\Rightarrow \text{‘Max believes that exactly one student smokes’}\]
(41) Max agrees with Kim that Ash smokes $\sim$  
$\exists p[p \in \text{Ans}({\{ p' \mid B_w(k, p') \}})(Q) \land B_w(m, p)]$

- Each member of Q presupposes uniqueness.

- Given the existential presupposition of Ans, there is a member $p'$ of Q such that $B_w(k, p')$.
  $\Rightarrow$ Uniqueness holds in all $w' \in \text{Dox}_k^w$ (univ-projection).
  $\Rightarrow$ ‘Kim believes that exactly one student smokes.’

- $B_w(m, p) \equiv w' \in \text{Dox}_m^w[p(w')]$. Thus, uniqueness holds in all $w' \in \text{Dox}_m^w$ (univ-projection).
  $\Rightarrow$ ‘Max believes that exactly one student smokes’
PUTTING THINGS TOGETHER
Putting things together: \textit{know}

\begin{equation}
(42) \quad \text{Max knows which student smokes} \mapsto \exists p[p \in \text{Ans}({\set{p' | p'(w)}})(Q) \land K_w(m, p)]
\end{equation}

1. \textbf{Existential presupposition of Ans}: ‘Some student smokes.’

2. \textbf{Uniqueness projection via Ans}: ‘Exactly one student smokes.’

3. \textbf{Uniqueness projection via K}_w(m, p): ‘Max knows that exactly one student smokes.’

\begin{itemize}
  \item 2 is stronger than 1.
  \item 3 is not mentioned earlier, but is a plausible prediction.
\end{itemize}
Putting things together: *be certain*

(43) Max is certain which student smokes $\sim$

$$\exists p[p \in \text{Ans}(\{p' \mid \exists w' \in \text{Dox}_m^w[p'(w')]\})(Q) \land B_w(m, p)]$$

1. Existential presupposition of Ans:
   ‘For some student, it is compatible with Max’s beliefs that they smoke.’

2. Uniqueness projection via Ans:
   ‘It is compatible with Max’s beliefs that exactly one student smokes.’

3. Uniqueness projection via $B_w(m, p)$:
   ‘Max believes that exactly one student smokes.’

- 3 is stronger than both 1 and 2.
(44) Max agrees with Kim that Ash smokes \( \sim \) 
\( \exists p [ p \in \text{Ans} (\{ p' | B_w (k, p') \})] (Q) \wedge B_w (m, p) \]

1. **Existential presupposition of Ans**: 
   ‘For some student, Kim believes that they smoke.’

2. **Uniqueness projection via Ans**: 
   ‘Kim believes that exactly one student smokes.’

3. **Uniqueness projection via \( B_w (m, p) \)**: 
   ‘Max believes that exactly one student smokes.’

- 1 & 2 \( \Rightarrow \) ‘For exactly one student, Kim believes that s/he smokes.’
- 3: Max believes that exactly one student smokes.
Some loose ends
In order to deal with number-neutral *wh*-complements, the definition of ? has to be revised.

\[(45) \text{StrTr}_w(p, Q) \Leftrightarrow p \in Q \land p(w) \land \forall p' \in Q[p'(w) \rightarrow p \subseteq p']\]

\[(46) ? \rightsquigarrow \lambda Q_{(st,t)} \{p | \exists p' \in Q[p = \lambda w' : \exists! p''[\text{StrTr}_{w'}(p'', Q)].p'(w')]\} \quad \text{(final ver.)}\]

\[(47) \text{which students smoke} \rightsquigarrow \{p | \exists X[st_w^*(X) \land p = \lambda w'.\text{smk}_{w'}^*(X)]\}\]

\[(48) ? [\text{which students smoke}] \rightsquigarrow \begin{cases} 
\lambda w' : \exists! p[\text{StrTr}(p, Q)].A(w'), \\
\lambda w' : \exists! p[\text{StrTr}(p, Q)].B(w'), \\
\lambda w' : \exists! p[\text{StrTr}(p, Q)].C(w'), \\
\lambda w' : \exists! p[\text{StrTr}(p, Q)].A(w') \land B(w'), \\
\lambda w' : \exists! p[\text{StrTr}(p, Q)].B(w') \land C(w'), \\
\vdots \\
(\text{where } Q := (47))\end{cases}\]
The treatment essentially incorporates Dayal’s uniqueness presupposition in each member of wh-complement denotations (either singular or number-neutral).

When the wh-complement is number-neutral, the presupposition amounts to the existential presupposition.

Some speakers’ judgment about the lack of existential presupposition in number-neutral wh-complements (despite the uniqueness presupposition in singular-which complements) can be accounted for by assuming the bottom element $0$ in the extension of plural NPs (Landman 2011; Gajewski and Hsieh 2014; Bylinina and Nouwen 2017).
The analysis extends to other ‘representational’ (i.e., ‘non-preferential’) predicates by varying the restriction $C$ for $\text{Ans}$ and the attitudinal relation corresponding to $K/B$.

Some representational predicates, especially communication predicates, are ambiguous between factive and non-factive readings (Spector and Egré 2015).

The non-factive reading can be analyzed as an intensional predicate (Theiler et al. 2016; cf. Groenendijk and Stokhof 1984).

\begin{align*}
\text{(49) a. } & \text{predict}^{+}\text{fac } \sim \lambda Q_{(st,t)} \lambda x_e. \\
& \exists p[p \in \text{Ans}({p' \mid p'(w)})](Q) \land \text{predict}_w(x, p)] \\
\text{b. } & \text{predict}^{-}\text{fac } \sim \lambda Q_{(st,t)} \lambda x_e. \\
& \exists v \exists p[p \in \text{Ans}({p' \mid p'(v)})](Q) \land \text{predict}_w(x, p)]
\end{align*}

Preferential preds (e.g., surprise, bother) have different lexical-semantic format (Romero 2015; Uegaki and Sudo 2017)
Exhaustivity

• The current account predicts weakly-exhaustive readings as well as mention-some readings in cases where the question denotation is not closed under conjunction (Fox 2013; Xiang 2016).

• It would be probably possible to encode additional conditions pertaining to the ‘no-false-answer’ condition in Ans, à la Theiler et al. (2016).

• However, I have not fully examined the possibility of integrating the current treatment of uniqueness presupposition with the Inquisitive Semantics framework, especially the assumption of downward-closure.
Conclusions
The goal of this talk
To provide a uniform analysis of the presuppositions of ‘NP Vs Q’ and ‘NP Vs that p’.

- There are two sources of presuppositions in ‘NP Vs Q’:
  1. The existential presupposition of Ans.
  2. The uniqueness presupposition coming from each member of the denotation of Q.

- The presuppositions of ‘NP Vs that p’ arises from 1.
- The presuppositions of ‘NP Vs Q’ arise from the combination of 1 and 2.


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