***Problem*:** Despite recent progress in the analysis of embedded questions (e.g., Guerzoni&Sharvit 2007; George 2011; Klinedinst&Rothschild 2011; Spector&Egré 2015; Theiler et al. 2016) the treatment of *presuppositions* in question-embedding sentences remains problematic. This paper specifically concerns the following question: how to uniformly analyze the presuppositions of 'NP *V*s *Q*' and 'NP *V*s that *p*', where the two sentences share a responsive predicate *V* (Lahiri 2002); *Q* is an interrogative complement and *p* is a declarative complement. Sentences in (1-2) exemplify this problem with the veridical predicate *know* and the non-veridical predicate *be certain*.

(1) a. Does Max **know** that Pat smokes? $\Rightarrow_{\text{presup.}}$ 'Pat smokes.'
b. Does Max **know** which student smokes? $\Rightarrow_{\text{presup.}}$ 'Exactly one student smokes.'

(2) a. Is Max **certain** that Pat smokes? $\Rightarrow_{\text{presup.}}$ 'Max considers it possible that Pat smokes.'
b. Is Max **certain** (about) which student smokes?
$\Rightarrow_{\text{presup.}}$ 'Max believes that exactly one student smokes.'

Existing accounts cannot account for these patterns. A simple extension of Dayal's (1996) account of (1b) in terms of the uniqueness presupposition triggered by the **Ans**(werhood)-operator would predict the same uniqueness presupposition as (1b) regardless of embedding responsive predicates. This makes an incorrect prediction for (2b). The fact that (2b) does *not* presuppose unique existence of a true answer, in contrast to (1b), is further evidenced by (3).

(3) No student smokes. But, Max believes that there is a student smoker.
Only, he {isn't certain / #doesn't know} which student smokes.

A more recent formulation of **Ans** by Uegaki (2015) accounts for the presupposition in (2b). However, since he analyzes declarative-embedding to be the singleton case of question-embedding, he predicts the following presupposition for (2a): Max believes that {'Pat smokes'} has exactly one true answer. This is incorrect, as (2a) would then presuppose that Max believes that Pat smokes.

***Two presupposition triggers*:** By considering the behavior of *agree*, we get a clearer picture:

(4) a. Does Max agree with Kim that Pat smokes? $\Rightarrow_{\text{presup.}}$ Kim believes that Pat smokes.
b. Does Max agree with Kim on which student smokes?
$\Rightarrow_{\text{presup.}}$ There is exactly one student such that Kim believes that she smokes.
$\Rightarrow_{\text{presup.}}$ Max believes that there is exactly one student who smokes.

Here, the declarative-embedding case in (4a) only has a presupposition concerning Kim's beliefs while the interrogative-embedding case in (4b) has presuppositions concerning Kim's beliefs *and Max's beliefs*. This suggests that there are two sources of presuppositions in question-embedding sentences: (i) the embedding verb (whose presuppositional effect is also observed in the declarative embedding case) and (ii) the interrogative complement (whose presuppositional effect cannot be observed in the declarative embedding case). Roughly, in (4b), the presupposition about Kim's belief corresponds to (i) while the one about Max's belief corresponds to (ii).

***Proposal outline*:** We propose our analysis following the above idea. It goes as follows. We treat each question-embedding predicate as presupposing existence of an answer that meets a lexically-specific condition: *know* presupposes that there is a true answer; *be certain* presupposes that there is an answer that the subject considers possible; *agree* presupposes that there is an answer that the 'with'-argument believes. Following Uegaki (2015), we treat declarative complements as singleton questions. Thus, these presuppositions manifest themselves in the declarative-embedding cases: *know-that* presupposes that the complement is true; *be certain-that* presupposes that the subject considers the complement possible; *agree-that* presupposes that the 'with'-argument believes the complement. At the same time, *each answer* in the denotation of an interrogative complement presupposes uniqueness (Rullmann and Beck 1998). This presupposition projects according to

the lexical semantics of the embedding predicate, resulting in different manifestations of uniqueness presuppositions. The reason why we don't always see two independent presuppositions in interrogative-embedding is that one of the two presuppositions may be stronger than the other. Below, we formalize this idea.

***The presupposition of* Ans :** Extending Cremers (2016), we analyze the **Ans**-operator to take an extra argument C which restricts the set of answers. Given a question Q and a restriction C, **Ans** presupposes that there is an answer in $Q \cap C$, and returns the set of maximally strong answers in $Q \cap C$ (cf. Fox 2013; Xiang 2016):

(5) $\mathbf{Ans}(C_{\langle st,t\rangle}) = \lambda Q_{\langle st,t\rangle}\colon \exists p \in Q \cap C.\ \{\, p \in C \cap Q \mid \neg\exists p' \in Q \cap C[p' \Rightarrow p \wedge p' \Leftarrow p]\,\}$

Responsive predicates encode **Ans** in their meanings with lexically specific restrictors, as in (6). Given Q and x, they return true iff x believes an answer in the answer-set provided by $\mathbf{Ans}(C)(Q)$.

(6) a. $[\![\text{know}]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x_e.\ \exists p[p \in \mathbf{Ans}(\ \{\, p \mid p(w)\,\}\ )(Q) \wedge \mathbf{Dox}^w_x \subseteq p]$

b. $[\![\text{be certain}]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x_e.\ \exists p[p \in \mathbf{Ans}(\{\, p \mid p \cap \mathbf{Dox}^w_x \neq \varnothing\,\})(Q) \wedge \mathbf{Dox}^w_x \subseteq p]$

c. $[\![\text{agree with } y]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x_e.\ \exists p[p \in \mathbf{Ans}(\ \{\, p \mid \mathbf{Dox}^w_y \subseteq p\,\}\ )(Q) \wedge \mathbf{Dox}^w_x \subseteq p]$

Interrogative complements are semantically treated as singleton questions (Uegaki 2015). Thus, the existential presupposition of **Ans** has the following manifestations for each predicate in interrogative embedding 'x *V*s Q' and declarative embedding 'x *V*s that p':

(7)

predicate	presup. of $[\![x\ Vs\ Q]\!]^w$	presup. of $[\![x\ Vs \text{ that } p]\!]^w$	
know	$\exists q \in Q[q(w)]$	$\exists q \in \{p\}[q(w)]$	$\equiv p(w)$
be certain	$\exists q \in Q[q \cap \mathbf{Dox}^w_x \neq \varnothing]$	$\exists q \in \{p\}[q \cap \mathbf{Dox}^w_x \neq \varnothing]$	$\equiv p \cap \mathbf{Dox}^w_x \neq \varnothing$
agree with y	$\exists q \in Q[\mathbf{Dox}^w_y \subseteq q]$	$\exists q \in \{p\}[\mathbf{Dox}^w_y \subseteq q]$	$\equiv \mathbf{Dox}^w_y \subseteq p$

***Uniqueness from answers*:** In addition, each answer of a *wh*-complement denotation presupposes uniqueness. E.g., answers of *which student smokes* presupposes that exactly one student smokes:

(8) $[\![\text{which student smokes}]\!]^w = \{\, p \mid \exists x[\mathbf{st}_w(x) \wedge p = \lambda w'\colon \underline{\exists! y[\mathbf{st}_w(y) \wedge \mathbf{smk}_{w'}(y)]}.\ \mathbf{smk}_{w'}(x)]\,\}$

Since $\mathbf{Dox}^w_x \subseteq p \equiv \forall w'[w' \in \mathbf{Dox}^w_x \rightarrow p(w')]$, the presupposition of p in $\mathbf{Dox}^w_x \subseteq p$ projects universally into $\mathbf{Dox}^w_x$ (Chemla 2009; Sudo 2012). This gives us the subject's belief of uniqueness. Compositionally, (8) is derived by applying the following constituent-question operator to the Hamblin denotation: $[\![?_{\text{const}}]\!]^w = \lambda Q_{\langle st,t\rangle}.\{\, p \mid \exists p' \in Q[p = \lambda w'\colon \exists! p''[\mathbf{StrongestTrue}_{w'}(p'', Q)].p'(w')]\,\}$

***Illustration*:** The presuppositions of the declarative cases in (1a,2a,4a) are explained by the existential presupposition of **Ans**, as summarized in (7). The presuppositions of the interrogative cases are explained as follows. **Re (1b)**: $\mathbf{Ans}(C)(Q)$ presupposes that (8) contains a true answer, which is equivalent to 'exactly one student smokes'. In addition, the uniqueness in (8) projects into Max's belief: 'Max believes that exactly one student smokes' (not shown in (2b), but a plausible prediction). **Re (2b)**, $\mathbf{Ans}(C)(Q)$ presupposes that (8) contains an answer that Max considers possible. Also, again, the uniqueness in (8) projects into Max's belief: 'Max believes that exactly one student smokes'. The latter presupposition entails the former, so we only observe the latter. **Re (4b)**, $\mathbf{Ans}(C)(Q)$ presupposes that (8) contains an answer that Kim believes. Conjoining this with the projection of uniqueness into Kim's belief (i.e., 'Kim believes that exactly one student smokes'), we get 'There is exactly one student such that Kim believes that she smokes'. In addition, the uniqueness is projected into Max's belief: 'Max believes that exactly one student smokes'.

***Other predicates*:** In the full paper, we will discuss how the analysis extends to other representational (i.e., 'non-preferential') predicates by varying the restriction C and the attitude representation corresponding to **Dox**. For example, the veridical version of *guess* would have the same C as *know* and the set of worlds compatible with the subject's guessing as the attitude representation.

References

Chemla, Emmanuel. 2009. Presuppositions of quantified sentences: experimental data. *Natural Language Semantics* 17(4):299–340.

Cremers, Alexandre. 2016. *On the semantics of embedded questions*. Ph.D. thesis, École normale supérieure.

Dayal, Veneeta. 1996. *Locality in wh-quantification: Questions and Relative Clauses in Hindi*. Dordrecht: Kluwer Academic Publishers.

Fox, Danny. 2013. Mention-some readings. Ms. MIT and HUJI.

George, Benjamin. 2011. *Question Embedding and the Semantics of Answers*. Ph.D. thesis, UCLA.

Guerzoni, Elena and Yael Sharvit. 2007. A question of strength: on NPIs in interrogative clauses. *Linguistics and Philosophy* 30:361–391.

Klinedinst, Nathan and Daniel Rothschild. 2011. Exhaustivity in questions with non-factives. *Semantics and Pragmatics* 4(2):1–23.

Lahiri, Utpal. 2002. *Questions and Answers in Embedded Contexts*. Oxford: Oxford University Press.

Rullmann, Hotze and Sigrid Beck. 1998. Presupposition Projection and the Interpretation of which-Questions. In D. Strolovitch and A. Lawson, eds., *Proceedings of Semantics and Linguistic Theory VIII*, 215–231.

Spector, Benjamin and Paul Egré. 2015. A uniform semantics for embedded interrogatives: an answer, not necessarily the answer. *Synthese* 192(6):1729–1784.

Sudo, Yasutada. 2012. *On the Semantics of Phi Features on Pronouns*. Ph.D. thesis, Massachusetts Institute of Technology.

Theiler, Nadine, Floris Roelofsen, and Maria Aloni. 2016. A uniform semantics for declarative and interrogative complements. Manuscript, ILLC, University of Amsterdam.

Uegaki, Wataru. 2015. *Interpreting Questions under Attitudes*. Ph.D. thesis, Massachusetts Institute of Technology.

Xiang, Yimei. 2016. Complete and true: A uniform analysis for mention-some and mention-all questions. In *Proceedings of Sinn und Bedeutung 20*.