Acceptability of interrogatives under be certain

Introduction Most attitude verbs are easy to classify as either rogative (only embedding interrogatives, e.g., **wonder**), anti-rogative (only embedding declaratives, e.g., **think**) or responsive (embedding both types of complements, e.g., **know**). However, it appears that there are also borderline cases such as **be certain**. Although this verb is often classified as a responsive verb (Karttunen, 1977; Preuss, 2001; Lahiri, 2002; Uegaki, 2015; Theiler et al., 2016), some authors claim that **be certain** can only embed interrogative complements under specific circumstances (Egré, 2008; Hölker, 2014; Mayr, 2017).

According to these authors, (1a) sounds strange without a preposition like **about**, while this effect disappears when **be certain-wh** appears under negation as in (1b):

(1) a. ? John is certain whether Mary smokes.
b. John is not certain whether Mary smokes.

This contrasts with verbs like **know** and **think**: the former can always embed interrogatives, while the latter only embeds declaratives.

Mayr's approach Mayr (2017) argues that **be certain-wh** can appear whenever negative polarity items (NPI's) can. For instance, **any** in (2) shows the same pattern as **be certain** in (1).

(2) a. #John saw any girl.
b. John didn't see any girl.

His analysis is therefore inspired by theories of NPI licensing (e.g., Krifka, 1995; Chierchia, 2013), and goes roughly as follows: the literal meaning of a sentence φ is strengthened by means of an exhaustivity operator, which negates all formal alternatives of φ which are not entailed by φ. If this strengthening procedure leads to a contradiction, φ is perceived as ungrammatical.

The formal alternatives of a sentence are constructed in a point-wise manner. Mayr assumes that the alternatives of a polar interrogative complement, **whether** p, are **that** p and **that not** p. Thus, (1b) entails both of its alternatives, and its strengthened meaning is the same as its literal meaning. In contrast, (1a) does not entail either of its alternatives. Strengthening its literal meaning by negating its alternatives leads to a contradiction, which explains the presumed degradedness of the sentence.[1]

Two predictions to test Mayr's analysis explains the degradedness of (1a) by deriving that it is systematically contradictory. However, it is usually assumed that such systematic contradictoriness gives rise to judgments of *ungrammaticality* (Gajewski, 2002). This seems fitting for unlicensed NPI's, but it would be worth testing whether it is not too strong for **be certain-wh**.

Another particularly interesting prediction concerns sentences like the following:

(3) Both John and Bill are certain whether Mary smokes.

Since John and Bill can both be certain *whether* Mary smokes, but still disagree with each other (e.g. John is certain that she smokes, Bill is certain that she doesn't), the negations of the alternatives are not incompatible with the literal meaning. Thus, since no contradiction arises, (3) is predicted to be grammatical, in contrast with (1a). This contrast does not intuitively feel very strong, if it exists at all, so it would be interesting to test the prediction.

[1] Mayr (2017) only discusses polar questions, but suggests that his analysis can be extended to *wh*-questions.

Experiment Participants were asked to judge the acceptability of sentences like (4a–c):

(4) a. Ava is certain which movie William watched (unembedded)
b. William is not certain which movie Olivia watched (negation)
c. Both Olivia and Emily are certain which movie Grace watched ('both')

To be able to compare judgments, other variants used a different verb (anti-rogatives **believe** and **think**, or responsive **know**), or a declarative complement (**that Ann read a book**), which, for simplicity, was only tested in positive sentences with singular subjects. Judgments were recorded on a five point scale between *odd* (1) and *natural* (5).

Results The results are presented in Figure 1. Participants' responses were normalized and analyzed with linear mixed-effects models. In short, we observed that questions were as good as declaratives under **know** in plain contexts, although they were slightly degraded under negation and **both** ($t = 2.2, p = .03$). For **be certain**, we observed the opposite: questions were degraded in unembedded contexts ($t = -4.9, p < .001$), but this effect disappeared under negation and **both** (interaction: $t = 5.3, p < .001$). With **think** and **believe**, questions were clearly degraded under any embedding ($t = -16, p < .001$).

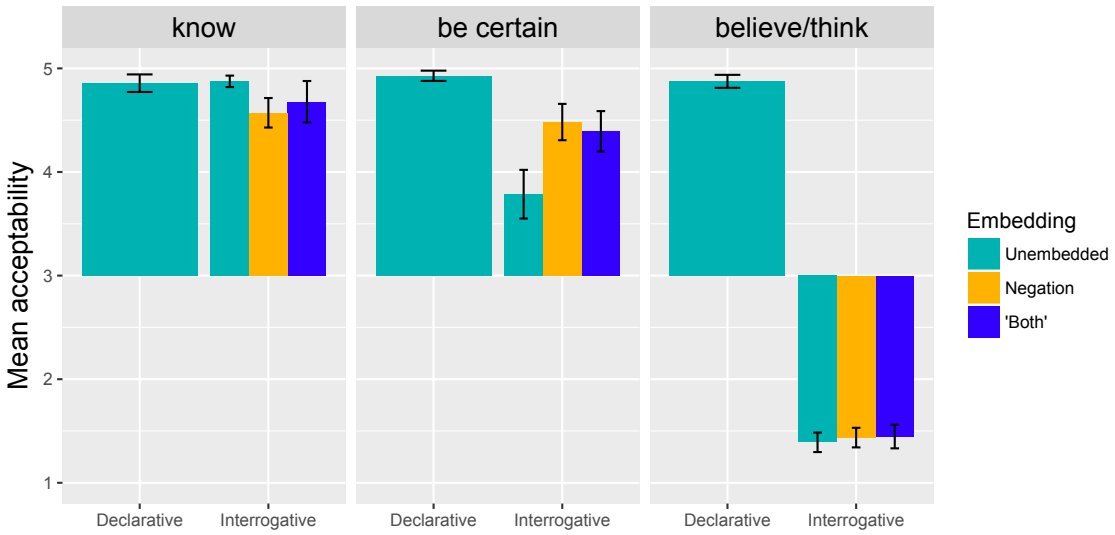

Figure 1: Mean (SE) acceptability for each construction

Conclusion Our results suggest that Mayr's judgment of the degradedness of **be certain-wh** in positive episodic sentences is correct. Moreover, we indeed find that this effect disappears when **be certain-wh** appears under negation or **both**.

However, if (1a) were really perceived as ungrammatical, as Mayr's theory formally predicts, we would expect the contrast between (1a) and (1b) to be bigger, more in line with the contrast between **believe-wh** and **believe-that**. Since we do not find this, it seems that the degradedness of (1a) and the ungrammaticality of unlicensed NPI's do not have exactly the same status. This presents a challenge for Mayr's theoretical hypothesis that one and the same mechanism should be held accountable for both.

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