

## On being certain that presuppositions don't project universally

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**Background** Research on presupposition projection has been plagued by a data problem. This is most evident when presupposition triggers are embedded in quantificational environments, where a large degree of inter-speaker (Sudo et al. 2012) and inter-trigger variation (Charlow 2009) has been reported. Nevertheless, Fox (2013) (building on George 2010) argues that a system based on the trivalent Strong Kleene logic for presupposition projection from the scope of quantifiers over entities, like *every*, allows for an adequate model of presupposition projection (*modulo* certain secondary processes like local accommodation, which we will return to later).

(1) **Projection out of a universal quantifier:**

The truth value of a formula  $\forall x \in D: \phi(x)$  is

- a. T if  $\phi(x) = T$  for all  $x \in D$ ; (universal definedness for  $\phi$ )
- b. F if there is an  $x \in D$  such that  $\phi(x) = F$ ; (existential definedness for  $\phi$ )
- c. # otherwise (if there is an  $x \in D$  such that  $\phi(x) = \#$  and no  $x \in D$  such that  $\phi(x) = F$ ).

While Fox (2013) was concerned with quantifiers over entities, here we ask whether the approach above makes correct predictions for quantifiers over worlds as well. Consider the sentence in (2), where the presupposition trigger *again* is embedded under the attitude predicate *be certain*. If *be certain* behaves like a universal quantifier over possible worlds, and quantification obeys the same logic across domains, Strong Kleene predicts that the truth conditions of the sentence are as is spelled out below. Notably, falsity obtains when there is a single accessible world where the presupposition of the embedded clause holds and its assertion is false, (2b).

(2) Peter is certain that Jan canoed again.

- a. T if Peter is certain that Jan canoed last time and this time.
- b. F if Peter considers it possible that Jan canoed last time and didn't this time.
- c. # if Peter considers it possible that Jan didn't canoe last time, but he is certain that if Jan canoed last time, he canoed this time, too.

Compare this to a system where universal projection is assumed (such as the dynamic framework in Heim 1992). While the conditions for a true sentence are identical to the predictions in (2), falsity can only obtain when all the attitude holder's certainty-worlds support the presupposition, (3b); all other scenarios result in presupposition failure.

(3) Truth conditions for (2) with universal projection

- a. T if Peter is certain that Jan canoed last time and this time.
- b. F if Peter is certain that Jan canoed last time and considers it possible he didn't this time.
- c. # if Peter considers it possible Jan didn't canoe last time.

**Experiment** In order to compare these two sets of predictions and test whether the Strong Kleene approach to presupposition projection for quantifiers over entities can be extended to quantifiers over possible worlds, we devised a continuous trivalent truth-value judgment task (cf. Križ & Chemla 2015) with the design outlined in (4). The experiment was carried out using PCIBex (Zehr & Schwarz 2022). While the experiment was carried out in German, we present English versions of the items here.

- (4)  $2 \times 4$  design (within-within; 48 items and participants)
- a. NEGATION: without vs. with matrix negation

b. SCENARIO: **true** vs. **false** vs. **undefined** vs. **critical**

c. Presupposition TRIGGER as a pseudo-factor: *again* vs. *stop* (between items, 24 each)

The critical stimuli resembled (2) (in the non-negated condition), with the presupposition trigger *again* embedded under *be certain*. We chose *be certain* instead of the more common *believe* because the former is not a neg-raising predicate. The SCENARIO factor was instantiated (redundantly) using both verbal and visual contexts. In (5) below, we list the verbal context for each level of the factor SCENARIO; the corresponding visual context, which was always shown in parallel, is illustrated in Fig. 1. Participants were familiarized with the notation used in the visual context at the beginning of the experiment.

(5) Peter is (not) certain that Jan canoed again.

**true** Peter: “I’m certain that Jan canoed last time, and I’m certain that Jan canoed this time.”


**false** Peter: “I’m certain that Jan canoed last time, but I have no idea if this time, Jan canoed or not.”

**undefined** Peter: “I have no idea if last time, Jan canoed or not, but I am certain that Jan canoed this time.”

**critical** Peter: “I have no idea if last time, Jan canoed or not, and I have no idea if this time, Jan canoed or not.”

In the experiment, participants were asked to judge the critical sentence as a report of the visual and verbal scenario using the scale below. In contrast to Križ & Chemla (2015), participants could freely place the slide anywhere on the scale, rather than having to resort to categorical judgments.

(6) (completely false) (neither completely true nor completely false) (completely true)



For the **true**, **false**, and **undefined** scenarios, both the proposals in (2) and (3) make the same predictions—they can be considered controls. Crucially, matrix negation should affect participants’ judgment in the first two levels of the SCENARIO factor but not the third, since there presupposition failure obtains. The scenario **critical** is where the approaches diverge. As with the **undefined** scenario, accounts that assume universal projection predict presupposition failure here because it is not the case that all of the doxastic alternatives support the presupposition of *again*. Hence, negation not is predicted to affect the truth value. Strong Kleene, instead, predicts no presupposition failure here because the attitude holder considers it possible that the presupposition holds and that the assertion is false—see (2b). Without matrix negation, we expect falsity; with it, truth is the predicted judgment. In other words, while universal projection accounts predict no effect of the NEGATION manipulation in the **critical** scenario, Strong Kleene does.

In addition to the two manipulations just described, we also included a pseudo-factor that varied the embedded presupposition trigger between items. Besides the hard trigger *again*, the soft trigger *stop* was included (for the distinction, see Abusch 2002, 2010)—see Fig. 2 for a sample item. This manipulation probes the availability of local accommodation, an operation that collapses falsity and undefinedness conditions (for an implementation in a trivalent framework, see Beaver & Krahmer 2001) that soft triggers are said to allow, contrary to hard triggers (Abrusán 2016). If local accommodation is available for soft triggers in attitude complements, and presupposition failure is collapsed with falsity, we expect negation to have an effect for the **undefined** condition with *stop* but not with *again*. All the predictions are summarized in Fig. 3.

(7)  $\llbracket \mathcal{A} \rrbracket = \lambda p_t . T \text{ if } p = T, F \text{ if } p \neq T$  (local accommodation)

The results are displayed in Fig. 4. For the **true** and **false** scenarios, we find that participants judge the stimuli as expected for both levels of the pseudo-factor. The **undefined** scenario was treated as involving presupposition failure, as indicated by the intermediate judgments on the scale as well as the crucial indifference to the **NEGATION** factor. In general, then, all the control conditions behave as expected. The **critical** scenario shows a clear effect of negation and an overall similarity to the **false** scenario. Finally, the two kinds of presupposition triggers pattern very similarly across the manipulations of the two factors. Overall, our findings are hard to reconcile with approaches that assume universal presupposition projection from attitude predicates, such as Heim (1992). Instead, if *be certain* is treated as a quantifier over possible worlds, our results readily align with the Strong Kleene approach to presupposition projection defended in Fox (2013), (1), such that in a sense, presuppositions project existentially out of negated universals.

For presupposition projection from quantifiers over entities, Charlow (2009) argues that strong presupposition triggers project universally even when embedded under quantifiers which do not usually result in universal projection patterns, like *some*. While Charlow (2009) takes Strong Kleene to derive the correct pattern for weak triggers, he argues that strong triggers are not easily analyzed in those terms. In our experiment with attitude predicates, no such discrepancy is present and the predictions of Strong Kleene are in line with the results for both trigger types.

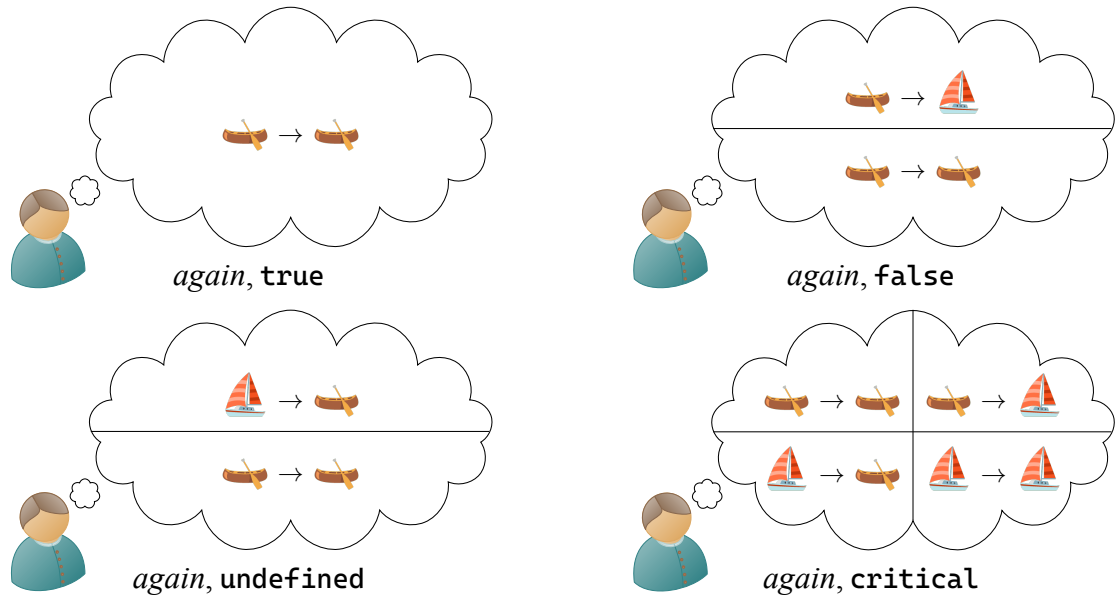
In addition, an explanation for the effect of negation in terms of local accommodation for only the **critical** scenario is unlikely to be applicable here, since both *again* and *stop* patterned alike. What is more, on the view that local accommodation is an operator defined as in (7) and inserted to derive weaker projection patterns out of the scope of quantifiers (Fox 2013), the  $\mathcal{A}$  operator should be able to afford parses like the one in (8) below (where the subscript indicates the presupposition triggered locally). Such a parse should be pragmatically desirable because it would allow for the avoidance of presupposition failure—see again Fig. 3.

(8) (NOT) Markus certain  $\lambda w . \mathcal{A}$  [Sonja stopped drinking wine in  $w$  Sonja drank wine in the past in  $w$ ]

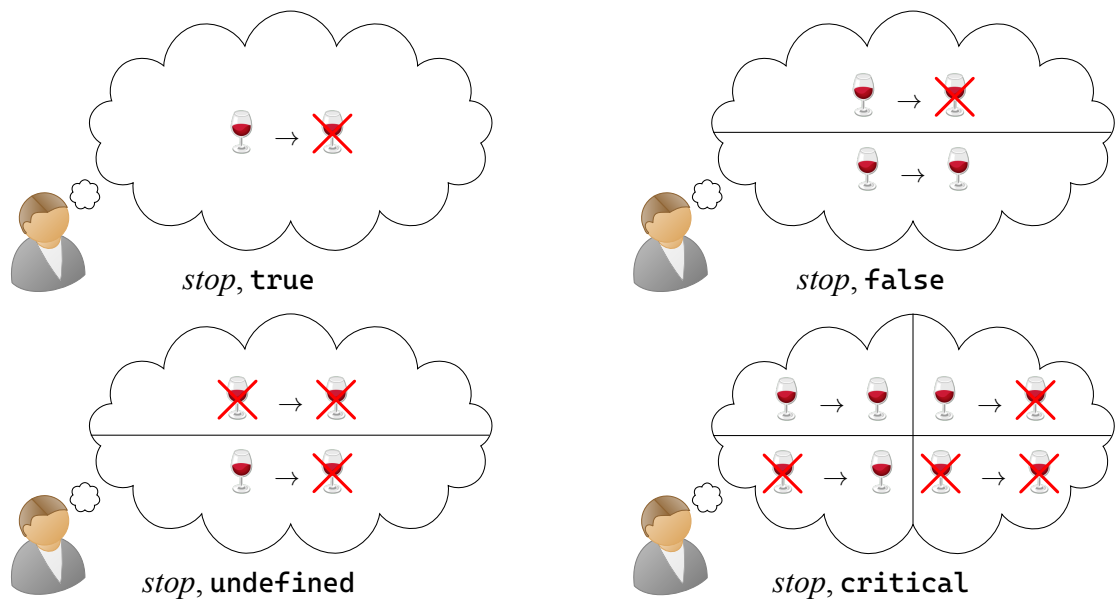
Given that our results strongly indicate a presupposition failure in the **undefined** scenario, we take them to suggest that participants did not have access to parses with local accommodation. Although there could be reasons why the experimental design discourages such parses, an alternative takeaway is that the view on local accommodation should be reconceptualized: instead of assuming that it is a silent operator freely available to syntax, we suggest that it can be limited to certain semantically determined environments. For instance, the unavailability of local accommodation in the complement of an attitude predicate mirrors its unavailability in the consequent of a conditional, whereas a conditional antecedent is a suitable environment. As this is not a question our experimental results address directly, further study is warranted.

**Conclusions** Our findings help to fill out the empirical picture of presupposition projection. In contrast to other studies which have consistently encountered various sources of heterogeneity, our results for the triggers *again* and *stop* embedded under *be certain* motivate an analysis of presupposition projection using Strong Kleene without further modification. While Fox (2013) argued for various extensions of Strong Kleene to capture the complex pattern found with quantifiers over individuals—like local accommodation—, our results can be captured without reliance on these additional mechanisms. As a next step, we plan on running a variant of the experiment presented above with universal quantifiers over entities to see in how far the results from this kind of experiment for the modal domain extend to another domain; previous findings relative to quantifiers over entities appear significantly more complex compared to the ones presented here. A sample item with the quantifier *all* and the presupposition trigger *again* is given below. The experimental design is otherwise identical to (4). The visual scenarios are shown in Fig. 5.

(9) (Not) all women canoed again.

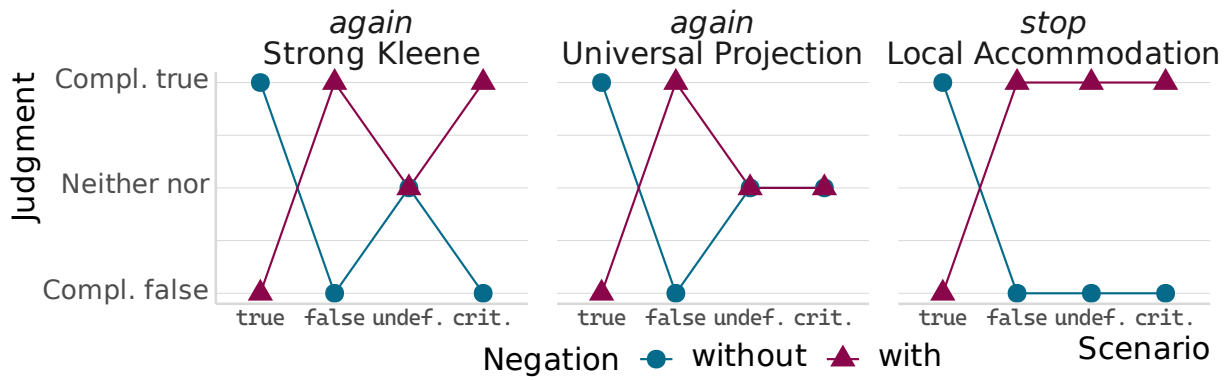


**Figure 1:** Visual scenarios for “Peter (not) is certain that Jan canoed again”.

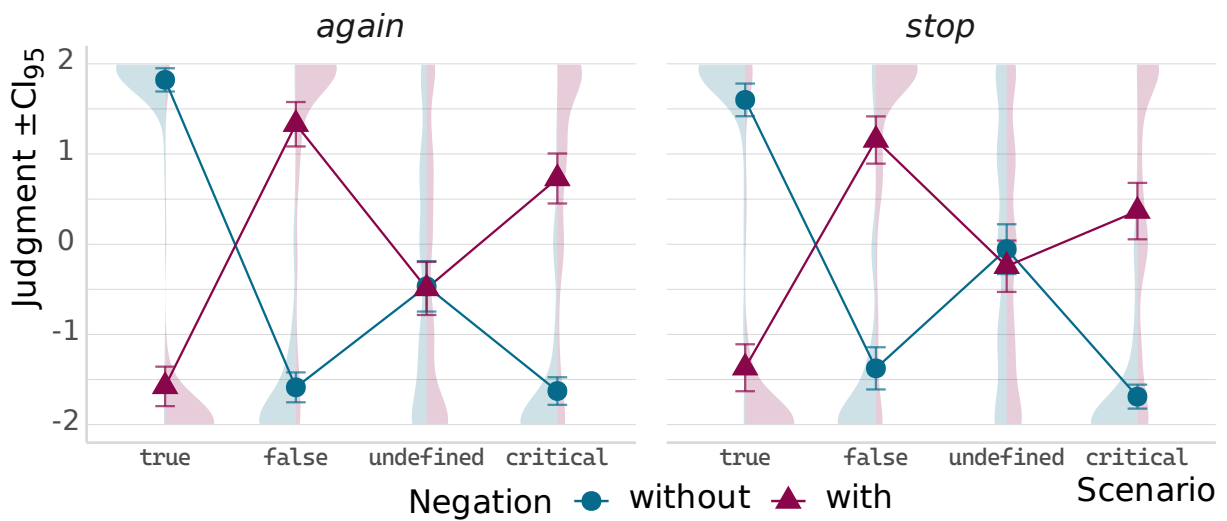


**Figure 2:** Visual scenarios for “Markus is (not) certain that Sonja stopped drinking wine”.

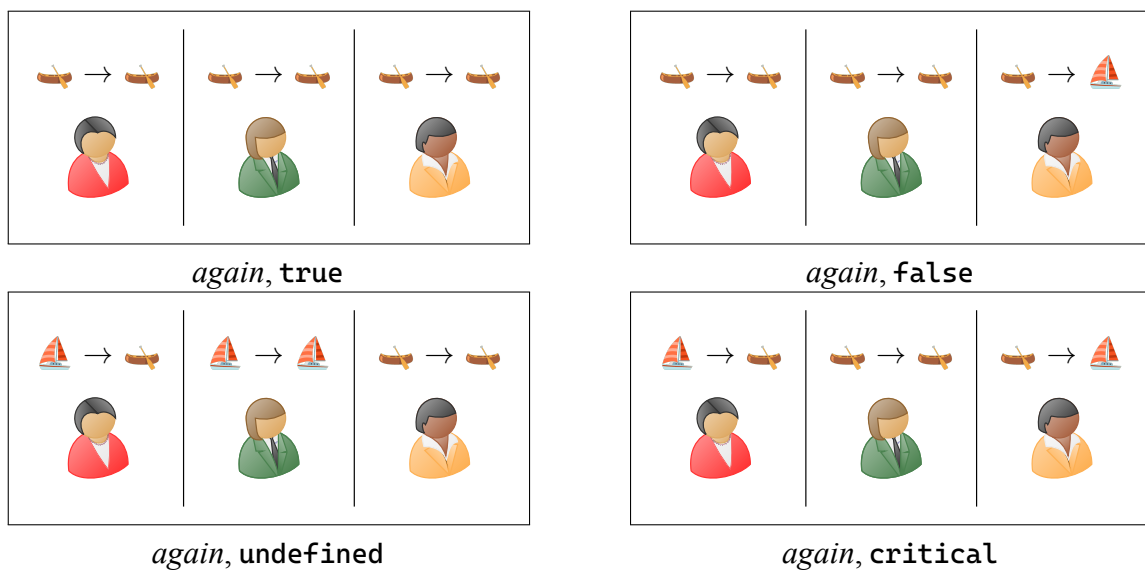
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**Figure 3:** Predictions for the experimental outcome for the two approaches, plus the predictions for the soft trigger *stop* with local accommodation.



**Figure 4:** Results. Shaded areas indicate raw distribution of the ratings. ‘Completely false’ was coded as  $-2$ , ‘completely true’ as  $2$ , and ‘neither nor’ as  $0$ .



**Figure 5:** Visual scenarios for “(Not) all women canoed again”.