Variation of Presupposition Projection in Quantified Sentences

Summary: Presupposition projection in quantified sentences is at the center of debates in the presupposition literature ([1-4,6-8,11]). This paper reports on a survey revealing inter-speaker variation regarding which quantifier yields universal inferences—i.e. which Q in $Q(B)(\lambda x.C(x)_{p(x)})$ supports the inference $\forall x \in B$: $p(x)$. In particular, we observe an implication that if *some* yields a universal inference for a speaker, *no*, and a polar question with *any* do too for the same speaker. We propose an account of this implication based on trivalent theories of presupposition projection together with auxiliary assumptions suggested by [6].

Survey: We conducted an on-line survey on Amazon Mechanical Turk whose main purpose was to investigate inter-speaker variation on which quantificational determiner yields a universal inference. [3] is a previous experimental study on this topic, but does not explicitly discuss inter-speaker variation. In this survey we looked at *some*, *none*, and a polar question with *any* (*?any*).

We employed the covered box method of [9] which allows us to investigate preferred readings of potentially ambiguous sentences. In each trial, participants saw a sentence and a pair of pictures, and were asked to pick the picture that the sentence was about. One of the pictures was covered, while the other picture was overtly displayed. Participants were instructed to choose the covered picture only if the overt picture was not a possible match for the sentence.

The survey had 3 target trials and 21 filler trials. The target trials involve the following sentences with the presupposition trigger *both*.

(1) Some of the three triangles have the same color as both of the circles in their own cell
(2) None of the three circles has the same color as both of the squares in its own cell
(3) Does any of the three squares have the same color as both of the triangles in its own cell?

The overt picture in each of the target trials was designed in such a way that the universal inference cannot be satisfied in it (see below for details). Therefore, the prediction is that the covered picture will be chosen if and only if the speaker obtains a universal inference.

As there are two possible answers for each of the three target trials, there are eight possible answer patterns. The data from 62 native speakers of English is summarized below, where CP stands for the covered picture.

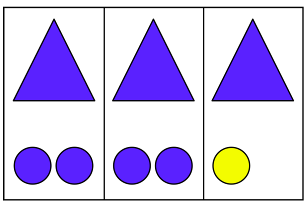
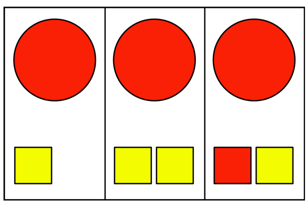
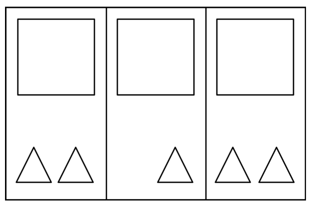
Some	*None*	*?Any*	# of Subjs
Overt	Overt	Overt	19
Overt	Overt	CP	17
Overt	CP	Overt	6
Overt	CP	CP	6

Some	*None*	*?Any*	# of Subjs
CP	Overt	Overt	1
CP	Overt	CP	1
CP	CP	Overt	1
CP	CP	CP	11

The distribution of the subjects across the answer patterns is clearly non-uniform. In particular, we observe the following implication:

(4) For a given speaker, if *some* yields a universal inference, then *none* and *?any* do too

The overt pictures for the target trials are given below. They contain three cells, each of which contains exactly one restrictor figure (e.g. a triangle for (1)). Crucially, only two of the cells have exactly two nuclear scope figures (e.g. circles for (1)), and the remaining one has only one.

(1’)  (2’)  (3’) 

For trials with a polar question such as (3), the overt picture is colorless, and participants were instructed to imagine that somebody who is incapable of distinguishing colors is asking the question, and guess which picture they are asking about.

Trivalent Account: We propose an account of the implication (4) using the trivalent theory of presupposition projection ([2,5,7,10]). This theory does not directly predict a universal inference $\forall x \in B$: $p(x)$ for $Q(B)(\lambda x.C(x)_{p(x)})$ with *some*, *none* or *?any* , but only a disjunctive presupposition $[\exists x \in B\text{: } p(x) \wedge C(x)] \vee [\forall x \in B\text{: } p(x)]$. For example (1) is true if at least one of the triangles has exactly two circles in its own cell and has the same color as them; (1) is false if each of the triangles has exactly two circles in their own cell, but has different colors from them; and is a presupposition failure otherwise. Therefore, it presupposes that some of the triangles have exactly two circles in its own cell and have the same color as them, or all of the circles have exactly two circles in their own cell. Since $[\![\text{none}]\!](B)(\lambda x.C(x)_{p(x)})$ is the negation of $[\![\text{some}]\!](B)(\lambda x.C(x)_{p(x)})$, they have the same disjunctive presupposition. Similarly, $[\![\text{?any}]\!](B)(\lambda x.C(x)_{p(x)})$ denotes $\{[\![\text{some}]\!](B)(\lambda x.C(x)_{p(x)}), [\![\text{none}]\!](B)(\lambda x.C(x)_{p(x)})\}$, and presupposes that one of them is true. Since both answers have the disjunctive presupposition, the question itself presupposes it too.

Following [6], we assume that the disjunctive presupposition is pragmatically marked and triggers one of two repair strategies: (i) pragmatic strengthening, or (ii) insertion of the A-operator: $[\![\text{A}]\!](p)(w) = 1$ if $p(w) = 1$, and $[\![\text{A}]\!](p)(w) = 0$ if $p(w) = 0$ or $p(w) = \#$. Again with [6], pragmatic strengthening is assumed to yield the universal inference $\forall x \in B$: $p(x)$ when applied to the disjunctive presupposition. On the other hand, the A-operator can result in a universal or weaker inference depending on its scope and the quantifier: For *some*, the sentence cannot have a universal inference, while for *none*, the A-operator yields a universal inference when applied above the quantifier and no inference when applied below it. Similarly for *?any*, it yields a universal inference when applied above the question operator, and no inference when applied below it or below the quantifier. More specifically $[\![\text{A}]\!]([\![\text{some}]\!](B)(\lambda x.C(x)_{p(x)}))$ is true iff $\exists x \in B$: $p(x) \wedge C(x)$, while $[\![\text{A}]\!]([\![\text{none}]\!](B)(\lambda x.C(x)_{p(x)}))$ is true iff $[\forall x \in B\text{: } p(x)] \wedge [\neg\exists x \in B : p(x) \wedge C(x)]$. The latter, but not the former, implies $\forall x \in B$: $p(x)$. Also assuming that $[\![\text{A}]\!]([\![\text{?any}]\!](B)(\lambda x.C(x)_{p(x)})) = \{[\![\text{A}]\!]([\![\text{some}]\!](B)(\lambda x.C(x)_{p(x)})), [\![\text{A}]\!]([\![\text{none}]\!](B)(\lambda x.C(x)_{p(x)}))\}$, and that polar questions presuppose one of the answers is true, it results in the disjunctive presupposition. This requires further pragmatic strengthening, consequently yielding a universal inference. Insertion of the A-operator in local positions yields weaker inferences, but these cases are omitted here for reasons of space.

Assuming that speakers differ in whether they use the A-operator as the default repair strategy, we can explain the implication (4) as follows. Those who do not use the A-operator always resort to pragmatic strengthening, obtaining a universal inference for all of the three cases. On the other hand, those who prefer to use the A-operator never get a universal inference for *some*, but may get a universal inference for *none* and *?any* depending on where it is inserted. We will argue that other theories of presupposition projection such as [1], [4], [8] and [11] cannot account for (4) as straightforwardly as our account.

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