Presupposition

Yasutada Sudo (UCL)

Eastern Generative Grammar (EGG)
Lagodekhi, Georgia
1–5 August 2016

Chapter 3

Presupposition Projection and Quantification in Satisfaction Theory

Presupposition projection through quantificational expressions is a difficult issue both empirically and theoretically. Here we will discuss two issues of presupposition projection through quantifiers under Satisfaction Theory:

- Variation among quantificational determiners
- The problem of non-entailed presuppositions

3.1 Presupposition Projection through Quantifiers

3.1.1 Indefinites

Presupposition projection through indefinites:

(3.1) a. $c[\mathsf{a}^i]$ is defined iff $i \notin \mathrm{dom}(c)$.
b. Whenever defined, $c[\mathsf{a}^i] = \{ \langle g[2 \mapsto e], w \rangle \mid \langle g, w \rangle \in c$ and e is an individual $\}$

(3.2) Whenever defined, $c[\mathsf{a}^i\ \phi\ \psi] = c[\mathsf{a}^i][\phi][\psi]$

There are two cases, depending on where the presupposition is triggered.

(3.3) a. A fat man was pushing his bike. (Heim 1983)
b. A man who was pushing his bike was tired.

We saw that Satisfaction Theory predicts (3.3a) to presuppose that every fat man has a bike, and (3.3b) to presuppose that every individual/entity has a bike. Both of these predictions seem to be inadequate.

Heim's (1983) suggestion is to resort to local accommodation. There are two potential problems with this:

- Local accommodation is usually not so free, but it seems that the non-universal readings of (3.3) are the default readings (Soames 1982).
- Local accommodation predicts that (3.3) don't have presuppositions. But this does not seem to be the right prediction.

  (3.4) a. Mary doubts that a fat man was pushing his bike.
  b. Mary asked if a fat man was pushing his bike.

  These sentences seem to have inferences that Mary believes that some fat man had a bike.
  Similarly:

  (3.5) Was a fat man pushing his bike?

3.1.2 Generalised Quantifiers

Dynamic generalised quantifier can be analysed as follows:

(3.6) a. $c[\mathrm{Q}^i\ \phi\ \psi]$ is defined only if $i \notin \mathrm{dom}(c)$
b. Whenever defined, $c[\mathrm{Q}^i\ \phi\ \psi]$

$$= \left\{ \langle g, w\rangle \in c \;\middle|\; \begin{array}{l} \mathbb{Q}(\{\, g'(i) \mid \langle g', w\rangle \in c[\mathrm{a}^i][\phi] \wedge g \leqslant g' \,\}) \\ (\{\, g''(i) \mid \langle g'', w\rangle \in c[\mathrm{a}^i][\phi][\psi] \wedge g \leqslant g'' \,\}) \end{array} \right\}$$

Q here is a dynamic quantifier, and $\mathbb{Q}$ is its static counterpart, which is a relation between two sets.

The predictions are the same as in the case of indefinites.

- The presupposition of the restrictor ϕ must be true of all entities.
- The presupposition of the nuclear scope ψ must be true of entities that are ϕ.

These predictions are again empirically inadequate.

There are two problems with the Satisfaction Theoretic account of presupposition projection through quantifiers:

1. Variation among quantificational determiners
2. Non-entailed presuppositions

Let us briefly see the first problem: it seems that different determiners give rise to different presuppositions.

Cases where the nuclear scope has a presupposition.

(3.7) a. Every student of mine went back to Russia.
b. No student of mine went back to Russia.

These sentences presuppose that every student of mine is from Russia.

The following sentences presuppose something weaker:

(3.8) a. A student of mine went back to Russia.
b. Two students of mine went back to Russia.
c. At least five students of mine went back to Russia.
d. Some of my students went back to Russia.
e. Exactly 10 of my students went back to Russia.

Less clear cases:

(3.9) a. Most of my students went back to Russia.
b. Few of my students went back to Russia.

Presupposition projection through restrictors:

(3.10) a. Every student who went back to Russia was a boy.
b. No student who went back to Russia was a boy.
c. Some students who went back to Russia were boys.
d. Two students who went back to Russia were boys.
e. Most of the students who went back to Russia were boys.

These all presuppose that there are some students who were from Russia.

We could resort to local accommodation here too. However, again, that would predict that these sentences don't have presuppositions. But consider:

(3.11) a. Mary doubts that no student who went back to Russia was a boy.
b. Was no student who went back to Russia a boy?

3.2 Existential Presupposition

Beaver (1994, 2001) argues that all quantificational sentences have existential presuppositions, and he proposes a version of Satisfaction Theory that achieves this.

His idea is to divided up the context according to what value the assignment function assigns to the relevant variable:

(3.12) $c_i^e = \{ \langle w, g \rangle : g(i) = e \}$

And he only requires the presupposition be satisfied by at least one value:

(3.13) a. $c[\mathrm{a}^i][\phi][\psi]$ is defined iff $i \notin \mathrm{dom}(c)$ and for some individual e, $(c[\mathrm{a}^i])_i^e[\phi]$ is defined and $(c[\mathrm{a}^i])_i^e[\phi][\psi]$ is defined.

b. Whenever defined,

$$c[\mathsf{a}^i][\phi][\psi] = \bigcup_{x \in \left\{ y \;\middle|\; \begin{array}{l} (c[\mathsf{a}^i])^y_i[\phi] \text{ is defined} \\ (c[\mathsf{a}^i])^y_i[\phi][\psi] \text{ is defined} \end{array} \right\}} (c[\mathsf{a}^i])^x_i[\phi][\psi]$$

Let us see a concrete example:

(3.14) A^2 x_2 fat man x_2 who was pushing his bike x_2 was tired.

Let's compute the presupposition of this sentence according to (3.13).

Take some context c such that $2 \notin \mathrm{dom}(c)$. Then:

(3.15) $c[\mathsf{a}^2] = \{\langle g[2 \to e], w\rangle \mid \langle g, w\rangle \in c \wedge e \text{ is an individual}\}$

Now we split this context *for some individual d*, $c_2'^d$:

(3.16)
$$c_2'^d = \{\langle g[2 \to e], w\rangle \mid \langle g, w\rangle \in c \wedge e \text{ is an individual} \wedge g[2 \to e](2) = d\}$$
$$= \{\langle g[2 \to d], w\rangle \mid \langle g, w\rangle \in c\}$$

This context $c_2'^d$ has to satisfy the presupposition of the restrictor ϕ:

(3.17) $c[(3.14)]$ is defined iff $2 \notin \mathrm{dom}(c)$ and for some d, for each $\langle g, w\rangle \in c$, d has a bike in w.

This is an existential presupposition, unlike in Heim's theory.

When the presupposition is satisfied, you compute $c_2'^d$ for all d and take the union of the resulting contexts.

Similarly for the nuclear scope example:

(3.18) A^2 x_2 fat man x_2 was pushing his bike.

Consider the same context c as above. In (3.18), there is no (interesting) presupposition in the restrictor ϕ, so we can just update $c_2'^d$ to obtain:

(3.19) $\{\langle g[2 \to d], w\rangle \mid \langle g, w\rangle \in c \wedge d \text{ is a fat man in } w\}$

Now this context (for some d) needs to satisfy the presupposition of the nuclear scope, namely that the extension of x_2 has a bike.

(3.20) $c[(3.18)]$ is defined iff $2 \notin \mathrm{dom}(c)$ and for some d, for each $\langle g, w\rangle \in c$, if d is a fat man in w, then d has a bike in w.

This is an existential presupposition, again.

Beaver (1994, 2001) furthermore claims that generalised quantifiers also have existential presuppositions. His analysis of generalised quantifiers look like (3.21):

(3.21) a. $c[\mathrm{Q}^i\ \phi\ \psi]$ is defined only iff $i \notin \mathrm{dom}(c)$ and for some d, $(c[\mathrm{a}^i])^d_i[\phi]$ is defined, and $(c[\mathrm{a}^i])^d_i[\phi][\psi]$ is defined.

b. Whenever defined, $c[\mathrm{Q}^i\ \phi\ \psi]$

$$= \left\{ \langle g, w \rangle \in c \;\middle|\; \mathbb{Q}\left(\bigcup_{x \in \{ y \mid (c[\mathrm{a}^i])^y_i[\phi] \text{ is defined} \}} \{ g'(i) \mid \langle g', w \rangle \in (c[\mathrm{a}^i])^x_i[\phi] \wedge g \leqslant g' \} \right) \left(\bigcup_{x \in \left\{ y \;\middle|\; \begin{array}{l} (c[\mathrm{a}^i])^y_i[\phi] \text{ is defined} \\ (c[\mathrm{a}^i])^y_i[\phi][\psi] \text{ is defined} \end{array} \right\}} \left\{ g''(i) \;\middle|\; \begin{array}{l} \langle g'', w \rangle \in (c[\mathrm{a}^i])^x_i[\phi][\psi] \\ \wedge g \leqslant g'' \end{array} \right\} \right) \right\}$$

However recent experimental results suggest that Beaver's empirical assumptions are not on the right track.

3.3 Experimental Data: Variation Among Quantifiers

3.3.1 Chemla (2009)

Experiment 1 looked at the following quantificational determiners (in French):

- Each
- No
- Less than three
- More than three
- Exactly three

The task was an inferential task with binary answers. In each trial, the subject saw two sentences S and p, and was asked to judge whether S suggests p. They provided their answer by either clicking on *Oui* or *Non*.

For example, S and p in a target trial looked like (3.22) (in French).

(3.22) S: None of these 10 students knows that his father is going to receive a congratulation letter.

p: The father of each of these 10 students is going to receive a congratulation letter.

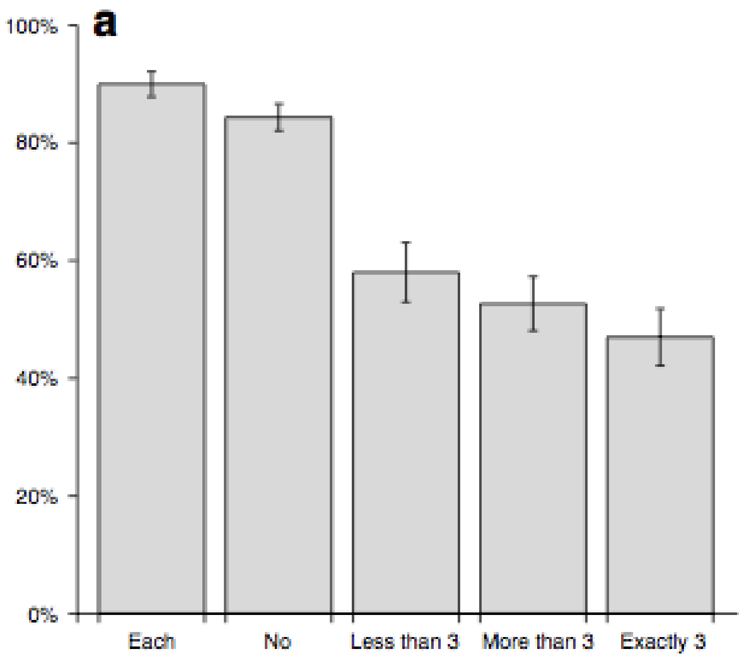
In the target trials, p was a universal statement, representing the alleged universal presupposition.

Each is a baseline condition, and is expected to simply entail p (but note that this is not at all trivial, depending on the presupposition trigger; see the discussion on non-entailed presuppositions below).

The following presupposition triggers were tested (in French):

- Know
- Be aware
- Stop
- Continue
- His

The results ($N = 30$) indicate that *no* is more likely to have a universal inference than *less than three*, *more than three*, and *exactly three*.



Experiment 2 is similar to Experiment 1 but the answers were given on a continuous scale. Also, more determiners were tested:

- Each
- No
- Most
- Few
- Many
- Less than six
- More than six
- Exactly six
- Who

One of the target trials looked like (3.23):

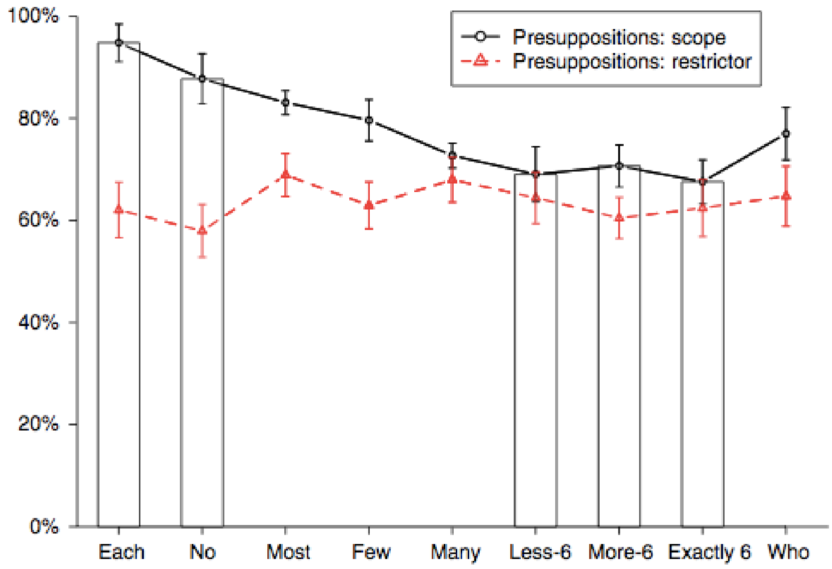
(3.23) *S*: Among these 20 students, who knows that his father is going to receive a congratulation letter?
p: The father of each of these two students is going to receive a congratulation letter.

In addition, projection through restrictor was tested, e.g.:

(3.24) *S*: Among these 20 students, most who know that their father is going to receive a congratulation letter take English lessons.

p: The father of each of these 20 students is going to receive a congratulation letter.

The results ($N = 10$):



These data show that at least quantificational determiners like *no* can give rise to universal presuppositions. This is not accounted for by Beaver (1994, 2001) analysis of generalised quantifiers.

At the same time, the data pose a challenge for Heim (1983), who predicts universal presuppositions for all. Although she could resort to local accommodation to derive non-universal readings, it needs to be explained why there is variation among quantificational determiners: If you can do local accommodation with one quantificational determiner, shouldn't it be possible with other determiners too?

3.3.2 Some Additional Data

Note that Chemla's (2009) experiment only has a baseline for universal presuppositions (*each*), and doesn't have one for non-universal presuppositions. So the results do not tell us which quantificational determiners (if any) can *not* give rise to universal presuppositions.

Sudo, Romoli, Hackl & Fox (ms.) included *the tallest* as a baseline condition without universal presuppositions, in addition to *each* (see also Sudo, Romoli, Hackl & Fox 2011). We tested the following type of sentences.

(3.25) a. $\left.\begin{array}{l}\text{The tallest}\\ \text{Each}\\ \text{Some}\\ \text{None}\end{array}\right\}$ of the 5 girls brought both of her/their pens.

b. Did any of the 5 girls brought both of her pens?

Each trial had a lead-in context, which served to introduce the domain of quantification in a neutral manner, e.g. *Yesterday, five girls met in their new school for the first time*. This was also meant to eliminate the possibility that some girls collectively own the relevant objects, e.g. pens in (3.25).

Participants read two sentences, S1 and S2. S1 was a quantificational sentence like (3.25), and S2 represented the universal presupposition:

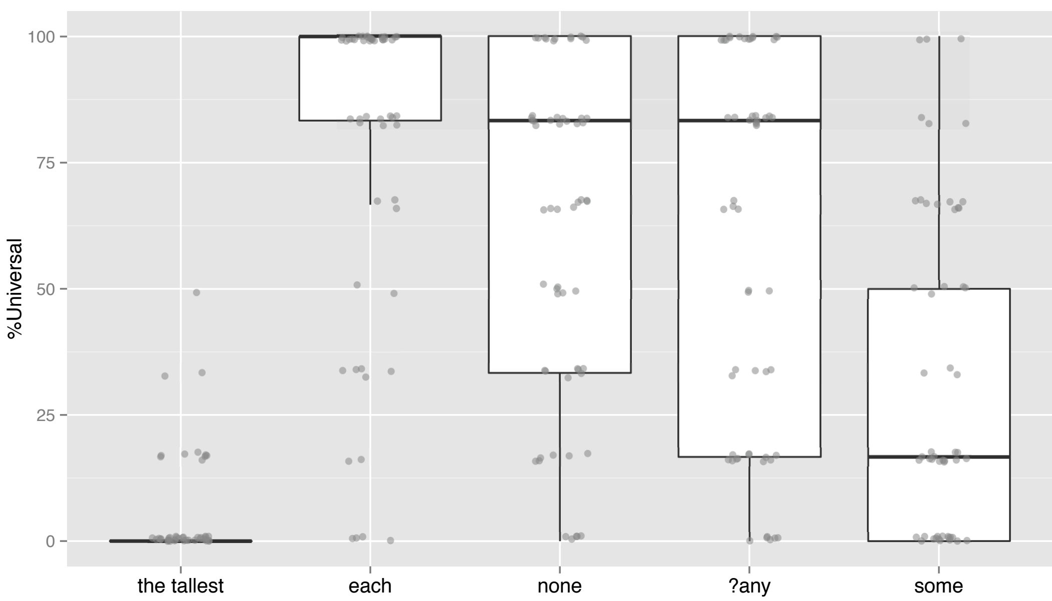
(3.26) Each of the 5 girls owns exactly two pens.

The main task is to answer the following question by YES or NO:

- When S1 is a declarative sentence: *If you sincerely accept the first sentence, do you have to believe the second one?*;
- When S1 is a polar question, *If you sincerely ask the first sentence, do you have to accept the second one?*.

In addition to 5 determiners $\times 6$ items $= 30$ target items, 36 filler items were prepared. Each participants saw all 66 items in one of two pseudo-randomized orders.

The results (*N* $= 79$):



As expected, *the tallest* did not give rise to universal presuppositions at all. On the other hand, *some* did to some extent. The difference between each pair of determiners was statistically significant (all $p < 0.001$), except for *none-?any* ($p = 0.21$) (Wilcoxon signed-rank tests with Bonferroni correction).

This suggests that even *some* can give rise to universal presuppositions unlike what Beaver expects.

3.3.3 Interim Summary

Both Heim (1983) and Beaver (1994, 2001) make a uniform prediction for all quantificational determiners, but the data show that there is variation among them.

3.4 Non-Entailed Presuppositions

Sudo (2012) pointed out that *non-entailed presuppositions* become problematic in quantificational contexts.

Theoretically, there can be two kinds of presuppositions: presuppositions that are entailed by at-issue meaning (*entailed presuppositions*), and presuppositions that are not entailed by at-issue meaning (*non-entailed presuppositions*).

An example of entailed presuppositions is *quit smoking* (according to the standard analysis):

(3.27) Rafael quit smoking.
  a. At-issue: Rafael used to smoke but not any more.
  b. Presupposition: Rafael used to smoke.

The at-issue meaning here entails the presupposition.

By contrast, *again* is (often) analysed as triggering an entailed presupposition:

(3.28) Rafael is going to London again.
  a. At-issue: Rafael is going to London.
  b. Presupposition: Rafael has been to London.

Unlike in the previous case, the at-issue meaning and presupposition are independent here.

Another example of non-entailed presupposition:

(3.29) Jesse is proud of herself.
  a. At-issue: Jesse is proud of Jesse.
  b. Presupposition: Jesse is female.

Again, these two inferences are logically independent.

Of course, these analyses might be wrong; Maybe *quit smoking* has a non-entailed presupposition as in (3.30):

(3.30) Rafael quit smoking.
 a. At-issue: Rafael is not smoking now.
 b. Presupposition: Rafael used to smoke.

Or maybe *again* gives rise to an entailed presupposition:

(3.31) Rafael is going to London again.
 a. At-issue: Rafael has been to London and is going to London.
 b. Presupposition: Rafael has been to London.

Similarly for *proud of herself*:

(3.32) Jesse is proud of herself.
 a. At-issue: Jesse is female and is proud of Jesse.
 b. Presupposition: Jesse is female.

How can we know?

One way to test this is by looking at the meanings with non-upward monotonic quantifiers that do not give rise to universal presuppositions, e.g. *exactly one student*. Recall that Chemla's (2009) results indicate that *exactly one NP* has a reading without universal presuppositions. For example:

(3.33) Exactly one of my students is proud of herself (namely, Jesse).

If this sentence has a non-universal presupposition, then no all of my students need to be female; It is sufficient to have one female student.

What is the at-issue meaning of (3.33)? Clearly, it entails that all the other students of mine are not proud of themselves, *regardless of their gender*. However, if the meaning of *proud of herself* is as in (3.32), this entailment wouldn't be predicted. See Zehr & Schwarz (to appear) for recent experimental results confirming these judgments.

So *proud of herself* should have the following kind of semantics with a non-entailed presupposition:

(3.34) Jesse is proud of herself.
 a. At-issue: Jesse is proud of Jesse.
 b. Presupposition: Jesse is female.

This behaviour of non-entailed presuppositions is hard to capture in Satisfaction Theory. Heim (1983) predicts a universal presupposition for (3.33) that each of my students is female. In order to prevent this, she could use local accommodation. However, it would yield a different reading:

(3.35) Exactly one of my students is female and is proud of herself.

This is what would be predicted if *proud of herself* had an entailed presupposition.

In fact, Beaver (1994, 2001) also cannot account for the correct truth-conditions. Although his presupposition is existential, his at-issue meaning would be based on these individuals that satisfy the presupposition of the nuclear scope, so he would end up predicting the same at-issue meaning in (3.35).

This problem is actually a very deep one. The central tenet of Satisfaction Theory is that presuppositions are pre-conditions for context-update with at-issue meaning to succeed (which is a version of the classical Frege-Strawson view of presupposition). This theory distinguishes three kinds of sentential meanings:

1. Presupposition is satisfied and at-issue meaning is true
2. Presupposition is satisfied and at-issue meaning is false
3. Presupposition failure

Crucially, under this view, you cannot access the at-issue meaning *alone*, because talking about it requires the presupposition to be true. However, to analyse the meaning of (3.33), we need to extract the at-issue meaning of the predicate in the following way:

(3.36) a. There is one student x such that the presupposition of x *is proud of herself* is satisfied and the at-issue meaning is true;
b. For all the other students y, the at-issue meaning of y *is proud of herself* is false.

In Satisfaction Theory, you can't state (3.36b), because in order to say the at-issue meaning of y *is proud of herself* is false, you have to make sure that its presupposition is satisfied, requiring y to be female.

Another way to look at the problem of non-entailed presuppositions is that it requires you to distinguish *four* kinds of meanings:

1. Presupposition is satisfied and at-issue meaning is true
2. Presupposition is satisfied and at-issue meaning is false
3. Presupposition is not satisfied and at-issue meaning is true
4. Presupposition is not satisfied and at-issue meaning is false

That is, the meaning of (3.33) properly can be described as follows:

(3.37) a. There is one student x such that the presupposition of x *is proud of herself* is satisfied and the at-issue meaning is true;

b. For all the other students y, the presupposition of y *is proud of herself* is or is not satisfied and the at-issue meaning is false.

You can do this in a framework with four truth-values; or *two dimensions of meaning*. Recall that in the multidimensional theory we considered at the beginning, we represented the at-issue meaning and presupposition separately. And we could access the at-issue meaning alone, without referencing presuppositions. Because each of the dimensions could be true or false, there were four truth-values.

However, if we have to use the multidimensional theory, the Binding Problem needs to be solved. I made an attempt in Sudo (2014).

Bibliography

Beaver, David. 1994. When variables don't vary enough. In *Proceedings of SALT 4*, .

Beaver, David. 2001. *Presupposition and Assertion in Dynamic Semantics*. Stanford: CSLI.

Chemla, Emmanuel. 2009. Presuppositions of quantified sentences: experimental data. *Natural Language Semantics* 17(4). 299–340. doi:10.1007/s11050-009-9043-9.

Heim, Irene. 1983. On the projection problem for presuppositions. In *WCCFL 2*, 114–125.

Soames, Scott. 1982. How presuppositions are inheritied: A solution to the projection problem. *Linguistic Inquiry* 13(3). 483–545.

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

Sudo, Yasutada. 2014. Presupposition projection in quantified sentences and cross-dimensional anaphora. Ms., UCL.

Sudo, Yasutada, Jacopo Romoli, Martin Hackl & Danny Fox. 2011. Presupposition projection out of quantified sentences: Strengthening, local accommodation and inter-speaker variation. In *Proceedings of the Amsterdam Colloquium 2011*, .

Zehr, Jérémy & Florian Schwarz. to appear. Entailed vs. non-entailed presuppositions: An experimental assessment. In *Proceedings of NELS 46*, .