Empty restrictors are neglected for redundancy avoidance

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1 Existence presuppositions of strong quantifiers

1.1 Universal quantifiers

Universal quantifiers presuppose that their restrictor is non-empty.[1]

(1) a. Every bakfiets I saw in Tokyo was imported from the Netherlands.
b. All vegan sushi sold at Albert Heijn contains avocado.

Projection tests:

(2) a. I doubt that every bakfiets I saw in Tokyo was imported from the Netherlands.
b. Was every bakfiets I saw in Tokyo imported from the Netherlands?
c. It's likely that that every bakfiets I saw in Tokyo was imported from the Netherlands.
d. ...

It is standardly assumed that universally quantified sentences are true when the restrictor is empty.

(3) Every reindeer is sleeping.
a. $\forall x[R(x) \to S(x)]$
b. $\{\, x \mid R(x) \,\} \subseteq \{\, x \mid S(x) \,\}$

but has an existence presupposition that the restrictor is not empty (De Jong & Verkuyl 1985, Diesing 1992, Geurts 2007).

NB: With the existence presupposition, it's actually not so clear if the assertion is not 'Aristotelian'.

(4) Every reindeer is sleeping.

[1]With count nouns, a stronger inference that there are three or more entities in the domain of quantification, but this is believed to be an 'anti-presupposition' (Percus 2006, Chemla 2007, among others). This is orthogonal to our main interests here, so we will not discuss it.

a. $\exists x[R(x)] \wedge \forall x[R(x) \rightarrow S(x)]$
b. $\varnothing \subset \{ x \mid R(x) \} \subseteq \{ x \mid S(x) \}$

Lappin & Reinhart 1988, among others, give some arguments against (4), but I think they are overall not so convincing (see also Geurts 2007 for discussion).

For our purposes today, it does not matter much which analysis of the assertion we assume, but the following example might speak in favour of the standard non-Aristotelian analysis.[2]

(5) a. Did you help everyone who asked you for help?
b. If you helped everyone who asked you for help, you will go to heaven.

Suppose no one ever asked you for help. Will you go to heaven? Compare:

(6) a. Did you help the people who asked you for help?
b. If you helped the people who asked you for help, you will go to heaven.

But it remains to be understood why the existence presupposition seems to disappear in (5) but not in other cases.

For the rest of this talk we'll assume the standard semantics for universal quantifiers.

1.2 Other strong quantifiers

Other so-called 'strong quantifiers' (mainly, *most* and other proportional quantifiers) also commonly presuppose that their restrictors are non-empty.

(7) a. Most bakfietsen I saw in Tokyo were imported from the Netherlands.
b. Most vegan sushi sold at Albert Heijn contains avocado.

Most would be false with an empty restrictor.

(8) Most reindeer are sleeping.
$|\{ x \mid R(x) \wedge S(x) \}| > |\{ x \mid R(x) \}|$

Some strong quantifiers normally appear with definite DPs in partitive constructions, but this is a confound for us, because it might be the definite article that is responsible for the existence presupposition.[3]

(9) a. Half of the bakfietsen I saw in Tokyo were imported from the Netherlands.
b. The majority of the bakfietsen I saw in Tokyo were imported from the Netherlands.

It's a relevant question why these ones require definite DPs, but we don't have anything

[2]The consistency of the CAPTCHA example in (i) is not a convincing case, because intuitively (ii) sound consistent too. Perhaps the semantics/pragmatics of imperatives is doing something funny here.

(i) Select all squares with bicycles. If there are none, click skip.

(ii) a. Select the squares with bicycles. If there are none, click skip.
b. Select (at least) some squares with bicycles. If there are none, click skip.

[3]Incidentally, quantificational expressions that have similar meanings in article-less languages like Japanese also carry existence presuppositions, but potentially they also involve 'defintie DPs'.

insightful to say about that.

1.3 Weak/strong ambiguity

Some quantifiers are believed to be ambiguous between weak and strong readings and only have existence presuppositions under the strong reading (see McNally 2019 for an overview).[4]

(10) a. No bakfiets I saw in Tokyo was imported from the Netherlands.
b. Some bakfietsen I saw in Tokyo were imported from the Netherlands.
c. Many bakfietsen I saw in Tokyo were imported from the Netherlands.
d. Few backfietsen I saw in Tokyo were imported from the Netherlands.

Projection tests:

(11) a. It's likely that no bakfiets I saw in Tokyo was imported from the Netherlands.
b. Was no bakfiets I saw in Tokyo imported from the Netherlands?
c. It's likely that no bakfiets I saw in Tokyo was imported form the Netherlands.
d. ...

Weak readings are perhaps more prominent with 'lighter' NPs and/or in object position.

(12) a. It's likely that they sell no electric bakfiets.
b. It's likely that they sell some electric bakfiets.
c. It's likely that they sell many electric bakfiets.

There-sentences have weak readings, and potentially no strong readings (cf. (Milsark 1977, Diesing 1992, Lappin & Reinhart 1988); Abusch & Rooth 2004 claim that they can receive strong readings).

(13) a. It's likely that there is no electric bakfiets here.
b. It's likely that there are some electric bakfietsen here.
c. It's likely that there are many electric bakfietsen here.

Ambiguous determiners are all symmetric/intersective, but not all symmetric/intersective determiners are ambiguous:

- Anderssen 2011 claims that *lauter* 'many' in German only has a weak use.
- Similarly *sm* in English is often said to be always weak (Milsark 1977), but it's perhaps debatable if it's a separate determiner form *some*.
- *Sommige* 'some' in Dutch is always strong and carries an existence presupposition (De Jong & Verkuyl 1985, De Jong 1987, De Hoop 1995).

NB: Note all diagnostics for weak/strong seem to converge (De Jong 1987, De Hoop 1995, Geurts 2007, McNally 2019, etc.).

[4] De Jong & Verkuyl 1985 claim that all quantifiers are ambiguous between weak and strong readings, including universal quantifiers, but this view is not standard today.

1.4 Interim summary

- Universal and proportional quantifiers (e.g., *every, most*) carry existence presuppositions.
- Others (e.g., *no, some, many*) are often ambiguous (though not always, e.g. *lauer, sommige*), and only sometimes have existence presuppositions.
- Ambiguous ones are symmetric/intersective.

Side remark: Mankowitz 2023 reports experimental results for *every* and *no* that are not straightforwardly expected from our view, but there seem to be some complications with the experimental task she used (which is based on Abrusán & Szendrői 2013, who used it for *the* and reported results that were unexpected from theories). We are currently planning an experimental study with a different task.

2 Presupposition triggering via redundancy avoidance

Why do strong quantifiers have existence presuppositions (presumably in all human languages)?

Why aren't there universal quantifiers that are just as in Predicate Logic and lack existence presuppositions?

2.1 Previous proposals

- Verification strategy (Lappin & Reinhart 1988)
- Topichood (Reinhart 2004) (see also Büring 1996 for a related idea for weak/strong ambiguity)
- Scalar implicature (Abusch & Rooth 2004)

We do not discuss these today, but it seems that they all fail to account for the projection facts (among other things) (see Geurts 2007 for more critical discussion).

2.2 Rough idea

We follow the intuition that the existence presuppositions of strong quantifiers have to do with **redundancy** (see De Jong & Verkuyl 1985: p. 31 for a related remark).

- For *every* and *no*, if the restrictor is null, the sentence is guaranteed to be true, no matter what the scope is. (With the Aristotelian denotation for *every*, it will be false)

(14) Every/no reindeer is sleeping
 a. $\{ x \mid R(x) \} \subseteq \{ x \mid S(x) \}$
 b. $\{ x \mid R(x) \} \cap \{ x \mid S(x) \} = \varnothing$

- For *most* and *some*, if the restrictor is null, the sentence is guaranteed to be false, no matter what the scope is.

(15) Most/some reindeers are sleeping.
a. $|\{x \mid R(x)\} \cap \{x \mid S(x)\}| > |\{x \mid R(x)\} - \{x \mid S(x)\}|$
b. $\{x \mid R(x)\} \cap \{x \mid S(x)\} \neq \varnothing$

In such circumstances, the choice of the scope argument wouldn't matter, hence its semantic contribution would be 'redundant'.

Generally natural language seems to eschew expressions that contribute no meaning, e.g.

- Ban on vacuous quantification
- Every argument XP bears a thematic role (cf. 'Theta Criterion')

It seems that there is a general ban on redundancy, requiring that every expression used make a non-trivial contribution to the overall (truth-conditional) meaning.

Idea: Strong quantifiers have existence presuppositions via redundancy avoidance.

3 Existence presuppositions via redundancy avoidance

3.1 Redundancy via omission

Cases like vacuous quantification and too many arguments suggest that omissible expressions need to be omitted.

(16) A constituent α occurring in a constituent Γ is *redundant in* Γ with respect to w, if $[\![\Gamma]\!]^w = [\![\Gamma']\!]^w$, where Γ' is derived from Γ by removing α.

But this notion of redundancy is too limited in scope for our purposes, because it only renders grammatically optional constituents redundant. In a quantificational sentence of the form "D NP VP", nothing is omissible.

3.2 Redundancy *salva veritate/falsitate*

(17) $\Gamma[\alpha/\beta] \coloneqq$ the constituent derived from Γ by replacing α with β

(18) A constituent α occurring in a constituent Γ is *redundant in* Γ with respect to w if for each constituent β distinct from α such that $\Gamma[\alpha/\beta]$ is grammatical, $[\![\Gamma]\!]^w = [\![\Gamma[\alpha/\beta]]\!]^w$.

In order for this to work, the object language needs to be rich enough and contain enough β to quantify over. Natural language is rich enough, of course.[5]

(19) Every reindeer is sleeping.
$\{x \mid R(x)\} \subseteq \{x \mid S(x)\}$

[5]The distinctness condition $\beta \neq \alpha$ is necessary to ensure that those α that are not replaceable won't be redundant, but we might not run into such cases in natural language.

If the restrictor is empty in w, then for any VP, 'Every reindeer VP' is true with respect to w, so 'is sleeping' is redundant in (19) with respect to w.

Based on this notion of redundancy, we can formulate a felicity condition:

(20) Uttering Γ is infelicitous with respect to context set c, if for any $w \in c$, Γ contains a constituent that is redundant in Γ with respect to w.

To account for presupposition projection, (20) needs to be tweaked (e.g. by relativising to local contexts), but we will eventually trigger such redundancy presupposition at every constituent, so we will not consider presupposition projection here.

3.3 Compositional order

But one problem of the above idea is that it predicts a presupposition about the scope argument too.

In the case of *every*, the scope will be presupposed to be not the entire set of individuals, because in that case the restrictor will be redundant.

(21) Every reindeer is sleeping.
$\{ x \mid R(x) \} \subseteq \{ x \mid S(x) \}$

One might be able to argue that this presupposition is practically innocuous because with such a predicate (e.g., *is a thing or person*), the overall utterance would be under-informative, so we want to render such cases infelicitous anyway. (Note that *exists* is probably not a simple extensional predicate)

The problem becomes more relevant with other determiners.

E.g., *no* can have an existence presupposition for the restrictor, but not for the scope, despite its symmetric meaning.

(22) No research assistant is a semanticist.
$\{ x \mid R(x) \} \cap \{ x \mid S(x) \} = \varnothing$

(23) No semanticist is a research assistant.
$\{ x \mid S(x) \} \cap \{ x \mid R(x) \} = \varnothing$

One way to account for this asymmetry between the restrictor and scope is in terms of linear precedence: the restrictor precedes the scope in the above examples. But in the general case, the scope may precede the restrictor in many natural languages, but linear order doesn't seem to matter.

(24) a. Semantics attracted no research assistant.
b. No research assistant was interested in semantics.

We make use of **compositional order** instead. The idea is that the first argument (= the restrictor) cannot make the second argument (= the scope) redundant.

(25) In [[Q R] S], Q has a redundancy presupposition that R does not render S redundant in this constituent.

This predicts that every generalised quantifier has an existence presupposition that the restrictor is non-empty: with an empty restrictor $[\![\text{R}]\!]^w = \varnothing$, for any S:

- $[\![\text{every R S}]\!]^w = 1$
- $[\![\text{no R S}]\!]^w = 1$
- $[\![\text{most R S}]\!]^w = 0$
- $[\![\text{some R S}]\!]^w = 0$

If all strong quantifiers, including strong uses of ambiguous quantifiers, are generalised quantifiers, then we explain why they have existence presuppositions.

Of course, we still have to say something about weak quantifiers, but before that, we will consider generalising the above idea.

4 Redundancy presuppositions more generally

Since the idea is that (25) follows from a general ban on redundant expressions, we want to generalise it to other cases.

We will abstract away from syntactic details and speak of redundancy in any structure where all the arguments are saturated.

(26) Let $[\![\alpha]\!]^w$ be a function of type $\langle \sigma_1, \cdots \langle \sigma_n, \tau \rangle \cdots \rangle$. Then $[\![\alpha]\!]^w$ has the following presuppositions:
  a. its 1st argument is not redundant;
  b. its 1st argument doesn't make its mth argument redundant for $2 \leqslant m \leqslant n$;
  c. its 2nd argument doesn't make its mth argument redundant for $3 \leqslant m \leqslant n$;
  d. its $n-1$th argument doesn't make its nth argument redundant.

The first clause excludes functions like $\lambda x.\lambda y.\ y$. Natural language indeed seems to avoid such lexical denotations (cf. Sauerland 2004 on the hypothetical connectives L and R).

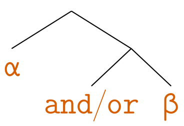
(26) can be seen as a general property of lexical denotations.

4.1 Connectives

One problem of (26) is that it will predict that (sentential) connectives will have presuppositions about the first argument.

Let's assume the following syntax, where the first argument is the second 'junct'.

(27)



  a. and will presuppose that β is true, lest α be redundant.

b. `or` will presuppose that β is false, lest α be redundant.

Obviously there are no such presuppositions.

(28) a. (It's not true that) Andrew lives in Amsterdam and Bob lives in Barcelona.
b. (It's not true that) Andrew lives in Amsterdam or Bob lives in Barcelona.

4.2 Strawson redundancy

Idea: Connectives lack the predicted presuppositions, because with them, the first junct would be redundant in the assertion.

- If α `and` β presupposes β to be true, then whenever this presupposition is true in w, $[\![\alpha \text{ and } \beta]\!]^w = [\![\alpha]\!]^w$.
- If α `or` β presupposes β to be false, then whenever this presupposition is true in w, $[\![\alpha \text{ or } \beta]\!]^w = [\![\alpha]\!]^w$.

Or to put it differently,

(29) α and β are Strawson equivalent iff whenever their presuppositions are satisfied, their assertive contents are equivalent.

(30) A constituent α occurring in a constituent Γ is *Strawson redundant* with respect to w, if for each constituent β distinct from α such that Γ[α/β] is well-formed, Γ and Γ[α/β] are Strawson equivalent.

(31) a. β would be Strawson redundant in α `and` β with respect to w, if β is presupposed to be true.
b. β would be Strawson redundant in α `and` β with respect to w, if β is presupposed to be false.

E.g., he following cases are not Strawson redundant, because they also affect the assertion.

- NP in *the NP*
- the complement of a factive predicate
- the argument of *also*
- the argument of the implicative verb *remember to*

Some 'pure' presupposition triggers, e.g., *also*, might be potentially Strawson redundant themselves, but it depends on what other expressions we quantify over. If we replace *also* with other focus particles, we will get different assertions.

It seems to us that natural language avoids Strawson redundancy entirely. So we revise our rule so that redundancy presuppositions only arise if they don't result in Strawson redundancy.

(32) Let $[\![\alpha]\!]^w$ be a function of type $\langle\sigma_1, \cdots\langle\sigma_n, \tau\rangle\cdots\rangle$. Then $[\![\alpha]\!]^w$ presupposes has the following presuppositions, **except for the ones that would render any argument Strawson redundant**.

a. Its 1st argument is not redundant.
b. Its 1st argument doesn't make its mth argument redundant for $2 \leqslant m \leqslant n$.
c. Its 2nd argument doesn't make its mth argument redundant for $3 \leqslant m \leqslant n$.
d. Its $n-1$th argument doesn't make its nth argument redundant.

5 Weak/strong ambiguity

According to the story so far, all quantificational determiners should carry existence presuppositions.

But symmetric/intersective ones like *no, some, many*, etc. have weak readings.

(Tentative) analysis: Weak readings are due to the 'conjunctive' uses of these determiners, and they lack existence presuppositions, for the same reason as conjunction lacks presuppositions, i.e., to avoid Strawson redundancy.

5.1 *Some*

Certain versions of dynamic semantics allow for a purely conjunctive analysis of indefinites.

- File Change Semantics (Heim 1982) has no existential quantifier (or operator that triggers random assignment). Fresh variables are those variables that range over all individuals.
- Context set c is a set of pairs consisting of a possible world and a total assignment.

(33) $c[\texttt{some}^{\texttt{x}}_{\texttt{wk}}\ \texttt{Rx}\ \texttt{Sx}] = c[\texttt{Rx} \wedge \texttt{Sx}] = c[\texttt{Rx}][\texttt{Sx}]$

- Heim 1982 guarantees that x here is fresh via a lexically encoded felicity condition ('Novelty Condition').
- More recent work (e.g., Heim 1991, Percus 2006, Heim 2011) suggests that this condition is derived via competition with *the* ('anti-presupposition'). If we follow this idea, we could get rid of the superscript x on some. Then some would be just a conjunctive connective.[6]

As we saw above, conjunction doesn't trigger a redundancy presupposition, because it would render the first conjunct Strawson redundant. If some is just a conjunction, this reasoning extends to this case too:

- The redundancy presupposition of $\texttt{some}_{\texttt{wk}}\ \texttt{Rx}\ \texttt{Sx}$ would be: Rx is true in each $w \in c$, i.e. $\{\, w \mid \exists g[(w, g) \in c[\texttt{Rx}]]\,\} = \{\, w \mid \exists g[(w, g) \in c]\,\}$.

[6]In fact, we could say that all DPs always introduce new variables, and the semantics of (familiar) definites (including pronouns) involve an identity statement that the variable they introduce is coreferential with some old variable. This way, we could remove many variables (though probably not all) from the syntax by using stacks (Van Eijck 2001, Nouwen 2003, 2007). But we won't formalise this idea today.

- If $\mathtt{x}$ is a fresh variable, this is an existential statement.
- But this existence presupposition would render $\mathtt{Rx}$ Strawson redundant in $\mathtt{some_{wk}\ Rx\ Sx}$ with respect to all $w \in c$.
  - Technical note: In order for this to work, we have to check the Strawson equivalence of $\mathtt{some_{wk}\ Rx\ Sx}$ and $\mathtt{some_{wk}\ R'x\ Sx}$ with respect to contexts c that not only simply satisfy the existence presuppositions of these two sentences but also incorporate the dynamic effects of both $\mathtt{Rx}$ and $\mathtt{R'x}$ as in $c[\mathtt{Rx}][\mathtt{R'x}]$.
  - Effectively, it's as if the existential scope is outside the whole computation.

But why does the stronger version, which essentially has the same truth-conditional meaning, can have an existence presupposition?

Speculative idea: Strong *some* is a real existential quantifier, and $\mathtt{x}$ in the alternative structures will be rebound. Consequently, $\mathtt{Rx}$ is not Strawson redundant. Writing $\exists\mathtt{x}$ for random assignment:

(34) $c[\mathtt{some_{str}\ Rx\ Sx}] = c[\exists\mathtt{x}][\mathtt{Rx}][\mathtt{Sx}]$

Or equivalently:

(35) $$c[\mathtt{some_{str}\ Rx\ Sx}] \\ = \left\{ (w,g) \in c[\exists\mathtt{x}][\mathtt{Rx}][\mathtt{Sx}] \;\middle|\; \mathsf{SOME}\left(\begin{array}{l} \{\, g'(\mathtt{x}) \mid (w,g') \in c[\exists\mathtt{x}][\mathtt{Rx}] \,\}, \\ \{\, g'(\mathtt{x}) \mid (w,g') \in c[\exists\mathtt{x}][\mathtt{Rx}][\mathtt{Sx}] \,\} \end{array} \right) \right\}$$

where $\mathsf{SOME}(R)(S) \leftrightarrow R \cap S \neq \varnothing$

5.2 *No*

For *no* (and other downward entailing quantifiers), we need to separate the negation (at least in the semantics, and possibly also in the syntax).

(36) $c[\mathtt{no_{wk}\ Rx\ Sx}] = c[\neg(\mathtt{some_{wk}\ Rx\ Sx})] = \{\, (w,g) \in c \mid \exists (w,g') \in c[\mathtt{Rx}][\mathtt{Sx}] \,\}$

If this presupposes $\mathtt{Rx}$ to be true, $\mathtt{Rx}$ will be Strawson redundant (for the same reason as in the case of *some*, except that the truth-value is flipped).

The strong version involves existential quantification,

(37) $c[\mathtt{no_{str}\ Rx\ Sx}] = c[\neg(\mathtt{some_{str}\ Rx\ Sx})] = \{\, (w,g) \in c \mid \exists (w,g') \in c[\exists\mathtt{x}][\mathtt{Rx}][\mathtt{Sx}] \,\}$

5.3 To do

Other quantifiers?

General type-shifting rule (presumably from weak to strong)

Prediction: Weak quantifiers are those that license donkey anaphora or their negation.

A (non-categorical?) correlation between weak/strong ambiguity and focus/topic has been suggested (Büring 1996, Herburger 1997, Reinhart 2004). If that's true, it's not clear how our idea would account for it.

6 Concluding remarks

Key idea: Existence presuppositions of strong quantifiers are due to a universal ban on redundancy, requiring every phrase used to make non-trivial semantic contributions.

- Presupposition triggering is still largely uncharted territory. Redundancy avoidance is obviously not meant to account for all presuppositions, but probably there are multiple mechanisms for presupposition triggering.
- Existence presuppositions bear some resemblance to neglect-zero effects, but:
  - It seems that the latter are cancellable (more implicature-like), the former or not?
  - If we are right about the former and if Maria is right about the latter, they are due to different principles.

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