

Existential inferences of strong and weak quantifiers

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1 the existential inference

Strong quantifiers typically come w/ an inference that their restrictor is not empty.

E.g. from the following we infer that there are Tahitian semanticists:

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|-----|----|---------------------------------------|--|
| (1) | a. | Every Tahitian semanticist is smart. | $every\ R\ S\ \text{iff}\ R \subseteq S$ |
| | b. | Most Tahitian semanticists are smart. | $most\ R\ S\ \text{iff}\ R \cap S > R - S $ |

For *every* this doesn't follow from the textbook semantics to the right: since $\emptyset \subseteq S$ for all S , (a) doesn't entail that $\llbracket \text{Tahitian semanticist} \rrbracket \neq \emptyset$. The quick fix: swap $\subset$ for $\subseteq$, is not sufficient for reasons discussed more below. For one, note that in the case of *most* the inference *is* an entailment but it seems to go through when we reject that sentence false.

Weak quantifiers can also give rise to existential inferences ((2a)). From the perspective of Barwise & Cooper 1981 at least, this should not be built into (univocal) $\llbracket \text{no} \rrbracket$ a la the quick fix: cf. (2b), which entails, in fact asserts precisely that, the restrictor *is* empty.¹

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|-----|----|---|--|
| (2) | a. | No Tahitian semanticist is at the conference. | $no\ R\ S\ \text{iff}\ R \cap S = \emptyset$ |
| | | $\rightsquigarrow T.S. \neq \emptyset$ | |
| | b. | There are no Tahitian semanticists. | $T.S. \cap E \neq \emptyset$ |

Barwise & Cooper 1981 suggested that the existential inference is pragmatic, and not part of the semantics of weak or strong determiners. (Their discussion points to a source for the inference: we take up this idea next week). B&C further report that the existential inference is optional w/ weak quantifiers in general, but robust for strong quantifiers (don't given an account this in terms of their analysis of weak vs. strong):

- (3) ?Every Tahitian semanticist is at the conference, because there are no Tahitian semanticists.
- (4) No Tahitian semanticist is at the conference, because there are no Tahitian semanticists.

For B&C weak vs. strong boils down to a semantic property dividing the class of GQs (turning on reflexivity; cf. week 2). From the perspective of Milsark/Diesing/Kratzer weak vs. strong is lexical and syntactic, and weak determiners are systemically ambiguous between a GQ reading, which arises e.g. with individual level predicates like *be famous* and a predicative one, which arises e.g. with existential-*there*.

¹Adding the existential inference into the semantics as a definedness condition/presupposition, or entailment would make *no* strong by B&C definition: in every model in which there are R s, *no R is R* is false.

A question is whether we get the existential inference iff we have a GQ reading according to M/D/K. (2a) has a stage level predicate and so the determiner is according to M/D/K ambiguous therein. The R-L half of the question amounts to whether cancellation tracks the non-GQ reading (a); the L-R half amounts to whether contexts for non-GQ readings give rise to the existential inference (b):

- (5) a. No Tahitian semanticist is famous. INDIVIDUAL LEVEL
 $\leadsto T.S. \neq \emptyset$ cancelable?
 b. There is no Tahitian semanticist at the conference.
 $\leadsto T.S. \neq \emptyset$ possible?
- (6) Whether or not there are Tahitian semanticists, no Tahitian semanticists are {famous / at the party}. contrast?

Following B&C there were several proposals to treat the existential inference as pragmatic in nature, or anyway non-semantic, and to derive the contrast in cancelability.

2 Lappin & Reinhart 1988

1. The existential inference arises because of the “procedures for the empirical assessment of a sentence” [as true or false]
2. “Whenever the assessment of a sentence must start with an N’ set of a given NP [DP], assessment is stalled if this set is empty.
3. “In this case the sentence is marked as anomalous or undefined... regardless of the semantic interpretation” $\Rightarrow$ felicitous use of such a DP requires its restrictor $\neq \emptyset$

To see the idea imagine a screen with various colored shapes on it. To assess the truth of

- (7) Every circle [on the screen] is red. $C \subseteq R$

The most obvious thing to do is identify all the circles, i.e. the set C , and then see if they are red. Nb. to do the latter you don’t have to identify R you can just identify $C \cap R$ (Conservativity). L&R basically stipulate if C is the empty set this is problematic for evaluation; this constrains the use of sentences like (7) to contexts where there are circles. A speaker wouldn’t use a sentence that could not be evaluated (3.).²

Must you, in the first instance, identify all the circles? As L&R note you could instead identify the complement R' of R , the set non-red things and then see if there’s a circle in R' . In this way you will arrive at a truth-value, and possibly without identifying C . But, L&R suggest, this is less efficient in general since complement sets can be very large. Given this, with *every* and other strong quantifiers, because they are inherently proportional, the most efficient assessment procedure is to (first) identify the restrictor set, and so according to L&R assessment must start with that set.

It is clear that the complement set strategy need not be less efficient in specific cases. E.g. suppose we contextually or overtly restrict ‘red’ to things on the screen and you are told in advance that there are more red than non-red things. Or take

²Nb. this explanation may only derive a weak $\neg B \rightarrow \exists$ inference.

(8) Every circle is not red.

By the logic of L&R's suggestion, shouldn't you follow the opposite strategy with negated VPs? But of course (8) and (7) equally have the existential inference. Reinhart 2004 recognises this problem and suggests that what it shows is that possible assessment procedures are limited to the sets expressed by the scope and restrictor sets.

Importantly L&R do not want to just stipulate that evaluation must start with the restrictor. This is because of weak quantifiers, which are a crucial part of their story. L&R like B&C assume the weak quantifiers are univocally GQs. They point out that because weak GQs are symmetric, (efficient) assessment can start equivalently from the nuclear scope set.

- (9) a. *no* $R\ S$ iff $R \cap S = \emptyset$ iff $S \cap R = \emptyset$
b. *some* $R\ S$ iff $R \cap S \neq \emptyset$ iff $S \cap R \neq \emptyset$
likewise the (other) cardinality DPs, placing constraints on $|S \cap R|$

According to L&R, where weak quantifiers don't have an existential inference, e.g. (4), (5b) this is because assessment starts from the nuclear scope – nb. this means they also predict optional existential inferences for (5a), (5b). They point out that, so-assessed (4) should yield an inference that the nuclear scope is not empty, which may not be correct (?). L&R thus further suggest that if/when there is an existential inference from either restrictor or scope, this is because assessment proceeds by identifying the intersection directly. nb. only the intersection matters for weak dets.³

2.0.1 Further issues

L&R motivate that idea that the inference is due to assessment procedures based on the claim in (de Jong & Verkuyl 1985) that existential inferences with strong Qs are absent in definitional and law-like sentences.

- (10) a. Every unicorn has a horn.
b. All trespassers will be shot.

For L&R, these aren't sentences whose truth we actually (need to) assess by checking things, so to speak. This motivation seems weak; for (a) mythical objects might exist (b) there may be implicit modality involved: there might be existential inference, but with respect to the (non-actual) situations implicitly quantified over. Notice that cases like the following we also don't need to check anything to judge its truth, but less clear that existential inference is absent?

- (11) Every zebra in the room is a zebra.

And as Abusch & Rooth 2004 point out it seems unlikely that the existential inference depends on actually assessing a sentence – we don't need to do this to understand and communicate. Maybe L&R's proposal can be turned into a lexicalisation story, about conventionalisation of existential inferences (e.g. as presuppositions) but that's not how the proposal is intended; for example because they want to account for optionality/cancelability with weak determiners.

³As Abusch & Rooth 2004 point out, this is problematic insofar as e.g. (2a) can be felicitous while failing to have an existential inference on scope or restrictor; assessment should fail when checking the intersection. Cf. also Reinhart 2004's way out of the complement set issue.

Finally there is the question of motivating the assumption that encountering the empty set prevents assessment. Notice that it doesn't in general: there's no existential inference on the predicate when (12) judged false:

(12) Richard is in my office right now.

Reinhart 2004 gestures to the possibility that it's a more general feature of topical NPs. Strawson (1954) proposed that definites have existence inferences (presuppositions) only when they are "topics". He noted e.g. the following contrast and proposed that in (a) but not (b) the definite is topical.⁴

(13) a. The king of France is bald. #
b. The King of France is among people I visited yesterday. F

Note that Strawson himself assumed that the existential inference for definites was a semantic presupposition (To deal with (b) he ended up positing an ambiguity in effect for definites). In any case Reinhart 2004 seems to propose that for strong quantifiers the existential inference doesn't depend on their being topical, so the question of motivation remains for those.

3 Abusch & Rooth 2004

also Groenendijk & Stokhof 1984

- As for L&R determiners have the the textbook meanings.
- Existential inference is a scalar implicature derived by negating an alternative .

(14) a. Every volunteer is ready. $V \subseteq R$
b. There is no volunteer.⁵ $V \cap E = \emptyset$, i.e. $V = \emptyset$

idea: (b) entails (a), (a) implicates (b) is false.

Existential inference for 'no' derived in the same way.

(15) a. No volunteer is ready. $V \cap R = \emptyset$
b. There is no volunteer. $V = \emptyset$

For other determiners, it needs to be assumed that negations of non-weaker alternatives are derived as implicatures.

(16) Most volunteers are ready. $|V \cap R| > |V - R|$
not entailed by "There is no volunteer." $V = \emptyset$

As noted there seems to be an existential inference when *most* is judged false. Cf. also

⁴Correspondingly (a) is supposed to be felicitous in a context where something else is topic: as a reply to "Tell me about the bald people, who is among them", we might ignore the false existential inference and reject the sentence.

⁵Note it's unclear this is derivable as an alternative on e.g. Katzir's theory. 'No volunteer exists'?

(17) Some volunteers are ready.

issues:

- why restrictor vs. nuclear scope (e.g. w/ 'no')
- projection of the existential inference

The existential inference seems to project like a presupposition when the quantifier is embedded. E.g. it is inherited in the “family of sentences”

- (18)
- Is every volunteer ready?
 - It's not the case that every volunteer is ready.
 - If every volunteer is ready, we will begin.
 $\leadsto V \neq \emptyset$

and can be filtered in conditional consequents and disjunction;

- (19)
- If there are volunteers, every volunteer is ready.
 - Either there are no volunteers, or every volunteer is late.
 $\nrightarrow V \neq \emptyset$

Theory neutrally, implicatures don't project in the same way, e.g. with conditional antecedents. *If John or Mary is here, we will begin* $\nrightarrow \neg(\text{John and Mary are here})$. A principled explanation would be needed why the requisite (non-weaker) alternatives are available in the case of quantifier restrictors. For some cases this is available but for others, e.g. conditionals it's less clear

- (20) a. It's not the case that every volunteer is ready. $\neg(V \subseteq R); \Rightarrow V \neq \emptyset$

- (21)
- It's not the case that no volunteer is ready. $\neg(V \cap R = \emptyset)$ i.e. $V \cap R \neq \emptyset$
 - It's not the case that there is some volunteer. $\neg(V \neq \emptyset)$ i.e. $V = \emptyset$

4 de Jong & Verkuyl 1985

- existential inference as lexical definedness condition (cf. Heim and Kratzer text)
- to deal with definitional sentences, etc. they propose an additional non-presuppositional lexical entry
- as Reinhart 2004 points out this needs to be constrained (the presuppositional reading is generally preferred), and it doesn't explain the weak/strong difference in the strength of the inference

Summing up we seem to want an account of the inference that treats it as a presupposition, but also we'd like to explain *why* quantifiers, strong and but not necessarily weak, have such a presupposition.

References

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