

# Counterfactuals and undefinedness: homogeneity vs. supervaluations

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## > Overview

- Theories of counterfactuals agree on the general form of the truth-conditions, but disagree on their quantificational force.
- We discuss three approaches: **Universal**, **Homogeneity**, and **Selectional**. Their predictions broadly agree on simple counterfactuals, but come apart for embeddings under quantifiers.
- We test one such case experimentally. Our findings support the **Selectional** approach and challenge the other two.

## > Three Approaches

Standard semantics for counterfactuals agree on the following schematic truth-conditions:

- (1)  $A \square \rightarrow C$  is true at  $w$  relative to  $\leq$  iff  
 $\text{QUANTIFIER } w' [w' \in \max_{w, \leq}(\llbracket A \rrbracket)] [w' \in \llbracket C \rrbracket]$

But they disagree on the quantificational force.

### 1. **Universal** (Lewis 1973, Kratzer 1981, a.o.)

$A \square \rightarrow C$  is TRUE iff **ALL**  $\text{closest}_{w, \leq} A$ -worlds are  $C$ -worlds

### 2. **Homogeneity** (von Stechow 1997, Schlenker 2004, a.o.)

$A \square \rightarrow C$  is DEFINED iff all  $\text{closest}_{w, \leq} A$ -worlds are  $C$ -worlds  
 or no  $\text{closest}_{w, \leq} A$ -worlds are  $C$ -worlds  
 TRUE iff **ALL**  $\text{closest}_{w, \leq} A$ -worlds are  $C$ -worlds

### 3. **Selectional** (Stalnaker 1968, 1980)

$A \square \rightarrow C$  is TRUE iff **THE**  $s$ -selected  $w, \leq$   $A$ -world is a  $C$ -world  
 + **supervaluations** over the  $s$  parameter

## > Key predictions

These approaches makes different predictions about undefinedness projection in complex sentences.

Approach	Prediction
<b>Universal</b>	: no undefinedness
<b>Homogeneity</b>	: strong Kleene <sup>a</sup>
<b>Selectional</b>	: supervaluations

Illustration of the different predictions: **the raffle scenario**.

There is a raffle and several of the tickets will win a prize. Winning tickets are selected via a random draw among all the tickets bought.

- (2) If ticket #37 was bought, it would win a prize.

**Universal** : false  
**Homogeneity** : undefined  
**Selectional** : undefined

- (3) No ticket would win a prize if it was bought.

**Universal** : true  
**Homogeneity** : undefined  
**Selectional** : false

<sup>a</sup>Križ 2015 suggests certain modifications of strong Kleene that do not affect our argument.

## > Experiment

We tested the key predictions of the three approaches building on experimental works by Križ & Chemla 2015 and Tieu et al. 2019.

**Participants.** 99 self-identified native speakers of English (mean age = 36 yrs, 47 female) paid \$1.5 for their time (10 min).

**Items.** A short context followed by a test sentence:

- (4) a. If ticket #37 was bought, it would win a prize. TGT-POS  
 b. If ticket #37 was bought, it would have to win a prize. CTL-POS  
 c. No ticket would win a prize, if it was bought. TGT-NEG  
 d. No ticket could win a prize, if it was bought. CTL-NEG

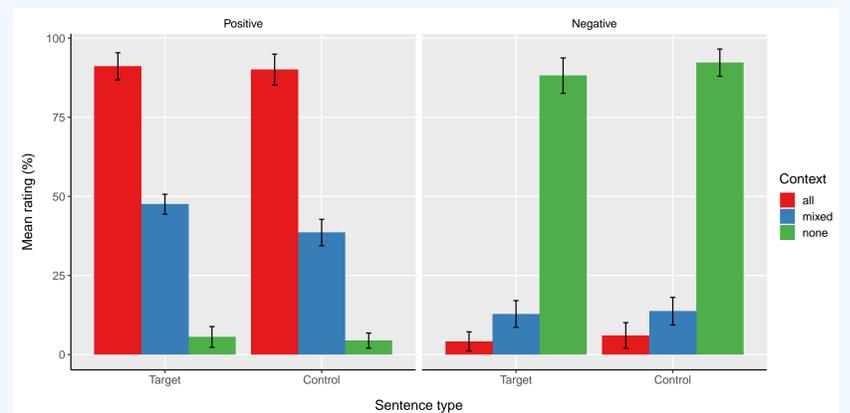
Contexts described the working of one of three kinds of raffles:

ALL : all the tickets bought win a prize  
 MIXED : only half of the tickets bought win a prize  
 NONE : none of the tickets bought win a prize

**Graded TVJT.** Middle of the response scale used to indicate that a sentence is neither completely false, nor completely true.



## Results



Above: Mean ratings to the POSITIVE and NEGATIVE sentences as a function of the type of contexts. Left: Outputs of the LMER models (Status: Target vs. Control; Context: MIXED vs. NONE for Positive, MIXED vs. ALL for Negative).

Sentence	Fixed Effect	$\beta$	sd	t-value	$\chi^2$	p-value
Positive	Status	9	1.8	4	14	< .0005
	Context	-34	2.1	-15	486	< .0001
	Status:Context	-8	2.6	-3	8	< .005
Negative	Status	-1.8	2	-0.9	0.9	0.3
	Context	7.7	2.1	3.5	24	< .0001
	Status:Context	0.9	2.8	0.3	0.1	0.7

Formula: Response ~ Status \* Context + (Context | Subject)

## > Summary

- POSITIVE sentences: intermediate ratings in MIXED-contexts and significant difference between TARGET and CONTROL items.
- NEGATIVE sentences: very low rating for TARGET items in MIXED-contexts and no difference between TARGET and CONTROL items.

## > Conclusion

- Our results discriminate among the three approaches: they are only compatible with **Selectional** theories
- They also show that continuous response scales can be used to distinguish among different ways of modelling undefinedness.
- NEXT STEPS: more on the mixed positive control and comparison with definites.

**Selected References:** von Stechow, K. 1997. Bare Plurals, Bare Conditionals, and Only • Klinedinst, N. 2011. Quantified Conditionals and Conditional Excluded Middle. • Kratzer, A. 1981. Partition and Revision: The Semantics of Counterfactuals • Križ, M. 2015. Aspects of Homogeneity in the Semantics of Natural Language. • Lewis, D.K. 1973. *Counterfactuals* • Schlenker, P. 2004. Conditionals as Definite Descriptions

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