A unified existential semantics for bare conditionals

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Overview. Bare conditionals show an unexpected semantic variability contingent on whether they are embedded in an Upward or a Downward Entailing context. We suggest that the basic semantics of bare conditionals involves existential quantification over worlds and their universal character in UE contexts is derived by grammatical strengthening.

The problem. A bare conditional as in (1) seems to involve *universal* generalization over cases/worlds. This meaning is preserved when the conditional is embedded in an Upward Entailing (UE) environment, (2a). But when embedded in a Downward Entailing (DE) environment as in (2b) it seems as though the conditional contributes an *existential* meaning rather than a universal one (see Kratzer 2012 for discussion and references).

(1) If you work hard you succeed.
$\rightsquigarrow$ In *all cases* where you work hard, you succeed.

(2) a. Everyone will succeed if they work hard.
$\rightsquigarrow$ For every x, in *all cases* where x works hard, x succeeds.
b. No one will succeed if they goof off.
$\rightsquigarrow$ There is no x s.t. *there is a case* where x goofs off and x succeeds.

Herburger's analysis. In light of such examples, Herburger (2015a,b) claims that bare conditionals are ambiguous: in UE environments they have universal semantics, and in DE environments an existential one. This can explain (2b) as well as another phenomenon in which a universal semantics for conditionals fails, namely Conditional Perfection (CP): When an *if p, q* sentence is uttered, we tend to understand it as *if and only if p, q* (see von Fintel 2001, a.o.). For example, in many cases we infer (3) from (1).

(3) Only if you work hard do you succeed.
a. $\rightsquigarrow$ It's not true that *there's a case* where you don't work hard and you succeed.
b. $\not\rightsquigarrow$ It's not true that in *all cases* where you don't work hard you succeed.

But the interpretation of (3) itself is problematic given a universal semantics for conditionals: A natural assumption would be that *if not p, q* is the relevant alternative that's being negated by *only* to get the inference in (3a). [*If not p, q* can be viewed here and throughout as a shorthand to a set of alternatives of the form *if* p'*,q* where p' is a relevant antecedent.] However, a universal semantics for *if p, q* would predict the inference in (3b), which is too weak: it allows for cases where you don't work hard and you succeed. For CP the problem is even more acute: We get a universal meaning for the prejacent, (1), and an existential one for the implicature, (3a). This is surprising even under an ambiguity analysis, which is why Herburger departs from standard theories of implicatures. But the scope of the problem extends beyond the implicature domain, as shown with VP ellipsis in (4): the conditional in the antecedent VP is interpreted universally as in (4a) while the one in the elided VP existentially as in (4b). This is unexpected since ambiguities are known to be resolved uniformly in the antecedent VP and the elided VP.

(4) Every boy calls his mother if he gets an A, and no girl does.
a. $\rightsquigarrow$ For every boy x, in *all cases* where x gets an A, x calls x's mother, and
b. there is no girl x s.t. *there is a case* where x gets an A and x calls x's mother.

Proposal. Following up on Herburger's idea, we suggest that bare conditionals not only *can* have existential semantics, but rather this is the *only* semantics they have, without assuming ambiguity. Like Herburger's account, this explains (2b) and the inference in (3). What we have to show is how to derive the universal import of *if p, q* in UE contexts. Let us adopt a semantics in which bare conditionals quantify existentially over worlds:

(5) $[\![if\ p,\ q]\!] = 1$ iff $\exists w[p(w) \wedge q(w)]$

We hypothesize that *if p, q* gives rise to *obligatory* (unprunable) domain alternatives, in a similar fashion to Chierchia's (2013) analysis of NPIs. Namely, *if p, q* has alternatives which are formed by replacing p with p', where p' is any subset of p:

(6) DOMAIN ALTERNATIVES: $Alt(if\ p,\ q) \supseteq \{if\ p',\ q : [\![p']\!] \subseteq [\![p]\!]\}$

The universal interpretation of bare conditionals in UE contexts is arrived at by grammatical strengthening, via *obligatory* double exhaustification, in the following way. We make use of the exhaustivity operator EXH as defined in Fox (2007): it takes the prejacent and a set of alternatives and returns the prejacent conjoined with the negation of all INNOCENTLY EXCLUDABLE (IE) alternatives. Below we illustrate the analysis for (1) (dubbed HARD). Its basic semantics is existential, as in (7a). Assume for simplicity that there are only two worlds of you working hard, w_1 and w_2, so that the domain alternatives of HARD are DOM_1 and DOM_2, the truth conditions of which are given in (7b-c).

(7) a. $[\![\text{HARD}]\!] = 1$ *iff* $\exists w[work.hard(w) \wedge succeed(w)]$
 b. $[\![\text{DOM}_1]\!] = 1$ *iff* $work.hard(w_1) \wedge succeed(w_1)$
 c. $[\![\text{DOM}_2]\!] = 1$ *iff* $work.hard(w_2) \wedge succeed(w_2)$

(8) $Alt(\text{HARD}) = \{\text{HARD},\ \text{DOM}_1,\ \text{DOM}_2\}$

Given (8), applying recursive exhaustification over the prejacent HARD yields:

(9) $\text{EXH}(\text{EXH}(\text{HARD}))$
 a. $= \text{EXH}(\text{HARD}) \quad \wedge\neg\text{EXH}(\text{DOM}_1) \quad \wedge\neg\text{EXH}(\text{DOM}_2)$
 b. $= \text{HARD} \quad \wedge\neg(\text{DOM}_1\wedge\neg\text{DOM}_2) \quad \wedge\neg(\text{DOM}_2\wedge\neg\text{DOM}_1)$
 c. $= \text{HARD} \wedge \text{DOM}_1 \wedge \text{DOM}_2$
 d. $\equiv \exists w[work.hard(w)] \wedge \forall w[work.hard(w) \rightarrow succeed(w)]$

The lower EXH is vacuous since no alternative in $Alt(\text{HARD})$ is IE. The higher EXH however has $\text{EXH}(\text{DOM}_1)$ and $\text{EXH}(\text{DOM}_2)$ in its set of alternatives which *are* IE and are thus negated. The result of recursive exhaustification in (9) is that HARD is true, and that it's not true that *only* DOM_1 is true and it's not true that *only* DOM_2 is true. Having domain alternatives, the result is that for any sub-case p' of p, *if* p', q is entailed by EXH(EXH(*if p, q*)). This is equivalent to the universal claim in (9d). The same mechanism can generate a universal meaning in (2a) since the conditional there is in a UE environment too, and the ellipsis case in (4) is accounted for assuming that EXH scopes outside each VP.

Importantly, the strengthening mechanism does not undermine the explanatory force of assuming existential semantics of conditionals for the DE cases such as (2b), since in these environments the entailment relations are reversed and the prejacent is the strongest alternative; thus EXH is vacuous and the original existential semantics is maintained. Furthermore, note that for this to work, we hypothesize that *if p, q* has no universal alternative. Partial justification for this is that there is no lexical universal alternative to *if* if *if* is existential. In this we follow other analyses that make use of the lack of a strong alternative for strengthening a weak element. See a.o. Meyer (2015); **?**.

Conditional Perfection. In order to derive CP for (1) we need only assume that *if not p, q* is an *optional* alternative to *if p, q*: If the alternative in (10a) is added to $Alt(\text{HARD})$ (see (8)), we get real perfection without compromising the derivation of universality for the prejacent, since (10a) is logically independent from any of the other alternatives in $Alt(\text{HARD})$. That is, the result of EXH(EXH(HARD)) would be then the conjunction of (9d) and (11). This is the desired result.

(10) a. If you don't work hard you succeed.
 b. $[\![(10a)]\!] = \exists w[\neg work.hard(w) \wedge succeed(w)]$

(11) $\neg\exists w[\neg work.hard(w) \wedge succeed(w)]$

Selected references. **Herburger, E.**: 2015a, 'Only if: If only we understood it', in *Proceedings of Sinn und Bedeutung 19*, pp. 284–301. **Herburger, E.**: 2015b, 'Conditional Perfection: The truth and the whole truth', in *Semantics and Linguistic Theory 25.* **Kratzer, A.**: 2012, 'Chasing Hook: Quantified Indicative Conditionals', in *Conditionals, Probability, and Paradox.* **Meyer, M.-C.**: 2015, 'Generalized Free Choice and Missing Alternatives', in *Journal of Semantics.*