

***Only if*: if only we understood it**

Elena Herburger, Georgetown University

1. The puzzle: Though *only* and *if* have been intensely studied, their joint appearance in (1) remains puzzling (e.g. McCawley 1974, Barker 1993, vFintel 1997, Dekker 2001).

(1) You only succeed if you [work hard]_F. (f marks focus)

I argue the puzzle is solved if conditionals are recognized to allow for existential readings.

2. Background: *Only*, when viewed as propositional operator, is held to presuppose its prejacent and to negate any not already entailed focus alternative (e.g. Rooth 1985):

(2) $[[\text{only}]](p)$ is defined only if $\exists r \in \text{Alt}(p)$: r is true in w ($\text{Alt}(p)$ are focus alternatives)

If defined, $[[\text{only}]](p)$ is true in w iff $\neg \exists r (r \in \text{Alt}(p) \wedge \neg p \subseteq r \wedge r$ is true in $w)$

Setting aside what ‘cases’ are and what ‘relevant’ means, conditionals, in turn, are widely thought to have universal force (e.g. Lewis 1973, Sommers 1984):

(3) *If* p q is true iff all relevant p -cases are q -cases.

Though independently motivated, when (2) and (3) are combined they wrongly predict that

(1) is true as soon as not *all* failures to work hard result in success, which is too weak.

3. Previous account: CEM One approach to the *only if* puzzle (cf. S.J. Barker 1993) exploits the Conditional Excluded Middle (CEM; *if* p q is true or *if* p not q is). Opting for this strategy while maintaining (3), which does not support CEM, von Fintel (1997) analyzes *if*-clauses as generic quantifiers and argues that they exhibit ‘homogeneity effects’ under negation (Löbner 1983). (1) then says that all normal cases where you neglect to work hard are cases where you fail. But, though appealing, the CEM solution is not without problems:

(i) CEM is controversial. (4a) and (4b) are not equivalent, contra CEM:

(4) a. It’s not the case that if this fair coin is flipped it will come up heads.

b. If this fair coin is flipped it will not come up heads.

(ii) The exclusionary force generic quantification derives for *only if* is slightly too weak; it predicts that (1) remains true if some unusual cases of laziness lead to success (Cohen 2004).

(iii) The analysis predicts that (1) presupposes its prejacent, which, given (3), says that in all (normal) cases where you work hard you succeed. However, while (1) asserts that hard work is a necessary condition for success it does not presuppose that it is a sufficient one.

4. Analysis: Existential conditionals The meaning of *only if* sentences like (1) is predicted if, (3) notwithstanding, the conditionals under *only* can have mere existential force:

(5) *If* p , q (under *only*) is true iff some p -cases are q -cases.

Only in (1) then correctly rules out that there are *any* cases other than those described or entailed by *if you work hard* that lead to success. It now also follows that (1) presupposes that *some* cases of hard work lead to success, and, likewise, that (6) would be misleading advertising as it presupposes that in some cases where you drink kale juice you reach 120.

(6) Only if you drink kale juice will you live to be a 120.

Independent support for existential conditionals: That ascribing existential force to conditionals under *only* would derive their exclusionary force is already noted in McCawley (1974) but rejected as a solution to the only if puzzle because of its incompatibility with (3) (cf. also von Fintel 1997). I argue that the worry about incompatibility with (3) is unfounded:

(i) Weak conditionals: Even if ‘bare’ conditionals often have universal force, they do not always. The ‘weak’ conditional in (7) can be true when the speaker only puts some of his quarters in the meter (e.g. Schubert and Pelletier 1989). While this may be due to heavy contextual restriction on a universal quantifier (C. Barker 1997, Schein 2003), on the simplest account, the one I advocate, it results from existential quantification:

(7) If I have a quarter, I’ll put it in the meter.

(ii) Decreasing quantifiers: Just as (8) is not explained on a material conditional account or (Higginbotham 1986), if, following (3), the conditional is universal it should be true as soon as no *all* cases where a student goes off are ones where she succeeds, which it is not:

(8) No student will succeed if they goof off.

Though if we then further appeal to CEM, we can derive the meaning of (8) as in (9) (cf. Higginbotham 2003, von Stechow and Iatridou 2002), this account will not extend to (10), where the quantifier embeds a conditional that we saw does not to obey CEM (Leslie 2009):

(9) All students are such that if they goof off they don't succeed.

(10) No fair coin will come up heads if flipped.

I argue that conditionals in the scope of decreasing quantifiers are another instance where conditionals have mere existential force (cf. Dekker's 2001 dualization operator for \rightarrow). (8) is now analyzed as in (11) and (10) as in (12):

(11) [No x : Student(x)] [$\exists w$: Goof-off(x, w)] Succeed(x, w)

No student is such that in some ('any') case where she goes off she succeeds.

(12) [No x : Fair-coin(x)] [$\exists w$: Flipped(x, w)] Comes-up-heads(x, w)

No fair coin is such that in some ('any') case where it is flipped it comes up heads.

(iii) Bare plurals under *only*: Conditionals are not alone in showing existential force under *only*—bare plurals do too, even when they combine with individual level predicates, which normally force generic or quasi-universal readings (McCawley 1974, von Stechow 1997):

(13) Only [adults]_f eat arugula.

In addition, just as conditionals in isolation can have existential force (weak conditionals), so can generic bare plurals, as pointed out in Cohen (2004) in connection with (13B):

(14) A: Birds lay eggs. B: Mammals lay eggs too.

5. Extension: Temporal orientation and adverbs: *If p q* and *only if q p* typically fail to be truth conditionally equivalent when temporal/causal order matters:

(15) a. If you heat butter, it melts. b. Only if butter melts do you heat it.

The contrast in (15) indicates that the antecedent (*only if*) clauses describe matters that are temporally/causally prior to those described by the consequent clause (McCawley 1983). I take this to suggest that (*only if*) clauses quantify not over worlds but entities amenable to temporal ordering, namely situations or events. Assuming that *if*-clauses denote definite descriptions of situations/events (Schein 2001, cf. Schlenker 2003), I claim the difference between conditionals with universal force and those with existential force lies in that in the former the tacit adverb in the main clause is universal whereas in the latter it is existential:

(17) [λx : $\forall e$ X(e) \leftrightarrow You-work-hard(e)] $\forall e'/\exists e'$ Follow(e', e) \wedge You-Succeed(e')

I finally show that this account also extends to conditionals embedded under *only* with overt adverbs as in (18), which are interpreted as in (19), with their adverbs *in-situ*:

(18) Only if you work hard do you always/ever/often get an A on the test.

(19) [[*Only*]] [λx : $\forall e$ X(e) \leftrightarrow Work-hard(e)] [All/Some/Many e' : Follow(e', e)] Get A(e')

[[*Only*]] 'The events where you work hard are such that all/some/many that follow them are events where you get an A on the test.'

In conclusion, if we recognize the tacit adverb in the main clause of 'bare' conditionals to be ambiguous between 'all' and 'some', the *only if* puzzle as well as the interpretation of conditionals under decreasing quantifiers is explained. **Selected references:** Barker 1993 Conditional excluded middle, conditional assertion, and *only if*. *Analysis* 53. Cohen 2004 Existential generics. *LeP* 27. Dekker, 2001. On *if* and *only*. *SALT XI*. von Stechow 1997 Bare plurals, bare conditionals, and *only*. *JofS* 14. Leslie 09 *If, unless* and quantification. In Viger and Stainton. McCawley 1974. *If* and *only if*. *LI* 5. Schein 2001. Adverbial reciprocals *SALT XI*.

