# Dynamic Conditionals?

Daniel Rothschild
September 20, 2015

## 1 The dynamic analysis of indicative conditionals

We'll follow a tradition in the treatment of informational language pioneered by Stalnaker [1975] and Veltman [1985, 1996] and taken up in Groenendijk et al. [1996], Beaver [2001], Gillies [2004], Yalcin [2007], Starr [2014], Willer [2013, 2014] amongst others.

Stalnaker [1975] suggested that indicative conditionals speak directly about the common ground. In his variably strict framework, this means that the nearest world in which the antecedent is true is presupposed to be inside the common ground. Let's move to a strict conditional: In a common ground $c$, if $\phi \to \psi$ in the context $c$ expresses the proposition that $\phi \supset \psi$ is true across the worlds in $c$ (so the strict conditional across the common ground). Stalnakerian update of context $c$ with assertion of $\phi$ (relative to common ground $c$ is going to be $c \cap [\![\phi]\!]^c$. This will yield a 'test' in the case of conditionals since the common ground worlds all agree on whether $[\![\phi \to \psi]\!]^c$ is true.

In a properly dynamic setting, this idea translates to a test semantics such as we find in Veltman [1996] and Gillies [2004]:

$$c[\phi \to \psi] = \{w \in c : c[\phi] = c[\phi][\psi]\}$$

The epistemic modals 'might' and 'must', likewise, can be seen to express possibility and necessity in the common ground (following Veltman):[1]

$$c[\Diamond\phi] = \{w \in c : c[\phi] \neq \emptyset\}$$

$$c[\Box\phi] = \{w \in c : c[\phi] = \phi\}$$

## 2 Motivation from epistemic modals and disjunction

(1) ?I might buy a car and crash it into a fence, but if I buy a car I won't crash it.

In other words, $\Diamond(P\&Q)$ seems to rule out $P \to \neg Q$.[2]

'Or-to-if' inference [Stalnaker, 1975]:

(2) Either I don't buy a car, or I crash one. $\leadsto$ If I buy a car, I will crash it.

'Must' in consequents:

(3) If John bought a car, he crashed it. $\leadsto$ If John bought a car, he must have crashed it.

In general, as Gillies [2004] argues, sentences of the form 'if $\phi$, then must $\psi$' and 'if $\phi$, then $\psi$' are 'true in exactly the same scenarios'.

## 3 Plan

I will focus on two problem areas about conditionals one centering around their apparent satisfaction of the law of the conditional excluded middle, the other around Sobel sequences. My conclusion will be that the dynamic entry for the conditional at least needs substantial modification severing its straightforward definability in terms of epistemic 'must' and 'might', but such modification can be made by appeal to the independent linguistic phenomenon of homogeneity effects [Križ, 2015]. I'll end by giving some considerations against identifying all indicative conditionals as dynamic.

## 4 Musty consequents

Early warning [must be elsewhere but in Rothschild, 2013]:

(4) a. If I flip this coin it must land heads.
b. If I flip this coin it will land heads.

We have some systematically different judgments about these sentences: in particular if it's a fair coin the first seems false, but the second...? But, perhaps this is just the result of the 'indirect evidence' implication associated with 'must'.

Another difference related to the CEM:

(5) a. No girl must fail if she tries.
b. No girl will fail if she tries.

[1] Veltman himself only puts forward 'might' in his article and does not believe that English 'must' is the dual of 'might'. If $c[\phi \supset \psi] = c\backslash(c[\phi]\backslash c[\phi][\psi])$ then (I hope) $c[\phi \to \psi] = c[\Box(\phi \supset \psi)]$ with reasonable assumptions (e.g. that updates are eliminative).

[2] I don't see how Stalnaker [1975] accounts for this.

The first is pessimistic, but not the second. Only with the b. examples do we get equivalence between (5) and (6):

(6) a. Every girl must succeed if she tries.
b. Every girl will succeed if she tries.

There is general consensus that the logical form of these sentences is: [no/every girl $x$][if $x$ tries, $x$ (must) fails/succeeds].[3] If this is right musty conditionals, really do behave very differently from plain ones in a truth-conditionally apparent way. In particular, as this equivalence is only established by the *conditional excluded middle* (CEM), regular indicatives but not musty indicatives appear to satisfy the CEM.

Other CEM evidence:

(7) a. John doubts if you buy the ticket you must win.
b. John doubts if you buy the ticket you will win.

All this data, seems to be bad for the dynamic conditional. Getting dynamic epistemic sentences to behave properly under quantifiers is a paper in itself [Groenendijk et al., 1996, Beaver, 2001, Yalcin, 2015], but once we sort this out we will not get the CEM readings, since dynamic conditionals don't satisfy the CEM. Dynamic conditionals in other worlds look empirically like musty conditionals, not bare conditionals.

## 5 Sobel Sequences

(8) If Maria comes to the party, it'll be fun. But, if she comes and talks about dynamic semantics, it will be boring.

Is this really felicitous? Certainly not in reverse order. Some use two-person dialogue [Moss, 2012], some use 'of course' instead of 'but' [Križ, 2015] to make them sound non-contradictory. In any case, these aren't plain contradictions. The dynamic account does not automatically explain this data: by having conditionals track a standard domain (the common ground) we predict a flat inconsistency. So we have to suppose some kind of extra principles governing the expansion of the common ground in successive conditionals.

Willer [2014] makes an interesting point in a related context. If (8) is felicitous than it should be possible to simply expand the common ground to get an antecedent-true world. His example:

[3]See e.g. von Fintel and Iatridou [2002], Klinedinst [2011].

(9) #Mary is not in New York. If she is in New York, she will meet Alex.

Im not sure this isn't rescued by a 'but' or 'of course', but *if* Willer is right, the dynamic story needs to be expanded.[4]

## 6 CEM and Sobel Sequences with Dynamic Conditionals

Parallels with definite descriptions with Sobel Sequences and CEM phenomona both noted by Schlenker [2004]:[5]

(10) a. The boys didn't drink. $\rightsquigarrow$ None of the boys drank.
All the boys didn't drink $\not\rightsquigarrow$ None of the boys drank.
b. My friends supported me. Of course, Nancy didn't, but she doesn't support anyone.
All my friends supported me. ?Of course, Nancy didn't, but she doesn't support anyone.

For Schlenker these parallels pushes us to something closer to a Stalnakerian variably strict conditional.[6]

Križ [2015] saves the possibility of a (more standard) dynamic account, by arguing that homogeneity phenomenon should not be reduced to restriction of domain of quantification in cases of plural descriptions or conditionals.

Adapting his view (which he presents for a static semantics) to the dynamic setting we would have something like this:

$$c[\phi \to \psi] = \begin{cases} c & \text{if } c[\phi][\psi] =^* c[\phi] \\ \emptyset & \text{if } c[\phi][\psi] =^* \emptyset \\ \# & \text{otherwise} \end{cases}$$

This is using a trivalent approach to homogeneity proposed by Križ.[7] It immediately explains the CEM, in a way akin to treatment of vagueness:

[4]Willer [2014] gives a more complex dynamic story to account for Sobel sequences.

[5]The connection to CEM is credited to Stalnaker.

[6]Schlenker thinks conditionals actually refer to a set of antecedent-satisfying worlds, just as definite descriptions refer to a set of individuals satisfying their restrictors

[7]Undefinedness should not be understood as akin to presupposition failure, as Križ recognizes.

'John is bald' versus 'John is not bald'. Not true all individuals are not borderline case, but assertion and negation both seem to entail lack of borderlinehood.

In our effort to avoid undefinedness we are exception-tolerant about the equalities which is why I marked them with *. What this amounts to is that marginal possibilities can be ignored.[8]

Our results above suggested that the $c[\phi][\Box\psi]$ behaves more like the traditional dynamic conditional rewritten as:

$$c[\phi \to \Box\psi] = \begin{cases} c & \text{if } c[\phi][\psi] = c[\phi] \\ \emptyset & \text{otherwise} \end{cases}$$

How does this come about compositionally? One obvious possibility is that Kratzer was right all along: 'if'-clauses restrict domain of modals. When there is an overt 'must' it is restricted by the antecedent. When there isn't, a silent necessity modal is restricted but it behaves in the homogeneity-friendly manner (parallel to the commonly posited silent GEN operator for generics, which also exhibits exception tolerance and CEM behavior [Carlson and Pelletier, 1995]).

But what about just sticking Veltman's epistemic modal into the consequent compositionally (i.e. just putting everything together as we find it)?

$$c[\phi \to \Box\psi] = \begin{cases} c & \text{if } c[\phi][\Box\psi] =^* c[\phi] \\ \emptyset & \text{if } c[\phi][\Box\psi] =^* \emptyset \\ \# & \text{otherwise} \end{cases}$$

The otherwise case now disappears as the test semantics of $\Box$ makes the first two cases exhaustive, hence it looks like our standard dynamic conditional above.[9] We can't define the conditionals out of our epistemic language anymore, but we can still have a straightforward dynamic definition capturing regular and musty conditionals compositionally.[10]

[8]But once mentioned they cannot be, which explains badness of (1) and reverse Sobel sequences, and even why single-speaker Sobel sequences are awkward. The story is not precise and elegant, but, then, neither is the data.

[9]Exception tolerance of =, becomes irrelevant as there are no in-between cases

[10]Unfortunately to my knowledge, the dynamic view of conditionals (this or the standard one) has no satisfactory story about interactions with adverbs of quantification, which suggests that maybe we are stuck with a Kratzer's restrictor story after all [Khoo, 2011, Rothschild, 2016].

## 7 Static conditionals?

We have retained the dynamic commitment to the idea that the indicative conditional is a test on the common ground (albeit an exception-tolerant and homogeneity-assuming one). There is evidence that this isn't *always* what indicative conditionals are doing.

- Weak point:

  (11) If you flip the coin it will land heads.

  Why do we label this true if the coin lands heads (similarly in past cases). Dynamic thought: truth-value judgments track current common grounds? But then why contrast with musty conditional:

  (12) If you flip the coin it must land heads.

  In other words, I'm not sure that the only difference between regular and musty conditionals is what we discussed above.

- Rothschild [2016] gives this example without much explanation:

  (13) It's likely that there's at least one athlete who will win a medal if she competes.
  *intended reading*: likely (one athlete $x$ : if $x$ competes, $x$ will get a medal).

  Situation: we are looking to bet on one possible athlete in upcoming competition, (13) is assuring us it's likely is a good bet to be made. Probability assignments don't work on dynamic view.

- Even if the dynamic account naturally extends to yield probabilities of conditionals satisfying Adams's thesis [Yaclin, 2012], how do we handle cases where we don't get such probabilities [McGee, 2000, Kaufmann, 2004, Rothschild, 2013]?

Natural conclusion: conditionals *sometimes* express necessity with respect to something besides the common ground.

## References


David Beaver. *Presupposition and Assertion in Dynamic Semantics*. CSLI, 2001.

Gregory N. Carlson and Francis Jeffry Pelletier. *The Generic Book*. University of Chicago Press, 1995.

Anthony Gillies. Epistemic conditionals and conditional epstemics. *Nous*, 38(4):585–616, 2004.

Jeroen Groenendijk, Martin Stokhof, and Frank Veltman. Corefrence and modality. In Shalom Lappin, editor, *Handbook of Contemporary Semantic Theory*. Blackwell, 1996.

Stefan Kaufmann. Conditioning against the grain. *Journal of Philosophical Logic*, 33:583–64, 2004.

Justin Khoo. Operators or restrictors? A reply to Gillies. *Semantics and Pragmatics*, 4(4):1–43, 2011.

Nathan Klinedinst. Quantified conditionals and conditional excluded middle. *Journal of Semantics*, 28:149–170, 2011.

Manuel Križ. *Aspects of homogeneity in the semantics of natural language*. PhD thesis, University of Vienna, 2015.

Vann McGee. To tell the truth about conditionals. *Analysis*, 60:107–111, 2000.

Sarah Moss. On the pragmatics of counterfactuals. *Noûs*, 46(3):561–586, 2012.

Daniel Rothschild. Do indicative conditionals express propositions? *Noûs*, 47:49–68, 2013.

Daniel Rothschild. A note on conditionals and restrictors. In *Conditionals, Probability, and Paradox: Themes from the Philosophy of Dorothy Edgington*. Oxford University Press, 2016.

Philippe Schlenker. Conditionals as definite descriptions. *Research on Language and Computation*, 2:417–462, 2004.

Robert Stalnaker. Indicative conditionals. *Philosophia*, 5:269–286, 1975.

William B. Starr. A uniform theory of conditionals. *Journal of Philosophical Logic*, 43(6):1019–1064, 2014.

Frank Veltman. *Logic for Conditionals*. PhD thesis, University of Amsterdam, 1985.

Frank Veltman. Defaults in update semantics. *Journal of Philosophical Logic*, 25(3):221–261, 1996.

Kai von Fintel and Sabine Iatridou. If and when *If*-clauses can restrict quantifiers. Paper for the Workshop in Philosophy and Linguistics at the University of Michigan, 2002.

Malte Willer. Dynamics of epistemic modality. *Philosophical Review*, 122 (1):45–92, 2013.

Malte Willer. Another case for dynamic conditionals. unpublished manuscript, 2014.

Seth Yaclin. Context probabilism. In *Proceedings of the 18th Amsterdam Colloquium*, pages 12–21, 2012.

Seth Yalcin. Epistemic modals. *Mind*, 116:983–1026, 2007.

Seth Yalcin. Epistemic modality *de re*. *Ergo*, 2(19):475–527, 2015. unpublished manuscript.