Indicative Conditionals, Strictly

UConn 'If' Workshop

April 7, 2019

William Starr
Cornell University, Philosophy
http://williamstarr.net

Slides available at: http://williamstarr.net/uconn19.pdf

1. Monotonic patterns for indicatives
2. New counterexamples
3. A dynamic strict analysis
4. Some of its other promising features

(1) a. If James Earl Ray didn't kill MLK, someone else did. **Indicative**
b. If James Earl Ray hadn't killed MLK, someone else would've. **Subjunctive**

1 Monotonic Patterns

Antecedent Strengthening (AS) $A \to C \vDash (A \wedge B) \to C$

Example:

(2) a. If Allie served tea, Chris came.
b. So, if Allie served tea and cake, Chris came.

Counterexample (Stalnaker 1968; Adams 1975):

(3) a. If Allie served tea, Chris came.
b. # So, if Allie served tea and didn't invite Chris, Chris came.

Simplification of Disjunctive Antecedents (SDA) $(A \vee B) \to C \vDash (A \to C) \wedge (B \to C)$

Example:

(4) a. If Allie served tea or cake, Chris came.
b. So, if Allie served tea, Chris came; and, if Allie served cake, Chris came.

Counterexample (Adams 1975; McKay & van Inwagen 1977):

(5) a. If Allie served only tea or only cake, she served only cake.

b. # So, if Allie served only tea, she served only cake.

Antecedent Monotonicity If $A \to C \vDash D$ and $B \vDash A$, then $B \to C \vDash D$

- Conditional antecedents preserve consequence relations.

- Antecedent Monotonicity follows from Transitivity and the assumption that if $A \vDash B$ then $\vDash A \to B$ (Starr 2019:n22)

Transitivity $A \to B, B \to C \vDash A \to C$

- Antecedent Monotonicity follows from Contraposition and 'Consequent Monotonicity' (Starr 2019:n23)

Contraposition $A \to B \vDash \neg B \to \neg A$

Indicative Felicity An indicative conditional is only felicitous in contexts where its antecedent is mutually supposed to be possible. (Stalnaker 1975; Adams 1975; Veltman 1986; Gillies 2010)

(6) a. Allie definitely did not serve tea.
b. # If Allie served tea, Chris came.

Antecedent Strengthening example revisited:

(7) a. Maybe Allie served tea and cake. If Allie served tea, Chris came.
b. So, if Allie served tea and cake, Chris came.

Antecedent Strengthening counterexample revisited:

(8) a. Maybe Allie served tea and didn't invite Chris. # If Allie served tea, Chris came.
b. # So, if Allie served tea and didn't invite Chris, Chris came.

SDA example revisited:

(9) a. Maybe Allie served tea, maybe she served cake. But, if Allie served tea or cake, Chris came.
b. So, if Allie served tea, Chris came; and, if Allie served cake, Chris came.

SDA counterexample revisited:

(10) a. Maybe Allie served only tea. #But, if Allie served only tea or only cake, she served only cake.
b. # So, if Allie served only tea, she served only cake.

The Generalization Monotonic patterns sound compelling only when Indicative Felicity of conclusion is compatible with the truth (and Indicative Felicity) of the premises.

Variably-Strict Explanation (Stalnaker 1975)

1. 'Examples' are semantically invalid but pragmatically compelling (*reasonable inference*): any context which is updated with a felicitous and true assertion of the premise, is one where the conclusion is true if felicitous.
2. 'Counterexamples' exist because monotonic patterns are semantically invalid, and do not sound pragmatically compelling because Indicative Felicity is not satisfied.

Strict Explanation

1. 'Examples' are compelling because monotonic patterns are semantically valid.
2. 'Counterexamples' sound bad because violation of Indicative Felicity for conclusion leads to:
   - Pragmatical infelicity (Veltman 1986, 1985)
   - Semantic presupposition failure (Gillies 2004, 2009)
   - Equivocation via accommodation (Warmbrōd 1981)

Shared Key Prediction Any time Indicative Felicity is satisfied, a monotonic pattern will sound compelling.

2 New Data

New counterexample to SDA:

(11) a. If the coin came up heads or tails, maybe it came up heads.
  b. # If the coin came up tails, maybe it came up heads.

(12) a. Maybe the coin came up tails. But, if the coin came up heads or tails, maybe it came up heads.
  b. # If the coin came up tails, maybe it came up heads.

New counterexamples to antecedent strengthening:

(13) a. If Allie served tea, maybe Chris came.
  b. # If Allie served tea and Chris didn't come, maybe Chris came.

(14) a. Maybe Allie served tea and Chris didn't come. But, if Allie served tea, maybe Chris came.
  b. # If Allie served tea and Chris didn't come, maybe Chris came.

(15) a. If Allie served tea, Chris probably came.
  b. # If Allie served tea and Chris didn't come, Chris probably came.

(16) a. Maybe Allie served tea and Chris didn't come. But, if Allie served tea, Chris probably came.
  b. # If Allie served tea and Chris didn't come, Chris probably came.

Embedded monotonic patterns:

(17) a. If Allie served tea, then if Bill brought honey or Chris brought sugar, everyone was happy.
  $A \to ((B \vee C) \to H)$
  b. If Allie served tea, then if Bill brought honey, everyone was happy.
  $A \to (B \to H)$

Old-style counterexamples lurk here too

(18)
  a. If Chris came then if Allie served only tea or only cake, she served only cake.
  b. # If Chris came then if Allie served only tea, she served only cake.

Antecedent Preservation (AP) $\vDash A \to (B \to A)$

- Valid on strict analysis; not variably-strict analysis.

Example:

(19) If Allie served tea, then if Chris came Allie served tea.

Familiar counterexample:

(20) # If the coin came up heads, then if the coin came up tails it came up heads.

The point:

- Both explained on strict analysis w/semantic approach to Indicative Felicity
- No explanation of (19) on variably-strict analysis

New counterexample:

(21) # If the coin maybe came up heads, then if the coin came up tails, the coin maybe came up heads.
  $\Diamond H \to (\neg H \to \Diamond H)$

Import-Export $A \to (B \to C) \mathrel{=}\!\!\!|\!\vDash (A \wedge B) \to C)$

- Valid on strict analysis; not variably-strict analysis.

Example:

(22) a. If Allie bet, then if the coin came up heads, she won.
  b. If Allie bet and the coin came up heads, she won.

3 A Strict Analysis

Dynamic Informational Semantics (Veltman 1996) Where $s \subseteq W$:

1. $s[\mathsf{A}] = \{w \in s \mid w(\mathsf{A}) = 1\}$
2. $s[\neg\phi] = s - s[\phi]$
3. $s[\phi \wedge \psi] = (s[\phi])[\psi]$
4. $s[\phi \vee \psi] = s[\phi] \cup s[\psi]$

Support $s \vDash \phi \iff s[\phi] = s$

- s supports ϕ just in case any information ϕ can provide is already part of s.

Epistemic Modals (Veltman 1996)

1. $s[\Diamond\phi] = \{w \in s \mid s[\phi] \neq \varnothing\}$
2. $s[\Box\phi] = \{w \in s \mid s \vDash \phi\}$

Dynamic Strict Conditional w/Presupposition

$$s[\phi \to \psi] = \begin{cases} s & \text{if } \exists w \in s : w \vDash \phi \ \&\ s[\phi] \vDash \psi \\ \varnothing & \text{if } \exists w \in s : w \vDash \phi \ \&\ s[\phi] \nvDash \psi \\ \text{Undefined} & \text{if } \nexists w \in s : w \vDash \phi \end{cases}$$

- Presupposes that ϕ is true in some $w \in s$.
- Tests that all ϕ-worlds in s are ψ-worlds.

Strawsonian Dynamic Consequence
$\phi_1, \ldots, \phi_n \vDash \psi \Leftrightarrow \forall s$: if $s[\phi_1]\cdots[\phi_n][\psi]$ is defined, $s[\phi_1]\cdots[\phi_n] \vDash \psi$

Old counterexample to AS:

(3) a. If Allie served tea, Chris came.
b. # So, if Allie served tea and didn't invite Chris, Chris came.

- $s_0 = \{w_{\mathsf{AIC}}, w_{\mathsf{aIC}}, w_{\mathsf{aic}}\}$;
  - Contextually excluded: $w_{\mathsf{Aic}}, w_{\mathsf{AIc}}, w_{\mathsf{AiC}}, w_{\mathsf{aiC}}$
- $s_0[\mathsf{A} \to \mathsf{C}] = s_0$, since $s_0[\mathsf{A}] \vDash \mathsf{C}$.
- But $s_0[\mathsf{A} \to \mathsf{C}]$ is undefined.
- So states like s_0 don't count for/against consequence.
- Beauty of Strawsonian Dynamic Consequence at work!

New counterexample to AS:

(13) a. If Allie served tea, maybe Chris came.
$\mathsf{A} \to \Diamond\mathsf{C}$
b. # If Allie served tea and Chris didn't come, maybe Chris came.
$(\mathsf{A} \wedge \neg\mathsf{C}) \to \Diamond\mathsf{C}$

- $s_0 = \{w_{\mathsf{AC}}, w_{\mathsf{Ac}}, w_{\mathsf{aC}}, w_{\mathsf{ac}}\}$
- $s_0[\mathsf{A} \to \Diamond\mathsf{C}] = s_0$, since $s_0[\mathsf{A}] \vDash \Diamond\mathsf{C}$
- $s_0[(\mathsf{A} \wedge \neg\mathsf{C}) \to \Diamond\mathsf{C}] = \varnothing$, since $s_0[\mathsf{A} \wedge \neg\mathsf{C}] \nvDash \Diamond\mathsf{C}$
- So $s_0[\mathsf{A} \to \Diamond\mathsf{C}] \nvDash (\mathsf{A} \wedge \neg\mathsf{C}) \to \Diamond\mathsf{C}$
- Hence: $\mathsf{A} \to \Diamond\mathsf{C} \nvDash (\mathsf{A} \wedge \neg\mathsf{C}) \to \Diamond\mathsf{C}$
- Why? Because of how $\Diamond$ works.

Persistence (Veltman 1985; Groenendijk *et al.* 1996) ϕ is *persistent* just in case $s' \vDash \phi$ if $s \vDash \phi$ and $s' \subseteq s$.

- Support for ϕ persists after more information comes in.
- $\Diamond\mathsf{A}$ is not persistent.
  - Moving from s to s' can eliminate A-worlds.

Miserly (Veltman 1985) ϕ is *miserly* just in case $s' \nvDash \phi$ if $s \nvDash \phi$ and $s' \subseteq s$.

- s continues to withhold support of ϕ even after s is enriched with more information.

Unrestricted Validities

1. Identity: $\vDash \phi \to \phi$
2. Modus Ponens: $\phi \to \psi, \phi \vDash \psi$
3. Deduction Equivalence: $\phi \vDash \psi \iff \vDash \phi \to \psi$
4. Import-Export: $\phi_1 \to (\phi_2 \to \psi) \dashv\vDash (\phi_1 \wedge \phi_2) \to \psi$

Persistent Validities For persistent ψ:

1. Antecedent Strengthening: $\phi_1 \to \psi \vDash (\phi_1 \wedge \phi_2) \to \psi$
2. SDA: $(\phi_1 \vee \phi_2) \to \psi \vDash (\phi_1 \to \psi) \wedge (\phi_2 \to \psi)$
3. Transitivity: $\phi_1 \to \phi_2, \phi_2 \to \psi \vDash \phi_1 \to \psi$
4. Antecedent Preservation: $\vDash \psi \to (\phi \to \psi)$

Miserly Validities For miserly ψ:

1. Contraposition: $\phi \to \psi \vDash \neg\psi \to \neg\phi$
2. Modus Tollens: $\phi \to \psi, \neg\psi \vDash \neg\phi$

Conditional/Modal Interactions (Gillies 2010)

1. $\phi \to \Diamond\psi \dashv\vDash \Diamond(\phi \wedge \psi)$
2. $\Box(\phi \to \psi) \dashv\vDash \phi \to \Box\psi \dashv\vDash \phi \to \psi$

4 Assorted Curiosities

4.1 The Truth

Truth-Conditions Just as Good? (Gillies 2009)
$[\![\phi \to \psi]\!]_C = \{w \mid C(w) \cap [\![\phi]\!]_C \subseteq [\![\psi]\!]_{C_\phi}\}$

- All the contextually-live ϕ-worlds are ψ-worlds
- $C(w)$ is the set of live worlds with respect to w
- $C_\phi(w) = C(w) \cap [\![\phi]\!]_C$, for all w

Problem:

- Modus ponens requires assuming that for all w, $w \in C(w)$.
- This assumption is inconsistent with interpreting $C(w)$ as agents' *information*.
- That interpretation is essential for basic applications.

Basic application:

- Chris just had a brief glimpse at two shapes x and y.
- She thinks there was both a triangle and a square.
- Given Chris' information, is it correct for her to assert/believe:

  (23) If x is a triangle, y is a square.

  - *My judgment*: Correct.
- As it turns out, x and y are both squares.
- Given Chris' information and the actual state of things, is it correct for her to assert/believe (23)?
  - *My judgment*: Probably, but some ambivalence.

Key Points about (23)

1. We do have simple judgments about whether some information supports a conditional belief/assertion.
2. Those judgments can occur even if that information is false in world of evaluation.
3. When we learn what the world of evaluation is, our judgments can *change*.

- Point 1 suggests judgments reflect contextual information alone — no 'world of evaluation'.
  - Judgments are not a product of both w and $C(w)$
- Point 2 incompatible w/requiring $w \in C(w)$ for all w.
- Can point 3 be explained on the dynamic approach?

Truth, Propositions (Starr 2010)
$w \vDash \phi \iff \{w\}[\phi] = \{w\}$
$[\![\phi]\!] = \{w \mid w \vDash \phi\}$

Two ways of evaluating (23):

- $s \vDash (23)$ vs. $w \vDash (23)$

Trivalent Truth-Conditions From semantics/definitions it follows that:

1. $\phi \to \psi$ is true in w if $\phi \wedge \psi$ is true in w.
2. $\phi \to \psi$ is false in w if $\phi \wedge \neg\psi$ is true in w.
3. Otherwise, $\phi \to \psi$'s truth-value is undefined.

These truth-conditions can be used to revisit Lewis (1975)/Kratzer (1986).

4.2 'Probably'

Semantics for 'Probably' Adapting Yalcin (2012),

$$s_{Pr}[\triangle\phi] = \begin{cases} s_{Pr} & \text{if } Pr(\{w \in s : w \vDash \phi\} \mid \{w \in s : w \vDash \phi \text{ or } w \nvDash \phi\}) > 0.5 \\ \varnothing_{Pr} & \text{otherwise} \end{cases}$$

- Update clause for atomics must also change to conditionalize *Pr*; disjunction tricky.

Interesting Consequences

1. $\phi \to \triangle\psi \Dashv\vDash \triangle(\phi \to \psi)$
2. $s_{Pr} \vDash \triangle(\mathsf{A} \to \mathsf{B}) \iff Pr([\![\mathsf{B}]\!] \mid [\![\mathsf{A}]\!]) > 0.5$
3. $\triangle\phi$ is neither persistent nor miserly.

4.3 Subjunctives

New indicative counterexample:

(21) # If the coin maybe came up heads, then (even) if the coin came up tails, the coin maybe (also) came up heads.
$\Diamond\mathsf{H} \to (\neg\mathsf{H} \to \Diamond\mathsf{H})$

- Consider its subjunctive counterpart, in context where we don't know outcome of past coinflip.

Does it work w/subjunctives?

(24) If the coin could have come up heads, then (even) if the coin came up tails, the coin could (also) have come up heads.
$\Diamond \triangleleft \mathsf{H} \to (\triangleleft \neg \mathsf{H} \to \Diamond \triangleleft \mathsf{H})$ (Starr 2014)

Counterfactual Expansion $\triangleleft$ **(Starr 2014)**
$s_f[\triangleleft \mathsf{A}] = \{w' \mid \exists w \in s : w' \in f(w, \mathsf{A})\}_f$

- w' is among the A-worlds closest to some $w \in s$
- w' may be outside s (cf. Iatridou 2000; von Fintel 1999)

What does this predict about the meaning of $\Diamond \triangleleft \mathsf{A}$?

- $\Diamond \triangleleft \mathsf{H}$ can persist after updating with $\neg \mathsf{H}$

New counterexamples don't clearly apply to subjunctives:

(25) a. If Allie had served only tea or only cakes, she could have served only tea.
b. So, if Allie had served only cakes, she could (also) have served only tea.

References

Adams, EW (1975). *The Logic of Conditionals.* Dordrecht: D. Reidel.

von Fintel, K (1999). 'The Presupposition of Subjunctive Conditionals.' In U Sauerland & O Percus (eds.), *The Interpretive Tract*, vol. MIT Working Papers in Linguistics 25, 29–44. Cambridge, MA: MITWPL. URL http://mit.edu/fintel/www/subjunctive.pdf.

Gillies, AS (2004). 'Epistemic Conditionals and Conditional Epistemics.' *Noûs*, **38(4)**: 585–616. URL http://rci.rutgers.edu/~thony/epi_cond_nous.pdf.

Gillies, AS (2009). 'On Truth-Conditions for "If" (but Not Quite Only "If").' *Philosophical Review*, **118(3)**: 325–349. URL http://dx.doi.org/10.1215/00318108-2009-002.

Gillies, AS (2010). 'Iffiness.' *Semantics and Pragmatics*, **3(4)**: 1–42. URL http://dx.doi.org/10.3765/sp.3.4.

Groenendijk, J, Stokhof, M & Veltman, F (1996). 'Coreference and Modality.' In S Lappin (ed.), *The Handbook of Contemporary Semantic Theory*, 179–213. Oxford: Blackwell Publishers.

Iatridou, S (2000). 'The Grammatical Ingredients of Counterfactuality.' *Linguistic Inquiry*, **31(2)**: 231–270.

Kratzer, A (1986). 'Conditionals.' In *Proceedings from the 22nd Regional Meeting of the Chicago Linguistic Society*, 1–15. Chicago: University of Chicago. URL http://semanticsarchive.net/Archive/ThkMjYxN/Conditionals.pdf.

Lewis, DK (1975). 'Adverbs of Quantification.' In EL Keenan (ed.), *Formal Semantics of Natural Language*, 3–15. Cambridge, England: Cambridge University Press.

McKay, TJ & van Inwagen, P (1977). 'Counterfactuals with Disjunctive Antecedents.' *Philosophical Studies*, **31**: 353–356.

Stalnaker, R (1968). 'A Theory of Conditionals.' In N Rescher (ed.), *Studies in Logical Theory*, 98–112. Oxford: Basil Blackwell.

Stalnaker, R (1975). 'Indicative Conditionals.' *Philosophia*, **5**: 269–286. Page references to reprint in Stalnaker (1999).

Stalnaker, RC (1999). *Context and Content: Essays on Intentionality in Speech and Thought.* Oxford: Oxford University Press.

Starr, WB (2010). *Conditionals, Meaning and Mood.* Ph.D. thesis, Rutgers University, New Brunswick, NJ. URL http://hdl.rutgers.edu/1782.1/rucore10001600001.ETD.000056780.

Starr, WB (2014). 'A Uniform Theory of Conditionals.' *Journal of Philosophical Logic*, **43(6)**: 1019–1064. URL http://dx.doi.org/10.1007/s10992-013-9300-8.

Starr, WB (2019). 'Counterfactuals.' In EN Zalta (ed.), *Stanford Encylcopedia of Philosophy*, spring 2019 edn. Metaphysics Research Lab, Stanford University.

Veltman, F (1985). *Logics for Conditionals.* Ph.D. dissertation, University of Amsterdam, Amsterdam.

Veltman, F (1986). 'Data Semantics and the Pragmatics of Indicative Conditionals.' In EC Traugott, A ter Meulen, JS Reilly & CA Ferguson (eds.), *On Conditionals.* Cambridge, England: Cambridge University Press.

Veltman, F (1996). 'Defaults in Update Semantics.' *Journal of Philosophical Logic*, **25(3)**: 221–261. URL http://dx.doi.org/10.1007/BF00248150.

Warmbrōd, K (1981). 'An Indexical Theory of Conditionals.' *Dialogue, Canadian Philosophical Review*, **20(4)**: 644–664.

Yalcin, S (2012). 'A Counterexample to Modus Tollens.' *Journal of Philosophical Logic*, **41(6)**: 1001–1024. URL http://dx.doi.org/10.1007/s10992-012-9228-4.