Openness requirements and conditional 'iffiness': evidence from Bangla *jodi*-conditionals

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A question of iffiness

- In philosophical literature: conditionals translated as two-place connectives relatingn sentences
- "The history of the conditional is the story of a syntactic mistake. There is no two-place *if . . . then* connective in the logical forms of natural languages. *If*-clauses are devices for restricting the domains of various operators." (Kratzer, 1986) (restrictor-only approach)

However...

- (Von Fintel and Iatridou, 2002): conditionals differ from syntactically similar constructions:

(1) a. ??If /When Peter wakes up, he will make coffee.

b. If Peter wakes up early, he will make coffee.

- **iffiness**: *if* contributes an invariant meaning: uncertainty about the antecedent
- But is this just a general/pragmatic constraint on modal assertion? Diversity: Condoravdi (2002)
- Evidence from a larger set of conditional connectives

jodi in Bangla

- Subordinating connective used in conditional statements: indicative, counterfactual
- Distribution: more restricted than *if*
- This work:
  - **Empirical question:** how to characterize the restriction?
  - **Formal question:** where/how is the restriction specified?
- Main claim: *jodi* presupposes an attitude of uncertainty towards the antecedent that is (i) independent of the consequent modality, and (ii) more stringent than the uncertainty contributed by *if*, adding to growing evidence that conditional connectives make lexically-specific semantic contributions that cannot be reduced to pragmatics: conditionals are semantically 'iffy'.

Roadmap

Empirical question

Sketching an analysis

Formal question

Implications and conclusion

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Scope of data

- Indicative conditionals
- Eventive antecedents
- Single-case conditionals (excludes 'whenever' readings: *If it rained, she went to the gym*)
- Restrictions on what can appear in the antecedent. Consequent is not constrained.

Restriction A: epistemic status of antecedent fact

- (2) a. ?? If Peter wakes up, he will make coffee.

  b. If Peter wakes up early, he will make coffee.

- Parallel contrast with *jodi*:

(3) a. ?? jodi peter ghum theke oth-ϕ-e, o coffee bana-b-e
?? if peter sleep from rise-PRS-3, he coffee make-FUT-3
?? If Peter wakes up, he will make coffee

b. jodi peter taratari ghum theke oth-ϕ-e, o coffee bana-b-e
if peter early sleep from rise-PRS-3, he coffee make-FUT-3
If Peter wakes up early, he will make coffee

Unacceptable if the truth of the antecedent fact is known by speaker at evaluation time.

Restriction B: tense-aspect marking

- (4) a. If he submits his paper to a journal, we will not publish it

  b. If he submitted his paper to a journal, we will not publish it

- (5) a. jodi o paper-ta journal-e submit kor-ϕ-e, amra publish korbo na
  if he paper-CLF journal-GEN submit do-PRS-3, we publish do.FUT.3 NEG
  If he submits the paper to a journal, we will not publish it

  b. ?? jodi o paper-ta journal-e submit kor-l-o, amra publish korbo na
  ?? if he paper-CLF journal-GEN submit do-PST-3, we publish do.FUT.3 NEG
  Intended: If he submitted the paper to a journal, we will not publish it

- Other clauses that behave like (b): progressive, perfect, past (perfective and imperfective)

Progressive, perfect, and past-marked clauses are unacceptable in the antecedent.

Restriction C: interpretation of simple present antecedents

- (6) a. If she drinks coffee (tomorrow), she will be jumpy during the meeting [future reading]

  b. If she drinks coffee (in general), she will love this place [habitual-generic reading]

- (7) a. jodi mini (kal) coffee kha-ϕ-e, meeting.er somoy osthir hObe
  if mini (tomorrow) coffee eat-PRS-3, meeting.GEN time agitated be.FUT.3
  If Mini drinks coffee (tomorrow), she will be agitated during the meeting.

  b. ?? jodi mini coffee kha-ϕ-e, o medellin.er coffee tour pochhondo korbe
  ?? if mini coffee eat-PRS-3, she medellin.GEN coffee tour like do.FUT.3
  Intended: If Mini drinks coffee (in general), she will enjoy the coffee tour in Medellin.

- Simple present antecedent clauses admit future interpretation, but not habitual-generic interpretation

Generalization

- All the allowed antecedent clauses are future *dependent* at UT (truth at UT depends on future facts about the evaluation world); all the disallowed clauses are future-independent at UT
- Dependence on future times in the evaluation world: corresponds to a known modal property: **historical/ontic/metaphysical openness** (Condoravdi, 2002)
- Historical modality: models (*our perception of*) the possible ways that the world could be given what is objectively the case now. Intuitively: corresponds to an attitude of 'in-principle knowability' (Kaufmann, 2005)
- **Empirical question:** *jodi*(A)(B) is acceptable iff A is *open* in the historical modal base at the evaluation time; *open* := neither A nor ¬A is necessary

Generalization (contd.)

- **Empirical question:** *jodi*(A)(B) is acceptable iff A is *open* in the historical modal base at the evaluation time; *open* := neither A nor ¬A is necessary
  - Restriction on epistemic status derives from interaction with epistemic modality: historical possibilities are a subset of epistemic possibilities (Klecha, 2016) – constraint A
  - Restrictions on tense-aspect derive from known interactions of historical modality with time – constraints B and C
- Argue for a lexical, presuppositional account: *jodi* directly specifies this.

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Tense-aspect and future reference in conditional antecedent

- Assumptions:
  - Antecedent and consequent clause both have tense and aspect
  - Future reference in simple present antecedents is facilitated by a future-shifting operator F (prospective aspect; Matthewson (2012); Matthewson et al. (2022); Williamson (2021); Mendes (2025)), which occupies AspP
  - Bangla disallows aspect-stacking (AspP cannot host more than one operator)
- LF of a simple present antecedent with future reference:

  (8) $_{TP}$ PRES [$_{AspP}$ F [$_{vP}$ ...]

- Truth conditions for conditional: strict conditional: *if A, then B* is true iff in all relevant worlds, the material conditional A→B is true

Formal system: setup

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- Propositional

  language; atomic sentences (At) correspond to sentence radicals
- W: non-empty set of worlds, T: non-empty

  set of time intervals related by containment $\subseteq$ and precedence

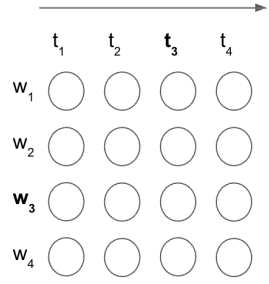
  $\leq$. I = W$\times$T: set of indices (Thomason, 1970; Kaufmann, 2005)
- Truth evaluated

  at indices (world-time pairs) and relativized to a context c,

  which provides a unique index $\langle w_c, t_c \rangle$. t_c = UT, the utterance time
- For any p of arbitrary complexity:

  (9) if p $\in$ At, p(w,t) = 1 iff V(p,$\langle$w,t$\rangle$) = 1

  (10) $[\![p(w,t)]\!]^c$ = 1 iff p(w_c, t_c) = 1



Formal system: historical modality and modeling future-dependence

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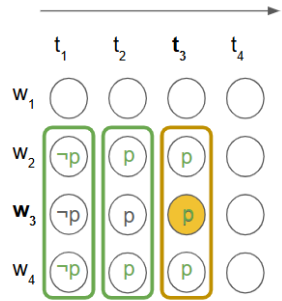
The historical accessibility relation $\approx$:

(11) a. Is modal ($\langle w,t\rangle R\langle w',t'\rangle$ implies that t = t')

b. Is an equivalence relation

c. **Backward-connectedness**
if $\langle w,t\rangle \approx \langle w',t\rangle$ and $t' \leq t$, then $\langle w,t\rangle \approx \langle w',t\rangle$
if two worlds are historical alternatives of each other at t, they are historical alternatives at all prior times

d. **Historicity**
if $\langle w,t\rangle \approx \langle w',t'\rangle$, then for all $p \in At$, $V(p,\langle w,t\rangle) = V(p,\langle w',t'\rangle)$
historical alternatives agree on the truth values of all atomic sentences



(c) and (d)
guarantee: all the worlds accessible from w at t are identical up until t

Formal system: historical modality and modeling future-dependence

- **Modal base:** a modal accessibility relation that is consistent across historical alternatives: if iRj and i$\approx$k, then kRj.
- Semantics for *jodi*:

(12) *jodi*(A)(B) (w,t) = undefined, if ($\Box_{\approx}$A $\vee$ $\Box_{\approx}\neg$A)(w,t) = 1. If defined,
jodi(A)(B) (w,t) = 1 iff $\Box_{R}$(A$\rightarrow$B) (w,t) = 1, where R is a modal base

Formal system: tense and aspect

Tenses

(13) PRES(p) (w,t) = 1 iff p(w,t) = 1

(14) PAST(p) (w,t) = 1 iff $\exists$t' s.t. t'$<$t and p(w,t') = 1

Aspect

(15) PERF(p) (w,t) = 1 iff $\exists$t' [t$\subseteq_{fin}$t' & p(w,t') = 1]; $\subseteq_{fin}$ gives a final subinterval of t'

(16) F(p) (w,t) = 1 iff $\exists$t': t $<$ t' & p(w,t') = 1

(17) PROG(p) (w,t) = 1 iff $\forall\langle$w',t$\rangle \in R_{mod}$(w,t), $\forall\langle$w',t'$\rangle \in R_{temp}$(w',t), p(w',t') = 1

(18) IMPF(p) (w,t) = 1 iff $\forall\langle$w',t$\rangle \in R_{mod}$(w,t), $\forall\langle$w',t'$\rangle \in R_{temp'}$(w',t), p(w',t') = 1

Formal system: tense and aspect

Tenses

(19) PRES(p) (w,t) = 1 iff p(w,t) = 1

(20) PAST(p) (w,t) = 1 iff $\exists$t' s.t. t'$<$t and p(w,t') = 1

Aspect

(21) PERF(p) (w,t) = 1 iff $\exists$t' [t$\subseteq_{fin}$t' & p(w,t') = 1]; $\subseteq_{fin}$ gives a final subinterval of t'

(22) F(p) (w,t) = 1 iff $\exists$t': t $<$ t' & p(w,t') = 1

(23) PROG(p) (w,t) = 1 iff $\forall\langle$w',t$\rangle \in R_{mod}$(w,t), $\forall\langle$w',t'$\rangle \in R_{temp}$(w',t), p(w',t') = 1

(24) IMPF(p) (w,t) = 1 iff $\forall\langle$w',t$\rangle \in R_{mod}$(w,t), $\forall\langle$w',t'$\rangle \in R_{temp'}$(w',t), p(w',t') = 1

Derivation: present perfect antecedent

jodi Mini has worked, she will leave soon.

(25) Antecedent LF: [$_{TP}$ PRES [$_{AspP}$ PERF [$_{vP}$ mw]]]

a. $[\![PRES(PERF(mw))]\!]^c = 1$

b. iff PRES(PERF(mw)) $(w_c,t_c) = 1$

c. iff $\exists t'$ [$t_c \subseteq_{fin} t'$ & $mw(w_c,t') = 1$]

d. Checking the modal status of the antecedent at $\langle w_c,t_c\rangle$. Suppose the antecedent is true in c:

e. $\Longrightarrow \exists t'$ [$t_c \subseteq_{fin} t'$ & $mw(w_c,t') = 1$]

f. since t_c is a *final* subinterval of t', there is no part of t' that extends beyond t_c. Therefore, $t' \leq t_c$.

g. Consider an arbitrary w' s.t. $\langle w_c,t_c\rangle \approx \langle w',t_c\rangle$

h. by **backward-connectedness**: $\langle w_c,t_c\rangle \approx \langle w',t_c\rangle$ and $t' \leq t_c \Longrightarrow \langle w_c,t'\rangle \approx \langle w',t'\rangle$

i. by **historicity**: $\langle w_c,t'\rangle \approx \langle w',t'\rangle$ and $mw(w_c,t') \Longrightarrow mw(w',t')$

j. Since we know that $t_c \subseteq_{fin} t'$, $\Longrightarrow \exists t'$ [$t_c \subseteq_{fin} t'$ & $mw(w',t') = 1$]

k. $\Longrightarrow$ PRES(PERF(mw)) $(w',t_c) = 1$

Sample derivation: present perfect antecedent (contd.)

(26)
a. Since $\langle w', t_c \rangle$ was arbitrary,
b. $\Longrightarrow \forall \langle w', t' \rangle$ s.t. $\langle w_c, t_c \rangle \approx \langle w', t' \rangle$, PRES(PERF(mw)) (w',t') = 1
c. $\Longrightarrow \Box_{\approx}$ PRES(PERF(mw)) (w_c, t_c) (1)
d. Similarly, if the antecedent is false in c, then $\forall \langle w', t' \rangle$ s.t. $\langle w_c, t_c \rangle \approx \langle w', t' \rangle$, PRES(PERF(mw)) (w',t') = 0
e. $\Longrightarrow \Box_{\approx} \neg$ PRES(PERF(mw)) (w_c, t_c) (2)
f. from (1) and (2), $(\Box_{\approx} A \vee \Box_{\approx} \neg A)(w_c, t_c) = 1$
g. $\Longrightarrow$ *jodi*(A)(B) = undefined; clause is unacceptable in the antecedent

Sample derivation: simple present antecedent with future reference

jodi Mini works (tomorrow), she will be in the office.

(27) Antecedent LF: [$_{TP}$ PRES [$_{AspP}$ F [$_{vP}$ mw]]]

a. $[\![PRES(F(mw))]\!]^c = 1$

b. iff $\exists$t' [$t_c < t'$ & $mw(w_c,t') = 1$]

c. Checking the modal status of the antecedent at $\langle w_c,t_c\rangle$. Suppose the antecedent is true in c:

d. $\Longrightarrow \exists$t' [$t_c < t'$ & $mw(w_c,t') = 1$].

e. Consider an arbitrary w' s.t. $\langle w_c,t_c\rangle \approx \langle w',t_c\rangle$

f. since $t_c < t'$, there is a counter-model where $mw(w',t') = 0$

g. $\neg\, \forall\langle w',t'\rangle$ s.t. $\langle w_c,t_c\rangle \approx \langle w',t'\rangle$, PRES(F(mw)) $(w',t') = 1$ (1)

h. Similarly, if PRES(PERF(mw))$(w_c,t_c) = 0$, then $\neg\, \forall\langle w',t'\rangle$ s.t. $\langle w_c,t_c\rangle \approx \langle w',t'\rangle$, PRES(PERF(mw)) $(w',t') = 0$ (2)

i. from (1) and (2), it does not follow that $(\Box_{\approx}A \vee \Box_{\approx}\neg A)(w_c,t_c) = 1$

j. therefore, *jodi*(A)(B) $\neq$ undefined; A is acceptable in the antecedent

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‘Two types’ of conditional reasoning, and diversity

- Q: What might lead to a ban against historically settled antecedents?
- If we assume (i) conditional connectives simply signal a restriction and make no semantic contribution; (ii) a general pragmatic principle of diversity (ban against vacuous restriction), we might say: the embedded modal under *jodi* is always ontic
- Since epistemic possibilities are a superset of historical possibilities, openness in the former does not guarantee openness in the latter. This would force historical openness
- **Alternative hypothesis:** *jodi* is specialized for ‘ontic’ reasoning, and the restrictions simply follow from diversity. (This doesn’t say anything about the role of the antecedent)

Epistemic reasoning with *jodi*

- Q: Is *jodi* just unable to restrict epistemic modals?
- A: Unlikely:
  - Formally: the consequent can be in the past of UT: *jodi he wins, he trained hard*. If the consequent modal base was historical, this would have trivial truth conditions. But, acceptable with *jodi*.
  - Interpretationally: the consequent above means: 'I will conclude/believe that he trained hard'
  - Linguistically: these consequents most naturally include *taar maane* 'that means'; or *nishchoi* 'surely'
- Conclusion: not a restriction against reasoning over epistemic possibilities, but on what kinds of facts can be used: the speaker must hold an attitude of un-knowability towards these facts. Stronger form of uncertainty than attitude of not knowing, which is presupposed by *if*.
- Formally: restriction specifically on status of the antecedent clause in the historical modal base, regardless of the modal in the consequent. Cannot be derived from pragmatic diversity condition.
- **Formal question** *jodi*(A)(B) presupposes that A is open in the historical modal base evaluation time.

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Back to iffiness, restrictors, and operators

- Systematic restrictions on the *antecedent*, regardless of consequent modality – unexpected if conditional device only marks the antecedent as being a restrictor.
- This account: restrictions are part of lexical meaning of conditional devices
- What is this meaning component? : presuppositional, uncertainty towards antecedent proposition – evidence for *iffiness* (Von Fintel and Iatridou, 2002)

Back to iffiness, restrictors, and operators

- Iffiness(es) across conditional devices: there are different 'flavors' of uncertainty (invoking different, specific, domains): (Kaufmann et al., 2024) on German *falls*, Arita (2009) on Japanese *-eba, -tara, -nara, -n(o)nara*, similar antecedent restrictions with English *in the event*.
- Translating conditional devices as conditional operators with invariant meaning-contribution: differences can be parameterized in presuppositional component, uniform assertive meaning across conditional expressions. Under restrictor-only approach: less clear.
- Future work: interaction with stativity; constraints on counterfactual uses of *jodi*.

Thank you!

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Restrictions: further embedded clauses

- 'Disallowed' markers and interpretations are acceptable in a further embedded clause, as long as the clause directly under *jodi* complies with the restrictions
- (28) jodi ami shun-ϕ-i je [mini phOl kha-ϕ-e /kha-ch-ϕ-e /kh-ech-ϕ-e], tahole ami
  if I hear-PRS-1 that [mini fruit eat-PRS-3 /eat-PROG-PRS-3 /eat-PRF-PRS-3], then I
  khuSi hObo
  happy be.FUT.1
  If I hear that [Mini eats (in general)/ is eating/ has eaten fruit], then I will be happy

Open questions and future directions

- F under PAST

(29) jodi kaaj-ta mini-i korlo, tumi acho ki korte?
if work-CLF mini- do–PST-3, you COP-3 what do.INF?
If it is Mini who does the work, what are you here for?

- Future-shifted habitual-generics

(30) (We are discussing Mary's plans for next year)

In the event that Mary plays golf, she will own a golf kit.

The $<$ and $\leq$ relations

- $t \leq t'$ iff no part of t extends beyond t'
- $t < t'$ iff $t \leq t'$ *and* t and t' have no part in common
- **Backward-connectedness:** if $\langle w,t\rangle \approx \langle w',t\rangle$ and $t' \leq t$, then $\langle w,t'\rangle \approx \langle w',t'\rangle$
- $F(p)\ (w,t) = 1$ iff $\exists t'$: $t < t'$ & $p(w,t') = 1$

  F invokes an interval that is strictly after t, so that F(p) cannot be true at t by virtue of p being true at t (it must depend on future times).

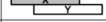
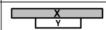
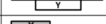
Allen Statements: Relations	Allen Statements: Inverse Relations	Pictoral Example	Chronological Sequence	x ≤ y	x < y	y ≤ x	y < x
X *before* Y	Y *after* X		$X_{start} < X_{end} < Y_{start} < Y_{end}$	✓	✓		
X *equals* Y	Y *equals* X		$X_{start} = Y_{start} < X_{end} = Y_{end}$	✓		✓	
X *meets* Y	Y *met by* X		$X_{start} < X_{end} = Y_{start} < Y_{end}$	✓			
X *overlaps* Y	Y *overlapped by* X		$X_{start} < Y_{start} < X_{end} < Y_{end}$	✓			
X *contains* Y	Y *during* X		$X_{start} < Y_{start} < Y_{end} < X_{end}$			✓	
X *starts* Y	Y *started by* X		$X_{start} = Y_{start} < X_{end} < Y_{end}$	✓			
X *finishes* Y	Y *finished by* X		$Y_{start} < X_{start} < X_{end} = Y_{end}$	✓		✓	

Figure: $\leq$ and $<$ in terms of Allen relations

Arguments for aspectual source of future-reference (F)

- Williamson (2021): A wider set of constructions show the same *pattern* of future-reference: future-shift in dependent clause, NO independent shift in the main clause, temporal donkey anaphora
- Mendes (2024): happens in non-modal constructions too; always co-occurs with subjunctive mood marking in languages with richer mood morphology
- Bangla facts: separation between scheduled, futurate uses and plain future reference of simple present
- Matthewson (2012): Gitksan has an overt marker that appears in exactly this set of constructions and is obligatory for future reference

Falls, wenn, if (Kaufmann et al., 2024)

Why epistemic openness is not a 'default' for conditional connectives:

(8) a. {??Falls/Wenn} Peter aufwacht, trinkt er immer einen Kaffee.
falls/wenn Peter wakes up drinks he always a coffee

b. {??Falls/Wenn} Peter zeitig aufwacht, trinkt er immer einen Kaffee.
falls/wenn Peter early wakes up drinks he always a coffee

(9) a. '{??If/When} Peter wakes up, he always drinks a coffee.'
b. '{✓If/When} Peter wakes up early, he always drinks a coffee.'

Even on its conditional uses, *wenn* does not have the same requirement. Moreover, *falls*, which is another conditional connective, is not acceptable even with epistemic openness. This shows: epistemic openness is only ONE kind of *iffiness*.