Wide Scope Simplification

Free Choice Effects from Disjunctions of Conditionals

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Do Children Interpret 'or' Conjunctively?

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Abstract and Figures

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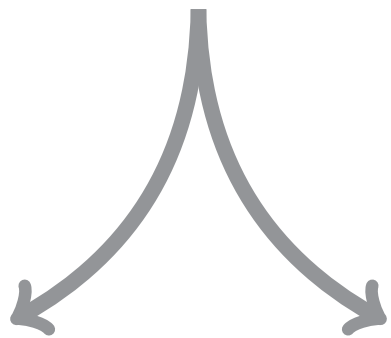
(1) If Jia takes the tofu she will enjoy her meal,
or if she takes the dumplings she will enjoy her meal.
… Everything in this restaurant is delicious.
… I can't remember which dish is good here.

If A, C or if B, C



CONJUNCTIVE INFERENCE

If A, C and if B, C

EXCLUSIVE INFERENCE

If A, C or if B, C and not both

(2) PRESENT (GENERIC)

If Jia takes the tofu she enjoys her meal,
or if she takes the dumplings she enjoys her meal.

(3) PRESENT + WILL (EPISODIC)

If Jia takes the tofu she will enjoy her meal,
or if she takes the dumplings she will enjoy her meal.

(4) PAST SIMPLE

If Jia took the tofu she would enjoy her meal,
or if she took the dumplings she would enjoy her meal.

(5) PAST PERFECT

If Jia has taken the tofu she would have enjoyed her meal,
or if she had taken the dumplings she would have enjoyed her meal.

(6) CONDITIONAL CONJUNCTION

Take the tofu and you'll enjoy your meal,
or take the dumplings and you'll enjoy your meal.

(7) When a person sins in hearing the spoken oath … he bears guilt.
Or when a person touches any ceremonially unclean thing, …
then he has become unclean and guilty.
Or when he touches human uncleanness, … then he shall be guilty.

(*Leviticus* 5:1–3, Modern English Version)

献赎愆祭的几种事例

5 “如果有人犯罪：他听见发誓的声音（“发誓的声音”或译：“传召作证的声音”，或“发咒语的声音”）；他本是证人，却不肯把看见或知道的说出来，他就要担当自己的罪责。 **2** 或人摸了甚么不洁净的东西，无论是不洁净野兽的尸体，或是不洁净牲畜的尸体，或是不洁净昆虫的尸体，当时并不留意，他因为成了不洁净，就有罪了； **3** 或有人摸了人的污秽，他没有留意沾染了甚么污秽；他一知道，就有罪了。 **4** 或有人嘴唇轻率发誓，无论是出于恶意或是出于好意，他没有留意起了甚么誓；他一知道，就有罪了。 **5** 如果他在任何一件事上犯了罪，就要承认自己所犯的罪； **6** 他要为所犯的罪，把赎愆祭带到耶和华面前当作赎罪祭，就是羊群中的母羊，或绵羊羔或山羊；祭司就为他的罪行赎罪。

Figure: Levitcus 5, Chinese New Version (Simplified)

A disjunction word links the clauses of Leviticus 5 in, among others,

- Chinese (*huò*)
- Hebrew (*o*)
- Hungarian (*vagy*)
- Icelandic (*eða*)
- Māori (*rānei*)
- Urdu (*yâ*)
- Somali (*ama*)
- Welsh (*neu*)
- Yoruba (*tàbí*)

Wide-scope simplification is a cross linguistically robust phenomenon.

Simplification of disjunctive antecedents

If A or B, C $\Rightarrow$ If A, C and if B, C

Arguing for its validity: Nute (1975), Ellis, Jackson, and Pargetter (1977), Warmbrōd (1981), Fine (2012), Starr (2014), and Willer (2018). Arguing for its invalidity: Nute (1980), Bennett (2003), van Rooij (2006), Santorio (2018), and Lassiter (2018).

Double-*if* simplification

If A or if B, C $\Rightarrow$ If A, C and if B, C

Khoo (2021) and Klinedinst (2024).

Wide-scope simplification

If A, C or if B, C $\Rightarrow$ If A, C and if B, C

A puzzling contrast

(8) If Alice had come to the party, Charlie would have come.
Or if Bob had come, Charlie would have come.

Default reading: *conjunctive*

(9) If Alice had come to the party, Charlie would have come.
Or if Alice had come, Darius would have come.

Default reading: *exclusive or*

Conjunctive readings of *If A, B or if C, D*

The consequents need not be identical for a conjunctive reading to arise:

(10) If you take the morning train, you'll arrive at 12:00,
or if you take the afternoon train, you'll arrive at 18:00.
⇝ *prominent conjunctive reading*

Context: Alice's best friend is Bob. Charlie's best friend is Deepta.
The hearer has a crush on Bob and Deepta.

(11) If you invite Alice, Bob will come,
or if you invite Charlie, Deepta will come.
⇝ *prominent conjunctive reading*

Conjunctive readings of *If A, B or if A, C*

(12) If Alice goes to the party, you can go with her,
or if she goes you can stay home.

$\rightsquigarrow$ *prominent conjunctive reading*

Plan

Plan

Wide scope free choice (Zimmermann 2000)

(8) If Alice had come to the party, Charlie would have come.
Or if Alice had come, Darius would have come.

$$\textit{If } A, C \vee \textit{if } B, C \quad \rightsquigarrow \quad \textit{If } A, C \wedge \textit{if } B, C$$

(13) Detectives may go by bus or they may go by boat.
$\rightsquigarrow$ Detectives may go by bus and may go by boat.

(14) Mr. X might be in Victoria or he might be in Brixton.
$\rightsquigarrow$ Mr. X might be in Victoria and might be in Brixton.

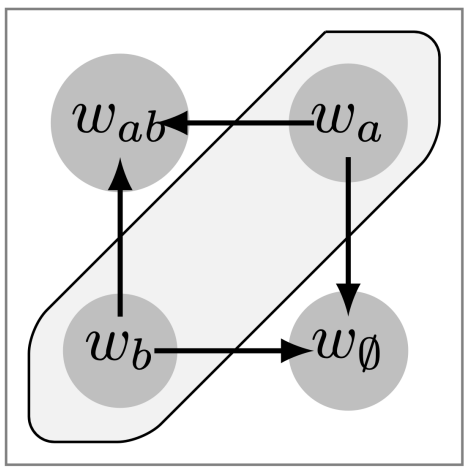
$$\Diamond A \vee \Diamond B \quad \rightsquigarrow \quad \Diamond A \wedge \Diamond B$$

Wide scope free choice from indisputability

Aloni (2023) predicts wide scope free choice from indisputability.

Definition (Indisputability)

R is *indisputable* in (M, s) iff for all $w, v \in s : R[w] = R[v]$.



Assuming s represents the information state of the relevant speaker, an indisputable R means that the speaker is fully informed about R, so, for example, if R represents a deontic accessibility relation, indisputability means that the speaker is fully informed about (or has full authority on) what propositions are obligatory or allowed.

(Aloni 2023)

(15) Detectives may go by bus or they may go by boat.
But I don't know which.

(16) I know exactly under what conditions Charlie will go to the party. If Alice goes, Charlie will go, or if Bob goes, Charlie will go.

Indisputability predicts: conjunctive reading ✓

(17) I know exactly who will go to the party if Alice goes. If Alice goes, Bob will go, or if Alice goes, Charlie will go.

Indisputability predicts: conjunctive reading! ✗

Problem

Not clear how BSML currently has the resources to derive this contrast.

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Free choice from missing conjunctive alternative

Kratzer and Shimoyama (2002) and Fox (2007). See also Bar-Lev and Margulis (2014), Bowler (2014), Meyer (2015), and Singh et al. (2016).

Conjunctive alternative available $\Rightarrow$ exclusive inference
Conjunctive alternative unavailable $\Rightarrow$ conjunctive inference

Assumption: $A \vee B$ has as alternatives $A \wedge \neg B$ and $B \wedge \neg A$.

EXCLUSIVE INFERENCE

- $A \wedge B$ is an alternative. $\rightsquigarrow \neg(A \wedge B)$

CONJUNCTIVE INFERENCE

- $A \wedge B$ is not an alternative.
- $\neg(A \wedge \neg B) \quad \wedge \quad \neg(B \wedge \neg A)$
- $A \rightarrow B \quad \wedge \quad B \rightarrow A$
- $(A \vee B) \wedge (A \leftrightarrow B)$ $\rightsquigarrow A \wedge B$

Task

Account for when, and why, the conjunctive alternative to
If A, C or if B, C is available.

Plan

If A, C **or** *if B, D* versus *If A, C* ***and*** *if B, D*

(18) If Alice comes to the restaurant we will need to reserve a table for 10 people. And if Bob comes we will need to reserve for ??.

Possible answers: 10 (less natural), 11 (more natural).

(19) If Alice comes to the restaurant we will need to reserve a table for 10 people. Or if Bob comes we will need to reserve for ??.

Possible answers: 10.

If A, C **or** *if B, D* versus *If A, C* ***and*** *if B, D*

(20) If Alice comes to the restaurant we will need to reserve a table for 10 people…

a. And if Bob comes we will need to reserve for 11.
(*preferred*)

b. And if Bob comes we will also need to reserve for 10.
(*dispreferred*)

c. #Or if Bob comes we will need to reserve for 11.

d. Or if Bob comes we will also need to reserve for 10.

Further *and/or* contrasts (Meyer 2015)

(21) John must be rich and he wouldn't drive a Porsche.

(22) John must be rich or he wouldn't drive a Porsche.

Further *and/or* contrasts (Meyer 2015)

(21) John must be rich and he wouldn't drive a Porsche.

(22) John must be rich or [if he weren't rich] he wouldn't drive a Porsche.

Further *and/or* contrasts (Meyer 2015)

(21) John must be rich and he wouldn't drive a Porsche.

(22) John must be rich **and** [if he weren't rich] he wouldn't drive a Porsche.

Meyer (2015):

- *Else* negates previous proposition it is anaphoric to.
- *And else*, conjunctive alternative to *or else*, is not available.

(23) #John must be rich and else he wouldn't drive a Porsche.

No conjunctive alternative $\Rightarrow$ Conjunctive reading.

Plan

Or else: same consequents

(24) If Alice comes to the party Charlie will come.
Or else if Bob comes, Charlie will come.

Conjunctive inference and no conjunctive alternative:

(25) #If Alice comes to the party Charlie will come. And else if Bob comes, Charlie will come.

Contribution of *else*:

(26) If Alice comes to the party Bob will come.
Or if Bob comes [and Alice does not], Charlie will come.

Now a conjunctive interpretation gives the right meaning:

(27) If Alice comes to the party Bob will come.
And if Bob comes [and Alice does not], Charlie will come.

Or else: same antecedents

(28) If Alice comes to the party Bob will come.
Or else if Alice comes, Charlie will come.

No conjunctive inference but also no conjunctive alternative:

(29) #If Alice comes to the party Bob will come.
And else if Alice comes, Charlie will come.

Idea. *else* is instead anaphoric to *Bob will come*:

(30) If Alice comes to the party Bob will come.
Or else if Alice comes [and Bob does not], Charlie will come.

Now a conjunctive interpretation gives the right meaning:

(31) If Alice comes to the party Bob will come.
And if Alice comes [and Bob does not], Charlie will come.

Or else: same antecedent

(32) If Alice goes to the party, you can go with her,
or else if she goes you can stay home.

(33) #If Alice goes to the party, you can go with her,
and else if she goes you can stay home.

Else anaphoric to *you go with her*:

(34) If Alice goes to the party, you can go with her,
and if she goes [and you do not], you can stay home.

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If A, C or if $B_{\neg A}$*, C*.

Fix Local Contexts across Alternatives

Keep local contexts constant when considering alternatives.

If A, C and if $B_{\neg A}$*, D* is not an available alternative.

Alternatives must be sentences that one could in principle utter.

But one cannot utter *If A, C and if* $B_{\neg A}$*, D*, given how we calculate local contexts.

If *A*, *C* or if *A*, *D*

If A, C or if $A_{\neg A}$*, D*.

Calculating the local context $A_{\neg A}$ leads to a contradictory antecedent.

Solution: Do not calculate the local context $\neg A$.

Resulting interpretation: *If A, C or if A, D*

Now *If A, C and if A, D* is an available alternative.

Plan

Zimmerman's problem

$$\Box A \vee \Box B$$

(35) "If you were born on or after September 2, 1971 and you are [...] age 9 through 16, you must successfully complete hunter education, OR you must be accompanied."

https://tpwd.texas.gov/education/hunter-education/faq

(36) "To be eligible for Medicaid, you must be a U.S. citizen. Or, you must be within one of the qualified categories of non-citizens."

https://www.illinoislegalaid.org/legal-information/am-i-eligible-medicaid

(37) "I thought, well, she must be lazy. Or she must be pretty stupid to let something like this happen to her."

From the TV Show *The Golden Girls*,

https://tvquot.es/the-golden-girls/quote/79md189/

Zimmerman's problem

A puzzle: $(\Box A \vee \Box B) \wedge \neg\Box A \wedge \neg\Box B$ is intuitively consistent.

(38) You must complete the course or you must be accompanied. But it's not true that you must complete the course, and it's also not true that you must be accompanied.

Local contexts to the rescue

A common idea:

When we interpret disjunctions, we evaluate the second disjunct assuming the negation of the first.

(Karttunen 1974, Heim 1983, Chierchia 1995, Beaver 2001 and many more)

Partee's bathroom sentences:

(39) Either this house doesn't have a bathroom or it's in a funny place.

Local contexts to the rescue

Edit: $\Box B$ can be evaluated with respect to $\neg A$ in $\Box A \vee \Box B$.

Support: "*or else* sentences exhibit considerable flexibility with respect to which part of the first disjunct enters the interpretation of the second disjunct" (Meyer 2015, pp. 7–8)

(40) a. Pronouns$_1$ must t_1 be generated with an index or (else) they will be uninterpretable. (Heim and Kratzer 1998)
b. If pronouns are not generated with an index, they will be uninterpretable.

(41) a. We$_1$ are not allowed t_1 to go or (else) we risk an incident.
b. If we go, we risk an incident.

(42) a. I'm afraid John$_1$ could t_1 have missed the bus or (else) he would be here by now.
b. If John hadn't missed the bus he would be here by now.

Adapted from Meyer (2015, examples 19–21)

A solution to Zimmerman's problem

Proposal

Must A or must B is interpreted as $\Box A \vee \Box_{\neg A} B$ in (35)–(37).

(35) "If you were born on or after September 2, 1971 and you are [...] age 9 through 16, you must successfully complete hunter education, OR you must be accompanied."

(36) "To be eligible for Medicaid, you must be a U.S. citizen. Or, you must be within one of the qualified categories of non-citizens."

(37) "I thought, well, she must be lazy. Or she must be pretty stupid to let something like this happen to her."

A solution to Zimmerman's problem

$$
\begin{aligned}
& \Box A \vee \Box_{\neg A} B \\
\equiv \quad & \Box A \vee \Box(\neg A \to B) \\
\equiv \quad & \Box A \vee \Box(A \vee B) \\
\equiv \quad & \Box(A \vee B)
\end{aligned}
$$

The solution does not inadvertently extend to entities

(43) Zhuoye must clean his room or he must cook dinner.
$\rightsquigarrow \quad \Box A \vee \Box_{\neg A} B \qquad \equiv \Box(A \vee B)$

(44) Everyone is in kitchen or everyone is in the garden.
$\not\rightsquigarrow \quad \forall x Ax \vee \forall x_{\neg Ax} Bx \qquad \equiv \forall x(Ax \vee Bx)$

Why the contrast?

A local context is a piece of information (a set of worlds),
not a set of entities.

A set of entities is not the kind of thing that can serve as a local context.

The solution is compatible with free choice inferences

$$\Box A \vee \Box_{\neg A} B \quad \equiv \quad \Box(A \vee B)$$

Note that this solution does not appeal to implicatures at all.

Though it makes fine predictions if we do add free choice inferences:

- What if from $\Box A \vee \Box B$ we infer $\Box A \leftrightarrow \Box B$? (Fox 2007, Goldstein 2019)
- Do we infer $\Box A \wedge \Box B$? No.
  $\Box(A \vee B) \wedge \Box A \leftrightarrow \Box B$ does not imply $\Box A \wedge \Box B$.
  - Crucially, this requires assuming $\Box B$ (rather than $\Box_{\neg A} B$) as an alternative to $\Box A \vee \Box_{\neg A} B$.
  - Plausible: the speaker could have said $\Box B$, without mentioning $\Box A$, but then there would be no previous A to supply a contextual restriction to $\neg A$.
- Welcome result: avoid predicting that $\Box A \vee \Box B$ implies $\Box A \wedge \Box B$, using independently motivated and well-studied principles.

Local contexts for conjunction

The solution is compatible with the local context for conjunction being the first conjunct.

(45) You must visit Beijing and then you have to visit again.

Prediction: $\Box A \wedge \Box_A B$ is true iff $\Box A \wedge \Box B$ is true.

$$\begin{aligned} & \Box A \wedge \Box_A B \\ \equiv \quad & \Box A \wedge \Box(A \rightarrow B) \\ \equiv \quad & \Box A \wedge \Box B \end{aligned}$$

A difficulty given Schlenker's Transparency Theory

> *we take the local context of an expression E in a sentence S to be the smallest set-theoretic object (of the right semantic type) that one may restrict attention to when assessing E without jeopardizing the truth conditions of S relative to the global context.*
>
> (Schlenker 2008)

Difficulty

$\Box A \vee \Box_{\neg A} B$ has the same truth conditions as $\Box(A \vee B)$, not $\Box A \vee \Box B$.

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Summary

1. Aloni's approach to free choice via has many advantages
   - No need for complex alternatives
   - No need for implicatures, which are acquired later (Tieu et al. 2016) and more costly (Chemla and Bott 2014) than free choice inferences
2. However, it currently cannot simultaneously predict
   - the conjunctive interpretation of *If A, C or if B, C*
   - the exclusive interpretation of *If A, C or if A, D*
3. Other approaches can, by tying the conjunctive interpretation to the availability of the conjunctive alternative
4. Local contexts offer a simple solution to Zimmerman's problem

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Plan

Bilateral State-Based Modal Logic (BSML; Aloni 2023)

Models

Let $M = (W, R, V)$ be a *model*, where

- W is a set of worlds
- $R \subseteq W \times W$ is a binary relation over W
- $V : W \times \mathit{Prop} \to \{0, 1\}$ is a valuation

and let a set of worlds s be a *state*.

Semantic clauses

$$
\begin{array}{lll}
M, s \models p & \text{iff} & \forall w \in s,\ V(w, p) = 1 \\
M, s \models A \wedge B & \text{iff} & M, s \models A \text{ and } M, s \models B \\
M, s \models A \vee B & \text{iff} & \exists t, t',\ s = t \cup t',\ M, t \models A \text{ and } M, t' \models B \\
M, s \models \Diamond A & \text{iff} & \forall w \in s : M, R[w] \models A \\
M, s \models \textsc{ne} & \text{iff} & s \neq \emptyset
\end{array}
$$

Ingredient 1: Non-empty states

(13) Detectives may go by bus or they may go by boat.

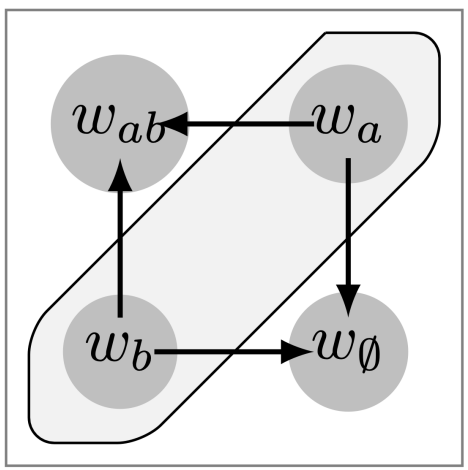
(14) Mr. X might be in Victoria or he might be in Brixton.

$$(\Diamond A \wedge \text{NE}) \vee (\Diamond B \wedge \text{NE})$$

Ingredient 2: Indisputability

Definition (Indisputability)

R is indisputable in (M, s) iff for all $w, v \in s : R[w] = R[v]$.



Assuming s represents the information state of the relevant speaker, an indisputable R means that the speaker is fully informed about R, so, for example, if R represents a deontic accessibility relation, indisputability means that the speaker is fully informed about (or has full authority on) what propositions are obligatory or allowed.

(Aloni 2023)

Deriving wide scope free choice (Aloni 2023)

$M, s \models (\Diamond A \wedge \text{NE}) \vee (\Diamond B \wedge \text{NE})$
iff for some nonempty states t, t' with $s = t \cup t'$:

$$t \models \Diamond A \quad \text{and} \quad t' \models \Diamond B$$
$$\forall w \in t : R[w] \models A \quad \text{and} \quad \forall w' \in t' : R[w'] \models B$$

Fact

If R is indisputable, $(\Diamond A \wedge \text{NE}) \vee (\Diamond B \wedge \text{NE}) \models_{BMSL} \Diamond A \wedge \Diamond B$.

Proof.

- By non-emptyness, there are $w \in t$ and $w' \in t'$.
- Since $t \models \Diamond A$, $R[w] \models A$ and since $t' \models \Diamond B$, $R[w'] \models B$.
- Pick any $v \in s$. By indisputability, $R[v] = R[w] = R[w']$.
- So $R[v] \models A$ and $R[v] \models B$. Hence $M, s \models \Diamond A \wedge \Diamond B$.

□

(46) I know exactly under what conditions Charlie will go to the party. If Alice goes, Charlie will go, or if Bob goes, Charlie will go.

Indisputability predicts: conjunctive reading ✓

(47) I know exactly who will go to the party if Alice goes. If Alice goes, Bob will go, or if Alice goes, Charlie will go.

Indisputability predicts: conjunctive reading! ✗

Problem

Not clear how BSML currently has the resources to derive this contrast.

Local contexts and anaphora

Partee's bathroom sentences:

(48) Either this house doesn't have a bathroom
or it's in a funny place.

(49) Either this house doesn't have a bathroom
or [it does have a bathroom and] it's in a funny place.

The same point applies to disjoined conditionals:

(50) If this house doesn't have a bathroom, we should leave,
or if it's in a funny place, we should ask the host where it is.

(51) If this house doesn't have a bathroom, we should leave,
or if [it does have a bathroom and] it's in a funny place, we
should ask the host where it is.

Local contexts and anaphora

Partee's bathroom sentences:

(52) If this house has a bathroom, it's in a funny place.

(53) If this house has a bathroom, we will stay,
and if it's in a funny place, we should ask the host where it is.

(54) If this house doesn't have a bathroom, we should leave,
or if [it does have a bathroom and] it's in a funny place, we should ask the host where it is.

Possible confounds: modal subordination (Roberts 1987), double restriction.

Making the contribution of local contexts redundant

(55) If you invite Alice, Bob will come,
or if you don't invite her, he will come.

Incompatible antecedents $\Rightarrow$ redundant local context:

(56) If you invite Alice, Bob will come, or if [you don't invite her and] you don't invite her, he will come.

If we do not calculate redundant local contexts...

(57) If you invite Alice, Bob will come, or if you don't invite her, he will come.

... the conjunctive alternative becomes available.

(58) If you invite Alice, Bob will come, and if you don't invite her, he will come.

Kratzer (1981)

- *If A* denotes the *A*-worlds
- The modal (such as *will*) selects the relevant *A*-worlds and quantifies over them

Schlenker (2004)

- *If A* denotes the selected *A*-worlds
- The modal quantifies over them

See Klinedinst (2024) for differences between these approaches.

(59) If$_i$ Alice comes to the restaurant we will$_i$ need to reserve a table for 10 people...

a. And if$_i$ (in addition) Bob comes we will$_i$ need to reserve for 11. (*preferred*)

b. And if$_j$ Bob comes we will$_j$ also need to reserve for 10. (*dispreferred*)

c. #Or if$_i$ (in addition) Bob comes we will$_i$ need to reserve for 11.

d. Or if$_j$ Bob comes we will$_j$ also need to reserve for 10.