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Coordinating If s

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Coordinating *If*s

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Abstract

Accounting for the behavior of conjoined and disjoined *if*-clauses is not easy for standard theories of conditionals that treat *if* as either an operator or restrictor. In this paper, I discuss four observations about coordinated *if*-clauses, and motivate a semantics for conditionals that reorients the compositional structure of the restrictor theory. On my proposal, *if*-clauses provide restrictions on modal domains, but they do so by way of a higher type intermediary—a set of propositions—that is collapsed by the modal. I argue that combining this view with an independently plausible type-shifting operation applied to *or* and *and* predicts the range of data we find for conditionals with coordinated *if*-clauses.

An overlooked fact about conditional clauses is that they can be coordinated by sentential connectives like *and* and *or*:

- (1) If John draws a gold coin or if John draws a silver coin, he will win.
- (2) If John draws a gold coin and if John draws a silver coin, he will win.

Coordinated *if*-clauses like these raise problems for standard compositional implementations of operator and restrictor theories of conditionals. I argue instead for a view on which *if*-clauses provide an element (a set of propositions) that is used to restrict modal domains.

In §1, I sketch a pattern of data involving coordinated *ifs* that raises a challenge to standard theories of conditionals. In §2, I show how my compositional reformulation of the restrictor theory predicts the behavior of such conditionals with coordinated *if*-clauses. In §3, I contrast my view with the dynamic theory of Starr 2014 and the plural description theory of Santorio 2018. The latter each make some correct predictions about the meanings of coordinated *if*-clauses; however, I argue that these theories fail to accommodate the full range of data about such conditionals.

1 Data

Let us call a clause formed by a disjunction of two *if*-clauses an *if or if*-clause, and the corresponding conditional sentences, such as (1), *if or if*-conditionals:¹

- (1) If John draws a gold coin or if John draws a silver coin, he will win.

Let us call a clause formed by a conjunction of two *if*-clauses an *if and if*-clause, and the corresponding conditional sentences, such as (2), *if and if*-conditionals:

- (2) If John draws a gold coin and if John draws a silver coin, he will win.

Finally, say that *if A, C* and *if B, C* are the **simplifications** of the complex conditional *if A or/and if B, then C*. So, (3-a)/(3-b) are the simplifications of (1) and (2):

- (3) a. If John draws a gold coin, he will win.
b. If John draws a silver coin, he will win.

Our first observation is that *if or if*-conditionals (on their primary reading) seem to be equivalent to the conjunction of their simplifications. It is very natural to think that (1) is equivalent to the conjunction of (3-a) and (3-b). Consider the following scenario:

Coins. There are 100 coins in an urn: 90 gold, 5 silver, and 5 bronze. The gold coins are all winners, but the silver and bronze coins are losers. John is about to draw a coin at random from the urn.

In this scenario, (1) seems false, in particular because (3-b) is false. If instead the silver coins were all winners, then (1) would be true, since both (3-a) and (3-b) would then be true. These intuitions are evidence that (1) is equivalent to the conjunction of (3-a) and (3-b). So, our first observation is:²

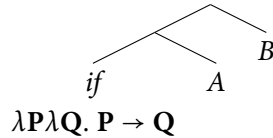
¹A note about my typographical choices. I'll use *italics* for English expressions (including uppercase letters for sentence variables) as well as their logical forms, and **boldfaced** font for denotations (including uppercase boldface letters for proposition variables).

²We also find disjoined *if*-clauses in the wild. Here are several cases where the context makes clear the conditional entails both simplifications:

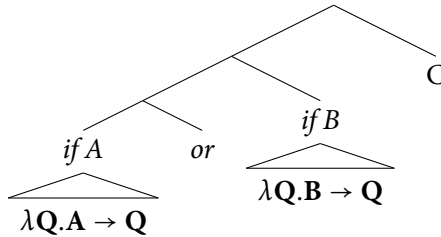
- (i) That will happen if Trump loses graciously or if he has to be escorted out of the Oval Office by Secret Service. <https://www.cnn.com/2020/11/06/politics/donald-trump-concede-election/index.html>
- (ii) Your chances of getting bit by a flea are greater if you have pets or if you sleep with your pets in

- **Observation 1:** *if* or *if*-conditionals (on their primary reading) are equivalent to the conjunction of their simplifications.

This observation immediately raises a problem for standard theories of conditionals. On operator theories, *if* denotes a function that maps two propositions to a truth value (cf. Stalnaker 1968, Lewis 1973, Jackson 1979, Warmbrod 1983, Gillies 2009, Moss 2015):



Given this denotation for *if*, to handle coordinated *if*-clauses, we would need to allow connectives like *and* and *or* to type shift to coordinate partially saturated functions from propositions to truth values, as in:



This by itself is not radical—nothing prevents *or* from type-shifting to coordinate objects of type $\langle st, t \rangle$ (the type of the function $\lambda Q. A \rightarrow Q$).³ The problem is that the type-shifted meaning of *or* would have to be conjunctive to compositionally generate the correct truth conditions (see Appendix for details):

$$\llbracket or \rrbracket^w = \lambda P_{\langle st, t \rangle} \lambda R_{\langle st, t \rangle} \lambda Q. R(Q) \wedge P(Q)$$

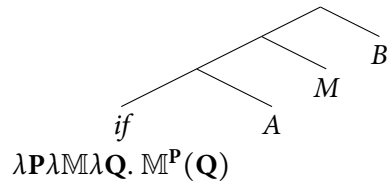
The problem **Observation 1** raises for restrictor theories is similar (I have in mind

the bed. <https://www.healthline.com/health/bites-but-no-signs-of-bugs>

- (iii) Bleach and other disinfectants may kill microbes but they also can kill humans if swallowed or if fumes are too powerful. <https://www.nytimes.com/2020/04/24/health/sunlight-coronavirus-trump.html>

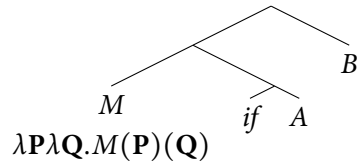
³I follow standard conventions in letting s be the basic semantic type for a possible world, t be the basic type for truth value. Then $\langle s, t \rangle$ is the type of a function from worlds to truth values (i.e., a possible worlds proposition), and $\langle st, t \rangle$ is the type of a function from propositions to truth values (i.e., a set of possible worlds propositions). As usual, I will freely switch between characteristic functions and sets as needed.

theories like Lewis 1975, Farkas & Sugioka 1983, Kratzer 1986, 1991, 2012, von Stechow 1994). Instead of building the modal meaning into *if*, restrictor theories propose that it is contributed by a (sometimes covert) modal in the consequent clause. One way to implement a restrictor theory is to let *if* denote a function from two propositions and a modal (or adverbial) operator to truth values:



Here, $[[if A] M]$ denotes a modal operator whose domain is restricted to *A*-worlds. This implementation of the restrictor theory faces a problem analogous to the one facing the operator theory above: we have to type shift *or* to coordinate functions of type $\langle \langle st, t \rangle, \langle st, t \rangle \rangle$, but this type shifted meaning must be conjunctive.

An alternative implementation of the restrictor theory holds that *if* is vacuous, merely present to mark the restrictor argument of some (possibly covert) two-place operator:⁴



This view predicts that, since *if* is vacuous, *if A or if B* should be equivalent to *A or B*. But to predict **Observation 1** on this view would require predicting that:

(i) $M(\mathbf{A} \vee \mathbf{B})(\mathbf{C})$

entails:

(ii) $M(\mathbf{A})(\mathbf{C}) \wedge M(\mathbf{B})(\mathbf{C})$

Where *M* is a universal modal, this entailment holds only if the domain of *M* contains both *A*-worlds and *B*-worlds.⁵ But this assumption is defeasible. Indeed, this point

⁴This is closer to the view suggested by Kratzer when she says, “The history of the conditional is the story of a syntactic mistake. There is no two-place ‘if . . . then’ connective in the logical forms for natural languages. ‘If’-clauses are devices for restricting the domains of various operators” (Kratzer 1986: 11).

⁵If *M* is a universal quantifier over a set of worlds (i.e., if the resulting conditional semantics is strict),

is sometimes cited as evidence for an implicature explanation of why we often find it reasonable to infer both simplifications from a disjunctive antecedent conditional, as in:

- (4) If John draws gold or silver, he will win.
 - a. So, if John draws gold, he will win.
 - b. So, if John draws silver, he will win.

The defeasibility of the inference from (4) to (4-a)/(4-b) can be seen by specificational disjunctive antecedent conditionals like (cf. Loewer 1976, McKay & van Inwagen 1977, Nute 1980, Bennett 2003, Klinedinst 2007):

- (5) If John draws gold or silver, he will draw gold.

(5) may still be true in a scenario where John will only draw one coin, and hence false that if John draws silver, he will draw gold. The problem for the restrictor theory adopting this line is that the simplification inference for *if or if*-conditionals is not defeasible in this way. The *if or if*-version of the specificational (5) is false in a scenario where John will only draw one coin, precisely because it entails that if John draws gold, he will draw silver (as pointed out by Starr 2014):

- (6) #If John draws a gold coin or if John draws a silver coin, he will draw a gold coin.

So, the challenge to the restrictor theorist taking this line is that it predicts that *if or if*-conditionals like (1) are equivalent to simple disjunctive antecedent conditionals like (4), and thus is in a difficult position to explain why the simplification inference for the *if or if*-conditionals is non-optional, while it is optional for disjunctive antecedent conditionals.⁶

I turn now to discuss three other observations about the behavior of coordinated

then the entailment from (i) to (ii) is trivially valid, even if the domain contains only **A**-worlds (for instance). But then the view faces the inverse problem: it predicts that the simplification inference in conditionals with disjunctive antecedents (such as (4) below) is not defeasible.

⁶Versions of these problems also arise for the view that *if*-clauses induce suppositions (Mackie 1973, Edgington 1995, 2001, Barnett 2006), as the following does not obviously mean the same thing as (1): “supposing John draws a gold coin or supposing John draws a silver coin, he will win.” Similar problems also arise for the view that *if*-clauses are correlatives, in which *if*-clauses are universal quantifiers over propositions (Alonso-Ovalle 2009). However, there is a version of the view that *if*-clauses are plural descriptions that avoids this problem (due to Santorio 2018). Finally, the dynamic theory of Starr 2014 can also handle this reading of *if or if*-conditionals. I discuss Starr and Santorio’s views in Section §3 below.

if-clauses. To begin, notice that **Observation 1** contains an important caveat—it characterizes only the primary reading of *if or if*-conditionals. These conditionals also have a weaker (ignorance) reading, as seen in the example:

- (7) If John draws a gold coin, or if he draws a silver coin, he will win; but I'm not sure which.

Since (7) is felicitous, it must have a reading on which it does not entail both of its simplifications. Were it only to have the simplifying reading, it would be incoherent:

- (8) If John draws gold, he will win; and if he draws silver, he will win; #but I'm not sure which.

The ignorance reading seems to be equivalent to the disjunction of its simplifications:

- **Observation 2:** *if or if*-conditionals have a secondary reading equivalent to the disjunction of their simplifications.

Next, turn to *if and if*-conditionals. A natural reading of such conditionals is as equivalent to their reduced form: a conditional with a conjunctive antecedent. Consider:

Coins v2. There are 100 coins in an urn: 90 gold, 5 silver, and 5 bronze. The bronze coins are losers, but you don't yet know whether the gold coins or the silver coins are winners. John is about to draw a coin at random from the urn.

- (9) If John draws a gold coin and if the gold coins are all winners, he will win.

In this context, (9) is both true and known. Thus, it seems to mean the same thing as:

- (10) If John draws a gold coin and the gold coins are all winners, he will win.

On this primary reading of *if A and if B, C*, it is thus equivalent to *if A and B, C*:⁷

⁷Again, in addition to these constructed examples, *if and if* conditionals in the wild are easy to find, and in each of these cases the context makes it clear they are equivalent to the corresponding conditional with a conjunctive antecedent:

- (i) If you are close and if you do have a relationship it might be important just to say ...
<https://www.npr.org/2020/06/08/872371063/microaggressions-are-a-big-deal-how-to-talk-them-out-and-when-to-walk-away>

- **Observation 3:** *if A and if B, C* has a primary reading equivalent to the simple conditional *if A and B, C*.

Interestingly, *if and if*-conditionals also share a reading with *if or if*-conditionals, on which they are equivalent to the conjunction of their simplifications:

- (2) If John draws a gold coin and if he draws a silver coin, he will win.

In a scenario like **Coins**, (2) seems false for the same reason that (1) does. Thus,

- **Observation 4:** *if and if*-conditionals have a reading on which they are equivalent to the conjunction of their simplifications.

These four observations reveal the varied and complex behavior of coordinated *if*-clauses. In the next section, I motivate a theory of conditionals that predicts all four observations.

2 A theory of *if*

My theory can be stated in four steps, which I review in turn. First, however, let me briefly explain my formalism. $[[\cdot]]$ is an interpretation function, which maps English expressions to their extensions relative to a world.⁸ The extension of a sentence relative to a world is its true value at that world (either 1 or 0). We can then use this framework to define the intension of a sentence as a function from worlds to truth values (as in Kaplan 1989).

Step 1. I propose that *if*-clauses denote sets of propositions, which are then used to generate the domain of a nearby modal, **not** to provide a conditional operator or to restrict some nearby modal domain. To this end, I propose that *if* denotes a function from a proposition to the set of propositions that entail it (here, I relativize extensions to a world w and a domain function f):

- (ii) If that happens, and if the up-front expense is unaffordable, it could deter some patients from getting a test. <https://www.kff.org/coronavirus-covid-19/issue-brief/five-things-to-know-about-the-cost-of-covid-19-testing-and-treatment/>
- (iii) If everything comes together, and if the technology comes off, it will be possible even for challenging sectors, like theatres, to get closer to normal before Christmas. <https://www.gov.uk/government/speeches/update-on-new-social-distancing-rules>

⁸Technically, I will also want extensions to be context dependent as well, but I set aside that complication since it won't matter to my purposes.

$$\llbracket \text{if} \rrbracket^{w,f} = \lambda \mathbf{P} . \{ \mathbf{S} : \mathbf{S} \subseteq \mathbf{P} \}$$

The idea that *if*-clauses denote sets of propositions has been explored in different ways in the literature. For instance, Starr 2014 proposes that *if*-clauses denote yes-no questions, while Santorio 2018 holds that *if*-clauses denote sets of truthmakers. The version I adopt here is inspired by inquisitive semantics—the denotation of *if* *A* is the *trivial issue* over **A** (see Ciardelli *et al.* 2013, 2018).

Step 2. Our denotation of *if* *A* allows *if*-clauses to be coordinated by *and* and *or* via generalized type-shifting operations:

$$\llbracket \text{or}^\uparrow \rrbracket^{w,f} = \lambda \mathbb{Q}_{\langle st,t \rangle} \lambda \mathbb{P}_{\langle st,t \rangle} . \mathbb{P} \cup \mathbb{Q}$$

$$\llbracket \text{and}^\uparrow \rrbracket^{w,f} = \lambda \mathbb{Q}_{\langle st,t \rangle} \lambda \mathbb{P}_{\langle st,t \rangle} . \mathbb{P} \cap \mathbb{Q}$$

Applied to coordinations of *if*-clauses, we thus generate the following denotations:

$$\llbracket \text{if } A \text{ or}^\uparrow \text{ if } B \rrbracket^{w,f} = \{ \mathbf{A}, \mathbf{B}, \dots \}$$

(This set will also include all logical strengthenings of **A** and **B**)

$$\llbracket \text{if } A \text{ and}^\uparrow \text{ if } B \rrbracket^{w,f} = \{ \mathbf{A} \cap \mathbf{B}, \dots \}$$

(This set will also include all logical strengthenings of **A** \cap **B**)

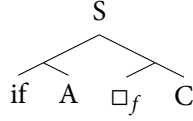
Step 3. Next, we turn to consequent clauses. I will assume (following Kratzer 1986, 1991) that bare conditionals contain a covert modal operator, \Box , in their logical forms.⁹ However, I adopt a non-standard semantics for all modals, including covert \Box . On the usual semantics, \Box is a function from a proposition to a truth value:

Standard Modals

$$\llbracket \Box \rrbracket^{w,f} = \lambda \mathbf{Q} . \forall w' \in f(w) : w' \in \mathbf{Q}$$

Here, the domain of the modal is determined by the domain function *f*, which maps a world *w* to a set of worlds. However, this denotation crashes when combined with the denotation of *if* *A*, which is a set of propositions:

⁹The covert operator is likely not a necessity modal (see Rothschild 2013, Mandelkern 2018). My official view is that it should be a covert selection function operator—see Khoo in progress for discussion.



I see two ways around this problem. One follows Starr 2014 and adopts a new composition rule for combining denotations of type $\langle st, t \rangle$ with denotations of type t . The other strategy changes the denotation of modals so that they now map a proposition to a function from a set of propositions to truth values. I won't decide between these approaches here, and for simplicity I will just focus on the latter.

Taking the latter strategy, I propose that modals contain two layers of quantification: one over a set of propositions and then one over their domain as pointwise restricted by the propositions in the first set:

Double Layered Modals

$$\llbracket \square Q \rrbracket^{w,f} = \lambda \mathbb{P}_{\langle st, t \rangle} . \forall \mathbf{X} \in \mathbb{P} : \forall w' \in f^{\mathbf{X}}(w) : \llbracket Q \rrbracket^{w',f^{\mathbf{X}}} = 1$$

$$\text{For all } w : f^{\mathbf{X}}(w) = f(w) \cap \mathbf{X}$$

This says that a modalized sentence $\square Q$ maps a set of propositions \mathbb{P} to 1 just if for every proposition \mathbf{X} in that set, every \mathbf{X} -world in the domain of the modal at w is a Q -world. In addition, I propose that the covert necessity modal carries a lexical presupposition that there be some \mathbf{X} -world in its domain $f(w)$, for each $\mathbf{X} \in \mathbb{P}$. Thus, in the particular case of covert \square , this predicts the observation that indicative conditionals presuppose that their antecedents are epistemically possible (cf. Stalnaker 1975, Edgington 1995, Bennett 2003, Gillies 2004):¹⁰

(11) #I know that John didn't dance; if he danced, he danced poorly.

¹⁰I pause to note that *if*-clauses can also be stacked, as in:

(i) If John draws a gold coin, then if the gold coins are winners, he will win.

This means the same as *If John draws a gold coin and the gold coins are winners, he will win*. The theory given here can predict this equivalence. Since *if*-clauses restrict modal domains by shifting a parameter of evaluation that is inherited by subordinated clauses, we predict that the shifted domain induced by the first *if*-clause in (i) will be inherited, and then subsequently further restricted, by the second *if*-clause. Compositionally, this will require that there are two covert modals in (i), as follows (unlike the strategy of Kratzer 1986 in which such conditionals only have the lowest covert modal in their LFs; see also Khoo 2013):

$$\text{if } A, \square(\text{if } B, \square C)$$

To ensure the collapse of two layers of modal quantification into one, we assume that epistemic modal bases are Closed (see Gillies 2010).

When a modal appears bare (not embedded under an *if*-clause) we assume that context supplies its restrictor argument a trivial value: the set containing the universal proposition, $\{\mathbf{W}\}$.¹¹

Let's pause to see what we predict so far for (1) and (9):

- (1) If John draws a gold coin or if John draws a silver coin, he will win.
- (9) If John draws a gold coin and if the gold coins are all winners, he will win.

Start with (1). We have:

$$\llbracket \text{if } G \text{ or } \uparrow \text{if } S \rrbracket^{w,f} (\llbracket \Box W \rrbracket^{w,f})$$

Here, $\llbracket \text{if } G \text{ or } \uparrow \text{if } S \rrbracket^{w,f} = \{\mathbf{G}, \mathbf{S}, \dots\}$, which is fed to the function denoted by $\Box W$, which yields 1 iff

$$\forall \mathbf{X} \in \{\mathbf{G}, \mathbf{S}, \dots\} : \forall w' \in f^{\mathbf{X}}(w) : \llbracket W \rrbracket^{w',f^{\mathbf{X}}} = 1$$

And this predicts, in line with Observation 1, that (1) is true iff both of its simplifications are true. Note, however, that we do not yet have the resources to predict Observation 2—the fact that *if or if*-conditionals have a secondary reading equivalent to the disjunction of their simplifications, as exhibited by (7):

- (7) If John draws a gold coin, or if he draws a silver coin, he will win; but I'm not sure which.

We will return to this point in Step 4 of the theory below.

Turning to (9), we have:

$$\llbracket \text{if } G \text{ and } \uparrow \text{if } GW \rrbracket^{w,f} (\llbracket \Box W \rrbracket^{w,f})$$

Here, $\llbracket \text{if } G \text{ and } \uparrow \text{if } GW \rrbracket^{w,f} = \{\mathbf{G} \cap \mathbf{GW}, \dots\}$, which is fed to the function denoted by $\Box W$, which yields 1 iff

¹¹The alternative strategy sketched above does not require this additional assumption, since it relies on a new rule of composition:

Restrictive Matrix Application (RMA)

If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any world w and domain function f : if $\llbracket \beta \rrbracket^{w,f}$ is a function of type $\langle st, t \rangle$ and $\llbracket \gamma \rrbracket^{w,f}$ is a function of type t , then $\llbracket \alpha \rrbracket^{w,f} = \forall \mathbf{X} \in \llbracket \beta \rrbracket^{w,f} : \llbracket \gamma \rrbracket^{w,f^{\mathbf{X}}} = 1$.

$$\forall \mathbf{X} \in \{\mathbf{G} \cap \mathbf{GW}, \dots\} : \forall w' \in f^{\mathbf{X}}(w) : \llbracket W \rrbracket^{w', f^{\mathbf{X}}} = 1$$

And this predicts, in line with Observation 3, that (9) is true iff at all worlds where John draws gold and the gold coins are winners, he wins. As above, notice that we do not yet have the resources to predict Observation 4—the fact that *if and if*-conditionals have a secondary reading equivalent to the conjunction of their simplifications, as exhibited by (2):

- (2) If John draws a gold coin and if he draws a silver coin, he will win.

We will return to this point in Step 4 of the theory below.

There is one final complication we have to address before we come to the final commitment of the theory. To see the problem, consider the simple disjunctive antecedent conditional (DAC):

- (12) If John draws a gold coin or a silver coin, he will win.

Simple DACs seem to exhibit a simplifying reading (like *if or if*-conditionals), but we saw above that they differ from *if or if*-conditionals in that they allow for felicitous specificational constructions in a context where it's presupposed that only one of the two disjuncts could be true (as pointed out by Starr 2014):

- (5) If John draws a gold coin or a silver coin, he will draw a gold coin.
(6) #If John draws a gold coin or if John draws a silver coin, he will draw a gold coin.

So, in a scenario in which John will draw exactly one coin, (5) may be true, but (6) is incoherent.

The problem is that our theory as currently formulated cannot predict this contrast. To see why, consider our denotation for *if A or B*:

$$\llbracket \text{if } A \text{ or } B \rrbracket^{w, f} = \{\mathbf{S} : \mathbf{S} \subseteq \mathbf{A} \cup \mathbf{B}\} = \{\mathbf{A}, \mathbf{B}, \mathbf{A} \cup \mathbf{B}, \dots\}$$

Thus, $\llbracket \text{if } A \text{ or } B \rrbracket^{w, f}$ will contain all of the propositions $\llbracket \text{if } A \text{ or }^\uparrow \text{if } B \rrbracket^{w, f}$ contains, as well as $\mathbf{A} \cup \mathbf{B}$. So, we predict that (5) should entail both of its simplifications and thus be incoherent, like (6). Furthermore, the problem is not resolved by the addition of some kind of optional collapse operator \times on the *if*-clause denotation prior to feeding

it to the modal:¹²

$$\times(\mathbb{P}) = \{\cup \mathbb{P}\}$$

Although this yields the right result for (5), ensuring that the modal is only restricted by the proposition $\mathbf{G} \cup \mathbf{S}$, there is no reason it should not be possible to apply to (6), thus predicting a coherent (and possibly true) interpretation of the latter as well.¹³

To handle this problem, I propose that we modify our denotation for modals. Instead of quantifying over each proposition in the supplied set of propositions, we quantify only over the weakest propositions in that set:¹⁴

$$weak(\mathbb{P}) = \{\mathbf{X} \in \mathbb{P} : \neg \exists \mathbf{Y} \in \mathbb{P} : \mathbf{X} \subset \mathbf{Y}\}$$

(This is the set of propositions in \mathbb{P} for which no other proposition in \mathbb{P} is strictly weaker.)

Double Layered Modals (Revised)

$$\llbracket \square Q \rrbracket^{w,f} = \lambda \mathbb{P}_{\langle st,t \rangle} . \forall \mathbf{X} \in weak(\mathbb{P}) : \forall w' \in f^{\mathbf{X}}(w) : \llbracket Q \rrbracket^{w',f^{\mathbf{X}}} = 1$$

Let's first see how the weakness operator works. Take the denotation of *if A or[↑] if B*:

$$\llbracket if A or^{\uparrow} if B \rrbracket^{w,f} = \{\mathbf{A}, \mathbf{B}\} \cup \bigcup_i \{\mathbf{A} \cap \mathbf{X}_i\} \cup \bigcup_i \{\mathbf{B} \cap \mathbf{X}_i\}$$

¹²This is a standard repair strategy for semantics that predict simplification of DACs as an entailment. See for instance, Ciardelli 2016: 743, Santorio 2018: 546.

¹³There are two other problems, both of which the fix below resolves. One is that $\llbracket if A \rrbracket^{w,f}$ will also contain \emptyset , and thus threaten every conditional with presupposition failure. But even if we stipulate that $\llbracket if A \rrbracket^{w,f}$ contain only those non-empty propositions that entail \mathbf{A} , we will still predict that the theory will automatically validate Antecedent Strengthening:

Antecedent Strengthening: *if A, C* \models *if A and B, C*

While there are proponents of Antecedent Strengthening (Warmbrod 1983, von Stechow 2001, Gillies 2007), its validity remains controversial (for detractors, see Stalnaker 1968, Lewis 1973, Moss 2012, Boylan & Schultheis 2020), and thus it would be preferable to not have to build its validity into our theory. I should note that, according to the simple view of modal restriction I endorse here, antecedent strengthening is valid, but that is an easily avoidable consequence. In a sophisticated Kratzer theory where modal domains are also determined by an ordering source, antecedent strengthening need not be valid.

¹⁴I am grateful to Ivano Ciardelli for this suggestion. The *weak* function behaves similarly to the definition of a sentence's alternatives in inquisitive semantics (see Ciardelli *et al.* forthcoming, 2018). However, we are effectively breaking apart two aspects of the inquisitive semantic theory: the generation of the trivial issue corresponding to a sentence, and the restriction to its weakest members. The reason this is important is that it allows for operators to intervene in that process—which is what have seen happen with coordinated *if*-clauses.

Here, $\bigcup_i \{\mathbf{A} \cap \mathbf{X}_i\}$ is the set of all logical strengthenings of \mathbf{A} . For each member that is strictly stronger than \mathbf{A} , it will be ruled out of $weak(\llbracket if A or^\uparrow if B \rrbracket^{w,f})$, and likewise for each proposition strictly stronger than \mathbf{B} . So, we have:

$$weak(\llbracket if A or^\uparrow if B \rrbracket^{w,f}) = \{\mathbf{A}, \mathbf{B}\}$$

Thus, combined with Double Layered Modals (Revised), we predict Observation 1—that $if A or if B, C$ will be true iff each of its simplifications is true. The same reasoning yields:

$$weak(\llbracket if A and^\uparrow if B \rrbracket^{w,f}) = \{\mathbf{A} \cap \mathbf{B}\}$$

Turn next to the denotation of $if A or B$:

$$\llbracket if A or B \rrbracket^{w,f} = \{\mathbf{A}, \mathbf{B}, \mathbf{A} \cup \mathbf{B}\} \cup \bigcup_i \{\mathbf{A} \cap \mathbf{X}_i\} \cup \bigcup_i \{\mathbf{B} \cap \mathbf{X}_i\}$$

The same reasoning rules out each logical strengthening of \mathbf{A} and \mathbf{B} from $weak(\llbracket if A or B \rrbracket^{w,f})$. But notice that it also rules out \mathbf{A} and \mathbf{B} as well, for each has a logically weaker member in $\llbracket if A or B \rrbracket^{w,f}$, namely $\mathbf{A} \cup \mathbf{B}$. Thus, we predict that:

$$weak(\llbracket if A or B \rrbracket^{w,f}) = \{\mathbf{A} \cup \mathbf{B}\}$$

And so, combined with Double Layered Modals (Revised), we predict the coherence of specificational DACs like (5):

- (5) If John draws gold or silver, he will draw gold.

This strategy does have a cost, since a standard observation is that ordinary DACs tend to have the reading in which they entail both simplifications:

- (12) If John draws a gold coin or a silver coin, he will win.
 a. If John draws a gold coin, he will win.
 b. If John draws a silver coin, he will win.

To handle this point, I propose that DACs like (12) are in fact syntactically ambiguous (something I motivate and discuss in more detail in Khoo forthcoming) between a doubled-*if* logical form (a disjunction of *if*-clauses) and a single-*if* logical form (an *if*-clause with a disjunctive complement). On the double-*if* logical form, they uniformly

carry the simplifying reading, while on the single-*if* logical form, they are uniformly non-simplifying.

Returning to coordinated-*ifs*, we still face the problem of accounting for Observations 2 and 4:

- **Observation 2:** *if or if*-conditionals have a secondary reading equivalent to the disjunction of their simplifications.
- **Observation 4:** *if and if*-conditionals have a reading on which they are equivalent to the conjunction of their simplifications.

The final step of the theory aims to address this point.

Step 4. I propose that *if or if*-conditionals and *if and if*-conditionals are ambiguous between two readings, the result of two ways of repairing the type-mismatch between *if A* and *or/and*. The type lifting operation \uparrow is one way: it lifts the type of the connective to map pairs of *if*-clause denotations (each of type $\langle st, t \rangle$) to an *if*-clause denotation. However, given that we want *if*-clauses to combine with modal sentences to yield sentences (something of type t), alternatively we could lift the type of the connective to map pairs of *if*-clause denotations to a function from modal sentence denotations to truth values (the latter being a function of type $\langle \langle st, t \rangle, t \rangle$):

$$\llbracket or^{\uparrow\uparrow} \rrbracket^w = \lambda Q_{\langle st, t \rangle} \lambda P_{\langle st, t \rangle} \lambda \mathcal{M}_{\langle \langle st, t \rangle, t \rangle} \cdot \mathcal{M}(\mathbb{P}) \vee \mathcal{M}(\mathbb{Q}).$$

$$\llbracket and^{\uparrow\uparrow} \rrbracket^w = \lambda Q_{\langle st, t \rangle} \lambda P_{\langle st, t \rangle} \lambda \mathcal{M}_{\langle \langle st, t \rangle, t \rangle} \cdot \mathcal{M}(\mathbb{P}) \wedge \mathcal{M}(\mathbb{Q}).$$

Thus, we have:

$$\llbracket if A or^{\uparrow\uparrow} if B \rrbracket^w = \lambda \mathcal{M}_{\langle \langle st, t \rangle, t \rangle} \cdot \mathcal{M}(\llbracket if A \rrbracket^w) \vee \mathcal{M}(\llbracket if B \rrbracket^w).$$

$$\llbracket if A and^{\uparrow\uparrow} if B \rrbracket^w = \lambda \mathcal{M}_{\langle \langle st, t \rangle, t \rangle} \cdot \mathcal{M}(\llbracket if A \rrbracket^w) \wedge \mathcal{M}(\llbracket if B \rrbracket^w).$$

Given this secondary type-lifting operation, we thus predict that coordinated-*if* conditionals are ambiguous between two readings, as follows:

<i>if A or if B, C</i>	
Primary	<i>if A or[↑] if B, □ C</i> iff $\forall w' \in f^A(w) : w' \in \mathbf{C}$ and $\forall w' \in f^B(w) : w' \in \mathbf{C}$
Secondary	<i>if A or^{↑↑} if B, □ C</i> iff $\forall w' \in f^A(w) : w' \in \mathbf{C}$ or $\forall w' \in f^B(w) : w' \in \mathbf{C}$

if A and if B, C

Primary	<i>if A and</i> [†] <i>if B, □ C</i> iff $\forall w' \in f^{A \cap B}(w) : w' \in C$
Secondary	<i>if A and</i> ^{††} <i>if B, □ C</i> iff $\forall w' \in f^A(w) : w' \in C$ and $\forall w' \in f^B(w) : w' \in C$

By generating the Primary and Secondary readings of *if or if*-conditionals, we predict Observations 1 and 2. And by generating the Primary and Secondary readings of *if and if*-conditionals, we predict Observations 3 and 4 (we explain the asymmetry in pragmatic preference for these readings below):

- **Observation 1:** *if or if*-conditionals (on their primary reading) are equivalent to the conjunction of their simplifications.
- **Observation 2:** *if or if*-conditionals have a secondary reading equivalent to the disjunction of their simplifications.
- **Observation 3:** *if A and if B, C* has a primary reading equivalent to the simple conditional *if A and B, C*.
- **Observation 4:** *if and if*-conditionals have a reading on which they are equivalent to the conjunction of their simplifications.

In addition to these plausible predictions, my strategy is independently motivated by non-conditional examples. Jacobson 2014 observes that (13) is ambiguous:

(13) Every wolf howled or sang.

The primary reading is the one on which (13) is true iff every wolf had the property of either howling or singing. However, the secondary (weaker) reading is one on which (13) is true iff either every wolf howled or every wolf sang. This reading is brought out by adding an avowal of ignorance:

(14) Every wolf howled or sang, but I can't remember which.

Jacobson proposes a type-lifting theory that predicts these two readings of (13), and which is the inspiration for my proposal above. According to Jacobson, we can type lift *or* to coordinate VPs in at least two ways to compositionally interact with the denotation of the DP: the first lifts *howled or sang* to a function from individuals to truth values, and the second lifts *howled or sang* to a function from DP denotations (functions from individuals to truth values) to truth values:

$$\llbracket or^\uparrow \rrbracket^w = \lambda A_{\langle e,t \rangle} \lambda B_{\langle e,t \rangle} \lambda x . B(x) \vee A(x)$$

$$\llbracket or^{\uparrow\uparrow} \rrbracket^w = \lambda A_{\langle e,t \rangle} \lambda B_{\langle e,t \rangle} \lambda M_{\langle \langle e,t \rangle t \rangle} . M(A) \vee M(B)$$

The fact that the same kind of explanation can apply in these two domains to account for a similar ambiguity is thus some evidence in favor of my strategy here.¹⁵

I turn at last to the question why we should expect the Primary readings to be default given my theory. Recall that in (13), we find a similar pattern: the narrow scope disjunction reading is the default one, while the wide scope disjunction reading requires extra context.

(13) Every wolf howled or sang.

On my theory, the primary reading of (13) results from *or* type-shifting to be a function from pairs of VP denotations (of type $\langle e, t \rangle$, standardly), to VP denotations; and for (1), *or* shifts to a function from a pair of sets of propositions to a set of propositions. The secondary reading results from the connective type shifting to a function that, in a sense, has to “know” the type of the clause it is combined with in order to know its type. So, for instance, with (13), the secondary type shifting operation applied to *or* shifts to a function from DP denotations (of type $\langle et, t \rangle$) to sentence denotations (of type t), since it knows it will combine with a DP to yield a sentence. And with (1) the secondary type shifting operation applied to *or* shifts to a function that maps a pair of sets of propositions to a function that takes an input of type $\langle \langle st, t \rangle, t \rangle$, since it knows it will combine with such a denotation to yield a sentence.

These secondary type shifting operations thus plausibly yield interpretations that are less salient overall. I don’t know if there is anything more to this explanation, but let me clarify my strategy at this stage. Given the parallel between primary and secondary readings of (13) and (1), my strategy is to explain the pragmatic preference for primary over secondary readings in coordinated-*if* conditionals by appealing to whatever explains the same effect for disjunctions/conjunctions under quantificational de-

¹⁵I should note that the type-shifting view is not the only kind of explanation that might work here. An alternative strategy appeals to ellipsis, allowing a reading on which doubled material is deleted at LF:

(i) If John draws a gold coin ~~he will win~~ or if John draws a silver coin, he will win.

(ii) If John draws a gold coin ~~he will win~~ and if John draws a silver coin, he will win.

I won’t argue for the type-shifting account over the ellipsis account at this time. Notice also that an ellipsis account could be co-opted by an orthodox operator or restrictor theory, but doing so would still not help those theories predict Observation 1.

terminers.¹⁶

3 Comparison with Starr and Santorio

I know of only two other theories that generate plausible semantic values for coordinated *ifs* compositionally: Starr 2014 and Santorio 2018. In this section, I briefly compare my theory with each.

3.1 Starr 2014

Starr offers a dynamic semantics for coordinated *if*-clauses. I won't review all of the details of Starr's view, most of which will not matter for our purposes. Given our aims, four key ideas matter:

1. The first is that a context \mathbb{C} is, for Starr, a pair of an information state $\mathbf{S}_{\mathbb{C}}$ and a set of highlighted sentences $H_{\mathbb{C}}$.
2. The second is that the meanings of declarative sentences are given by their update potential, which is a function from contexts to contexts. In the case of atomic factual sentences, we have:¹⁷

$$\mathbb{C}[A] = \langle \mathbf{S}_{\mathbb{C}} \cap \mathbf{A}, H_{\mathbb{C}} \rangle$$

We then define *and* and *or* as follows:¹⁸

$$\mathbb{C}[\phi \wedge \psi] = \mathbb{C}[\phi][\psi]$$

$$\mathbb{C}[\phi \vee \psi] = \mathbb{C}[\phi] \cup \mathbb{C}[\psi]$$

$$\text{where } \mathbb{C}_1 \cup \mathbb{C}_2 = \langle \mathbf{S}_{\mathbb{C}_1} \cup \mathbf{S}_{\mathbb{C}_2}, H_{\mathbb{C}_1} \cup H_{\mathbb{C}_2} \rangle$$

Thus, the update operation performed by conjunction is sequential update of its conjuncts, and the update operation of a disjunction is the union of the point-wise updates with each disjuncts, where the union of two contexts just is point-wise union of its members.

¹⁶Thanks for an anonymous reviewer for pointing out the viability of this strategy.

¹⁷An atomic, factual sentence is one which contains no modal operators or logical connectives. Here I use uppercase italic letters as variables over atomic factual sentences.

¹⁸' ϕ ' and ' ψ ' are variables over declarative sentences, which may or may not be atomic and may or may not be factual.

3. Starr separates the meaning of a conditional into two parts. *if*-clauses add their complement to the set of highlighted sentence:¹⁹

$$\mathbb{C}[if\ \phi] = \langle \mathbf{S}_{\mathbb{C}}, H_{\mathbb{C}} \cup \{\phi\} \rangle$$

4. Finally, Starr proposes that clauses embedded under *if*-clauses test whether each highlighted sentence in the context is such that updating the context with it yields a context which accepts the embedded clause:

$$\mathbb{C}[if\ A, B] = \begin{cases} \mathbb{C} & \text{if } \forall X \in H_{\mathbb{C}[if\ A]} : \mathbb{C}[X][B] = \mathbb{C}[X] \\ \emptyset & \text{otherwise} \end{cases}$$

In simple cases, Starr's theory's predictions match the standard dynamic test semantics for *if* A, B : updated with such a conditional, the context passes the test iff all of the \mathbf{A} -worlds in its information state are \mathbf{B} -worlds (see Veltman 1985, 1996, Gillies 2004, 2009). However, when it comes to coordinated *ifs*, Starr's theory generates some interesting results.

Start with (1):

- (1) If John draws a gold coin or if John draws a silver coin, he will win.

According to Starr's theory, we evaluate this conditional by first updating with its coordinated *if*-clauses. Since they are disjointed, this means we update the context with each pointwise, and then take the union of the results. The result is that both *John draws a gold coin* and *John draws a silver coin* will be highlighted. Then we test both highlighted sentences to see if updating with them will support the consequent. Thus, Starr's theory predicts that a context will accept this conditional iff all of the gold-worlds in its information state are win-worlds and all of the silver-worlds in its information state are win-worlds. Since (given the information in **Coins**) none of the silver-worlds in the information state are win-worlds, Starr's theory correctly predicts that we will reject such a conditional.

Next, consider (2):

- (2) If John draws a gold coin and if John draws a silver coin, he will win.

Here, since the *if*-clauses are conjoined, to update with their conjunction we first update the context by the first and then the second. The result is that both *John draws a*

¹⁹This is not fully general, since we'll only focus on atomic factual *if*-clauses. See Starr 2014 for full details.

gold coin and *John draws a silver coin* will be highlighted. Thus, Starr’s theory predicts that (2) will be accepted by exactly the same contexts that accept (1). So, it correctly predicts that (2) is rejected in the **Coins** context.

However, for this reason, Starr’s theory faces an immediate problem, for, as we’ve seen, some *if and if*-conditionals are not equivalent to their *if or if*-counterparts. Take (9) in the context of **Coins v2**:

(9) If John draws a gold coin and if the gold coins are all winners, he will win.

This sentence is intuitively equivalent to *If John draws a gold coin and the gold coins are all winners, he will win*. This is not immediately predicted by Starr’s theory, which instead predicts that we should reject (9) because it entails *if the gold coins are all winners, John will win*.

Starr anticipates this challenge, and proposes a fix: “if the two highlighted propositions are compatible then they are conjoined together into a single highlighted proposition” (Starr 2014: 16). In (9), since the two highlighted sentences (*John draws gold* and *the gold coins are all winners*) are compatible, we predict that they are conjoined together in a single highlighted sentence: *John draws gold and all the gold coins are winners*. We then test this single highlighted sentence to get the result that (9) is accepted in the context, since it is indeed the case that all of worlds in which John draws gold and gold coins are winners are worlds in which John wins.

The problem with this fix is that it generates incorrect results for some *if or if*-conditionals. Go back to (1) and consider the following context:

Coins v3. John may draw one or two coins. The gold coins are winners and silver coins are losers. So, it’s possible that John will draw a gold coin and win, and also possible he will draw a gold coin and a silver coin and also win.

In this context, the sentences *John draws gold* and *John draws silver* are compatible, and so by Starr’s fix should be collapsed into a single highlighted sentence, *John draws gold and silver*. But then, (1) should be accepted in the context just if all of the informationally accessible worlds where John draws a gold coin and a silver coin are worlds in which he wins. Since this does hold, (1) should be accepted. But we intuitively reject (1) for the same reason as in the original **Coins** context—since none of the silver coins are winners, and (1) entails that if John draws a silver coin, he will win. We could put this point another way, which is that (1) does not mean the same as (15) in this context:

(15) If John draws a gold coin and a silver coin, he will win.

(15) is true in this context, but (1) is intuitively not.

Thus, it seems that Starr’s theory faces a problem that my theory above does not. The problem here is that Starr’s theory aims to predict **Observation 4** by a post-semantic mechanism that collapses compatible highlighted sentences. Since we’re given no reason the same mechanism should not apply equally to disjoined *if*-clauses, the theory wrongly predicts *if or if*-conditionals should exhibit the same range of readings as *if and if*-conditionals, which they do not.

3.2 Santorio forthcoming

Santorio 2018 proposes a theory that can also account for coordinated *ifs*, which is in some ways similar to and some ways different from mine. Although Santorio does not apply his theory to coordinated *ifs*—and thus my remarks here are speculative—it is still worth exploring how such a theory might provide an alternative to the one given here. According to Santorio, *if*-clauses denote sets of truthmakers, and as such can be coordinated via generalized conjunction and disjunction, just as in my theory. I will suppress the complexities of the truthmaker aspect of his theory, and state his view about *if*-clauses as follows:

$$\llbracket \textit{if} \rrbracket^{w,f} = \lambda \mathbf{P} . \{ \mathbf{X} : \mathbf{X} \text{ is a truthmaker of } \mathbf{P} \}$$

Thus, where the truthmakers of a disjunction are its disjuncts, Santorio predicts that:

$$\llbracket \textit{if } A \textit{ or } B \rrbracket^{w,f} = \{ \mathbf{A}, \mathbf{B} \}$$

This is one crucial difference between our theories. This leads to an important difference between how our theories predict **Observation 1** and **Observation 2**. Santorio proposes that the simplifying reading of *if or if*-conditionals is due to the presence of a covert distributivity operator $DIST_{\pi}$:²⁰

$$\llbracket DIST_{\pi} \rrbracket^{w,f} = \lambda \mathbb{P}_{\langle st,t \rangle} \lambda \mathcal{R}_{\langle \langle st,t \rangle, t \rangle} . \forall \mathbf{P} \in \mathbb{P} : \mathcal{R}(\{ \mathbf{P} \}) = 1$$

This operator maps a set of propositions \mathbb{P} and a property of a set of propositions \mathcal{R} to true iff every proposition in \mathbb{P} is such that \mathcal{R} holds of its singleton. Finally, Santorio proposes a meaning for modals on which they map a set of propositions to a truth

²⁰The entry here is slightly different from Santorio 2018, but the changes are, I think, necessary to preserve compositionality.

value, as follows:²¹

$$\llbracket \Box Q \rrbracket^{w,f} = \lambda \mathbb{P}_{\langle st,t \rangle} . \forall w' \in f(w) \cap \cup \mathbb{P}: \llbracket Q \rrbracket^{w'} = 1$$

Note that Santorio's entry for the modal is different from mine in a crucial way. Once the set of propositions reaches the modal, the modal domain is fed the union of this set of propositions. Thus, whereas I build the simplifying component into the meaning of the modal, Santorio uses the covert distributivity operator to turn a set of propositions into a function from modal meanings that quantifies pointwise over each member of that set of propositions.

All together, we can now predict **Observation 1**:²²

$$\begin{aligned} & \llbracket [[[\text{if } A \text{ or }^\uparrow \text{if } B] \text{DIST}_\pi] \Box C] \rrbracket^{w,f} = 1 \text{ iff} \\ & (\{ \mathbf{A}, \mathbf{B} \} (\llbracket \text{DIST}_\pi \rrbracket^{w,f})) \llbracket \Box C \rrbracket^{w,f} \text{ iff} \\ & (\{ \mathbf{A}, \mathbf{B} \} (\lambda \mathbb{P}_{\langle st,t \rangle} \lambda \mathcal{R}_{\langle \langle st,t \rangle, t \rangle} . \forall \mathbf{P} \in \mathbb{P} : \mathcal{R}(\{ \mathbf{P} \}) = 1)) \llbracket \Box_f C \rrbracket^{w,f} \text{ iff} \\ & (\lambda \mathcal{R}_{\langle \langle st,t \rangle, t \rangle} . \forall \mathbf{P} \in \{ \mathbf{A}, \mathbf{B} \} : \mathcal{R}(\{ \mathbf{P} \}) = 1) \llbracket \Box C \rrbracket^{w,f} \text{ iff} \\ & (\lambda \mathcal{R}_{\langle \langle st,t \rangle, t \rangle} . \forall \mathbf{P} \in \{ \mathbf{A}, \mathbf{B} \} : \mathcal{R}(\{ \mathbf{P} \}) = 1) (\lambda \mathbb{P}_{\langle st,t \rangle} . \forall w' \in f(w) \cap \cup \mathbb{P}: \llbracket C \rrbracket^{w',f} = 1) \text{ iff} \\ & \forall \mathbf{P} \in \{ \mathbf{A}, \mathbf{B} \} : \forall w' \in f(w) \cap \cup \{ \mathbf{P} \}: \llbracket C \rrbracket^{w',f} = 1 \end{aligned}$$

To predict **Observation 2**, Santorio may follow me and hold that such intuitions result from an LF which is a disjunction of *if*-clauses. However, Santorio's theory runs into the problem of distinguishing between specificational DACs, which may be true, and specificational *if or if*-conditionals, which are incoherent (in a context in which only one of the disjuncts can be true):

- (5) If John draws a gold coin or a silver coin, he will draw a gold coin.
- (6) #If John draws a gold coin or if John draws a silver coin, he will draw a gold coin.

To predict the non-simplifying reading of specificational DACs, Santorio proposes that the DIST_π operator is optional:

$$\begin{aligned} & \llbracket [[\text{if } A \text{ or } B] \Box A] \rrbracket^{w,f} = 1 \text{ iff} \\ & (\{ \mathbf{A}, \mathbf{B} \}) \llbracket \Box A \rrbracket^{w,f} \text{ iff} \\ & (\{ \mathbf{A}, \mathbf{B} \}) (\lambda \mathbb{P}_{\langle st,t \rangle} . \forall \mathbf{P} \in \mathbb{P} : \forall w' \in f(w) \cap \cup \{ \mathbf{P} \}: \llbracket A \rrbracket^{w',f} = 1) \text{ iff} \end{aligned}$$

²¹Again, this differs slightly from Santorio's entry for *would*, but the differences are inessential.

²²Note, we suppose here that the only truthmakers for **A** and **B** in the relevant context are themselves (respectively).

$$\begin{aligned} \forall w' \in f(w) \cap \cup\{\mathbf{A}, \mathbf{B}\}: \llbracket A \rrbracket^{w',f} = 1 \text{ iff} \\ \forall w' \in f(w) \cap \mathbf{A} \cup \mathbf{B}: \llbracket A \rrbracket^{w',f} = 1 \end{aligned}$$

The problem is that, then the $DIST_\pi$ should also be optional with *if or if*-conditionals, yielding a coherent interpretation of (6). And it's not obvious why the $DIST_\pi$ operator *must* appear under an *if or if*-clause, but is optional under an *if*-clause that contains a disjunction. Indeed, it is hard to see how any answer could be given that doesn't violate compositionality.

4 Conclusion

My aim in this paper has been to investigate coordinated *if*-clauses to better understand the compositional semantics of conditionals. I began with a challenge (from coordinated *ifs*) for standard operator and restrictor theories of conditionals. I then looked at four observations about coordinated *ifs*, and I articulated a theory that predicted those observations. Finally, I argued that my view had some advantages over the theories of Starr 2014 and Santorio 2018, the only other theories I know of that are in a position to account for my first observation.

Of course, much more work remains. Ben Holguin (personal communication) observes that disjunctions of conditionals that share the same consequent have conjunctive interpretations, as in:

(16) If John draws a gold coin he will win or if he draws a silver coin he will win.

The restriction here to conditionals sharing the same consequent is important—without that parallelism, the conjunctive reading goes away:²³

(17) If John draws a silver coin he will win or if he draws a bronze coin he will lose.

(18) If Smith flipped the coin, it landed heads or if Smith flipped the coin, it landed tails.

(17) seems true simply because its second disjunct is true, and (18) seems true insofar as the coin will land either heads or tails.

²³Geurts 2005 (following Johnson-Laird & Savary 1999, Woods 1997) draws a related observation involving disjunctions of conditionals whose antecedents are incompatible:

(i) Either he will stay in America if he is offered tenure or he will return to Europe if he isn't.

I am not sure the theory offered in this paper can account for these conditionals.

The theory in this paper might be in a position to help explain this observation. If one possible LF of (16) involves deletion of the doubled consequent clause at LF (resulting in it having the LF of an *if or if*-conditional), and it is only when it has this LF (with *or* type raising via \uparrow) that it has the simplifying interpretation, that would explain the parallelism requirement.

$$\textit{if } A, C \textit{ or if } B, C \Rightarrow \textit{if } A \in \textit{ or if } B, C$$

Simons 2005 proposes a similar effect due to across-the-board movement (Ross 1967, Williams 1978, Postal 1974) to predict the free choice inference for wide scope possibility modals:

- (19) a. John might draw gold or he might draw silver.
 b. John might draw gold or silver.

Simons' theory is designed to predict the free choice inference of (19-b). To account for the same inference in (19-a), she proposes that the two modal auxiliaries ATB-raise to a single, high-scope, position (making (19-a) have an LF like that of (19-b)'s surface form). We might appeal to a similar mechanism to get from the surface form of (16) to the logical form [*If A or if B*] *C*.²⁴ I leave sorting out the details of this project for future work.

Finally, the theory discussed in this paper could be extended to account for a similar pattern of data regarding coordinated *if*-clauses interacting with adverbially quantified expressions:

- (20) If Sue got an A or if she got a B, she sometimes had ice cream.
 a. If Sue got an A, she sometimes had ice cream.
 b. If Sue got a B, she sometimes had ice cream.

I leave working out the details of this for future work.²⁵

²⁴A further piece of evidence for this approach is that when the parallelism is broken in both cases, the free choice inference goes away:

- (i) John might (for all we know) draw gold or he must (by the rules) draw silver.

²⁵This paper grew out of a project on disjunctive antecedent conditionals which, through various twists and turns, fractured into two—the paper you have here and Khoo forthcoming. Along the way, I benefitted from discussion on this topic from many people, including audiences at Dartmouth, MIT, Oxford, and the Central APA in Denver (February 2018). Thanks in particular are due to David Boylan, Nate Charlow, Kai von Fintel, Caspar Hare, Ben Holguín, Matt Mandelkern, Agustín Rayo, Kate Ritchie, Daniel Rothschild, Paolo Santorio, Ginger Schultheis, Jack Spencer, Bob Stalnaker, Steve Yablo. I am

Appendix

What meaning for *or* would predict **Observation 1**? Start with the following meaning for *if*:

$$\llbracket \text{if} \rrbracket^w = \lambda P \lambda Q . P \rightarrow Q$$

Now, what is the denotation of *if A or if B*? Well, intuitively, we want it to be:

$$\llbracket \text{if } A \text{ or if } B \rrbracket^w = \lambda Q . A \rightarrow Q \wedge B \rightarrow Q.$$

It is possible to get this result, but it requires the following unusual semantics for *or*:

$$\llbracket \text{or} \rrbracket^w = \lambda P_{\langle st,t \rangle} \lambda R_{\langle st,t \rangle} \lambda Q . R(Q) \wedge P(Q)$$

Here is the derivation:

- $\llbracket \text{if } A \text{ or if } B \rrbracket^w =$
- $\llbracket \text{if } A \rrbracket^w (\llbracket \text{or if } B \rrbracket^w) =$
- $\llbracket \text{if } A \rrbracket^w [(\llbracket \text{or} \rrbracket^w) (\llbracket \text{if } B \rrbracket^w)] =$
- $\llbracket \text{if } A \rrbracket^w [(\llbracket \text{or} \rrbracket^w) (\lambda Q . B \rightarrow Q)] =$
- $\llbracket \text{if } A \rrbracket^w [(\lambda P_{\langle st,t \rangle} \lambda R_{\langle st,t \rangle} \lambda S . R(S) \wedge P(S)) (\lambda Q . B \rightarrow Q)] =$
- $\llbracket \text{if } A \rrbracket^w [\lambda R_{\langle st,t \rangle} \lambda S . R(S) \wedge B \rightarrow S] =$
- $(\lambda Q . A \rightarrow Q) (\lambda R_{\langle st,t \rangle} \lambda S . R(S) \wedge B \rightarrow S) =$
- $\lambda S . A \rightarrow S \wedge B \rightarrow S$

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