Simplification of Disjunctive Antecedents

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1. Granting Equal Rights

If we know that the sentence in (1) is true, then—so the usual story goes—we can surely conclude that *at least one* of these two propositions is the case: that Obelix carried menhirs or that he danced with his girlfriend.

(1) Obelix carried menhirs or danced with his girlfriend.

But suppose we read the following statement in a declaration of rights:

(2) Obelix may carry menhirs or eat wild boar.

For (2) to be true, is it sufficient for one of the disjuncts to be permitted? No. Out of a sudden, that is not enough. The declaration is granting Obelix the right to carry menhirs *and* the right to eat wild boar. How come?

Unlike in (1), the disjunction in (2) is under the scope of a deontic modal. Granting equal rights to each disjunct in modal contexts has proved to be a difficult task. It is a classic problem in deontic logic (see Ross 1941; von Wright 1969; Lewis 1975; Kamp 1973, 1978; Hintikka 1979; Hilpinen 1982; Higginbotham 1986), and it has sparked some interest in the semantics literature (Vainikka 1987; Higginbotham 1991; Zimmerman 2001; Aloni 2002; Blutner 2003; Geurts 2003). This paper deals with how to grant equal rights to each disjunct in the antecedent of a counterfactual.

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2. Simplification of Disjunctive Antecedents

This much I know about World War II: Spain didn't join Hitler, Hitler would have been pleased if she had joined him, and he would have been infuriated if she had joined his enemies—a remote possibility, given that she was a fascist country. It is on the basis of such knowledge that I am ready to reject the following claim:

(3) If Spain had fought in alliance with America or in alliance with Germany in World War II, Hitler would have been pleased. (Nute 1980, 157)

I take (3) to be false in our world because if Spain had fought in alliance with America, Hitler would *not* have been pleased.

As clear-clut as our intuitions might be, a minimal change semantics for counterfactuals of the Stalnaker–Lewis type (Stalnaker 1968; Stalnaker and Thomason 1970; Lewis 1973) does not validate the inference when coupled with a classic truth-functional semantics for disjunction.

To see why, take first a simple counterfactual, like the one in (4):

(4) If kangaroos had no tails, they would topple over. (Lewis 1973, 1)

Kangaroos do have tails. The sentence in (4) invites considering alternative scenarios where they don't. Sure there are quite a few. In some of them kangaroos don't topple over: they defy gravity—if there is any— have crutches, or are born with a giant wheel—what have you. But those scenarios are somehow too remote. The type of scenarios the sentence invites us to consider, the ones where kangaroos *do* topple over, differ as little as possible from what we know to be the case. It is in those scenarios that tailess kangaroos topple over.

The situation is illustrated in Fig. 1. The concentric circles —a *system of spheres*— are meant to capture our intuitions about similarity among worlds. Each concentric circle is meant to depict the set of worlds that are equally close to the actual world. The smaller the circle, the closer to the world of evaluation w the worlds are. The ellipse contains the worlds where kangaroos have tails: to check whether the sentence is true in w, we need to look at the ones within the smallest circle.

Just for the sake of clarity, let us stick to a toy semantics for counterfactuals in the spirit of the Stalnaker and Lewis proposals. According to it, a sentence like (4) claims that the consequent holds throughout *the* set of closest worlds in which the antecedent is true.[1] In symbols, where $\mathfrak{M}_{\$_w}$ is a class selection function that picks out for any evaluation world w, any system of spheres $\$_w$ and any proposition p, the set of worlds that are the closest to w in which p is true,

(5) $w \in [\![\text{If } \alpha\text{, then would } \beta]\!] \Leftrightarrow \mathcal{M}_{\$_w}([\![\alpha]\!]) \subseteq [\![\beta]\!]$

Now consider again the sentence in (3):

[1] I assume all worlds are comparable, but I am glossing over two important issues: whether there is a limit to closeness (the Limit Assumption) and whether there might be ties in closeness. I will be just assuming that there is a limit and that there might be ties. The differences are inmaterial for the problem at stake.

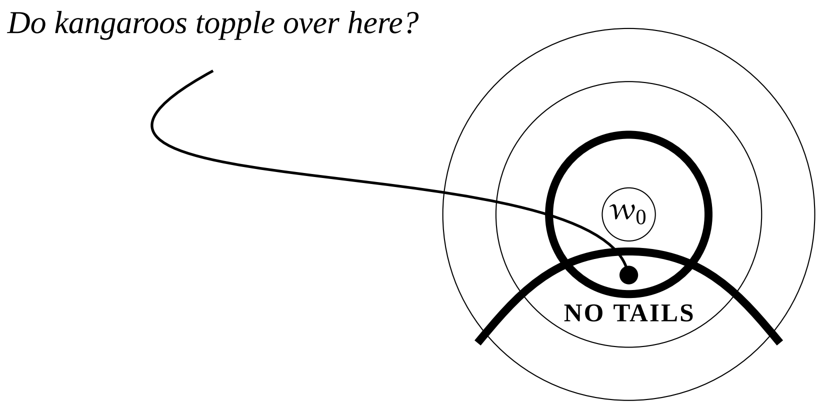

Figure 1: A Toy Minimal Change Semantics

(6) If Spain had fought in alliance with America or in alliance with Germany in World War II, Hitler would have been pleased. (Nute 1980, 157)

The little I know about World War II suffices to provide firm intuitions about how similar a world where Spain joins Germany is when compared to one where she joins the U.S.: the worlds where Spain joins the U.S. are more distant than those where she takes sides with Germany. Fig. 2 depicts the kind of similarity structure that captures our intuitions.

Our toy semantics checks whether the consequent is true in the closest worlds where the proposition expressed by the antecedent is true. Assume that English disjunction corresponds to the familiar boolean operation. Then the disjunctive antecedent expresses the proposition that is true in worlds where at least one of the disjuncts is true.

(7) $w \in [\![(6)]\!] \Leftrightarrow \mathcal{M}_{\$_w}([\![\text{Spain} \oplus \text{America} \vee \text{Spain} \oplus \text{Germany}]\!]) \subseteq [\![\text{Hitler is happy}]\!]$

As a consequence, the most remote disjunct is neglected: the closest worlds where at least one of the disjuncts is true are all worlds where at most one of them is—worlds where Spain joins Germany. And those are surely worlds where Hitler is pleased: the sentence is predicted to be true, contrary to our intuitions.

3. Lewis' Insight

Creary and Hill (1975) and Fine (1975) spotted the problem right after the appearance of Lewis' monograph on counterfactuals (Lewis 1973). Nute (1975) dubbed the problematic inference pattern "Simplification of Disjunctive Antecedents":

(8) *Simplification of Disjunctive Antecedents*
If $\alpha \vee \beta$, then would γ
Therefore, if α, then would γ and if β, then would γ

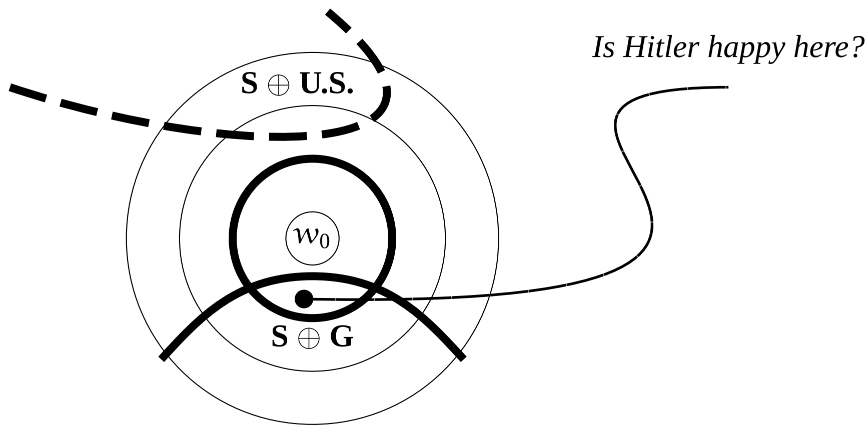

Figure 2: The Problem

Although the pattern in (9) is valid in propositional logic, Nute (1975) showed that if Lewis' logic was to validate Simplification and keep the assumption that disjunction is the usual propositional logic connective, it would be hopelessly trivialized, for its counterfactual operator would then be provably equivalent to material implication.

(9) a. $(p \vee q) \rightarrow r$
b. $\models (p \rightarrow r) \wedge (q \rightarrow r)$

Ellis et al. (1977) presented the Simplification pattern as an insurmountable problem for possible-worlds semantics. McKay and Inwagen (1977) and Lewis (1977) immediately reacted against them. From then on, the problem became a hot topic, which eventually found its way into the textbooks (Bennett 2003, 168-171).

There are two ways out of the problem: to dismiss a minimal change semantics for counterfactuals or to dismiss the assumption that the disjunction we see in the antecedent of a counterfactual is the usual boolean operation. Both strategies have been tried. On one side of the debate, Warmbrōd (1981) rejects the minimal change semantics and Nute (1980) modifies it by imposing an extra condition on the class selection function. On the other side, the majority of the literature (which Nute (1984) calls "the translation lorists") rejects *tout court* the assumption that disjunction in the antecedent of counterfactuals is the usual boolean function, though most of the time only offers as an alternative a *brute force* mechanism that translates disjunction as a wide scope conjunction (Loewer 1976; McKay and Inwagen 1977; Humberstone 1978; Nute 1978; Hilpinen 1982; Hardegree 1982).[2]

The problem of giving each disjunct equal rights would indeed dissolve in mid-air if the logical form of disjunctive counterfactuals assured that the disjunction in the antecedent

[2]Nute 1975, 1978, 1984 assumed disjunction could be interpreted as the usual truth–functional connective but treated the antecedent of counterfactuals as hyperintensional contexts in which the usual rules of substitution of logical equivalents do not hold. Nute (1984) gives a nice overview of the debate.

had the force of a *wide scope* conjunction (or, equivalently, a universal quantification, as in (10)).

(10) $\forall p : p \in \left\{ \begin{array}{c} \text{Spain joins the U.S} \\ \text{Spain joins Germany} \end{array} \right\}$ [if p, Hitler would have been pleased.]

But the translation lorists have been accused of proposing an *ad hoc* solution. And rightly so —it seems— for two reasons. First, because they propose to translate disjunction as wide scope conjunction only in the antecedents of counterfactuals. And second, because they offered no account of why: Where does the universal quantification in (10) come from? And how come disjunction sets up a domain of quantification?

As for the first complaint, Lewis (1977) already pointed out that the antecedent of counterfactuals is *not* the only context where disjunction is seemingly interpreted as wide scope conjunction. Around the time of his reply, generative semanticists (Horn 1976; Legrand 1975) were actively discussing other contexts:

(11) a. You may eat cake or pie, as you wish. (Legrand 1975, 79)
b. Therefore, you may eat cake and you may eat pie.

(12) a. It's possible that he has chicken pox or measles. (Legrand 1975, 79)
b. Therefore, it's possible that he has chicken pox and it is possible that he has measles.

The second complaint may very well be unmotivated too. Lewis (1977) suggested in passing that the locus of the conjunctive force might be the modal operator:

> "Perhaps the 'either ... or' ... [here] is a three-place operator. We could define it as follows:
>
> $$\left. \begin{array}{c} A \\ B \end{array} \right\} \Box\!\!\rightarrow C =^{\mathrm{df}} (A \Box\!\!\rightarrow C) \wedge (B \Box\!\!\rightarrow C)$$
>
> ... The seeming disjunctive antecedent is an illusion of surface structure."
> (Lewis 1977, 360)

Lewis' informal suggestion faces two major problems: one conceptual and one empirical. The conceptual problem will be obvious to the reader —as it was to Lewis— and it might explain why few followed up on the suggestion: it seems hopelessly *ad hoc*. After all, the only motivation for assuming that his disjunctive counterfactual operator *distributes conjunctively* over the alternatives in the antecedent is the behavior of disjunction in the antecedent of counterfactuals, which is precisely what the disjunctive counterfactual operator is purported to explain. The empirical problem is that disjunctions in the antecedent of counterfactuals are not always equivalent to wide scope conjunctions. Take, for instance, the following example:

(13) If the U.S. devoted more than half of its national budget to defense or to education, it would devote more than half of its national budget to defense.
(Nute 1984, 414)

Simplifying the antecedent here would lead to a contradiction: no world in which the U.S. devotes more than half of its national budget to education is a world where it devotes more than half of its national budget to defense. Yet the sentence is not contradictory: it claims that the U.S. is more likely to spend more than half of its money in defense than in education.

Lewis' suggestion should not be dismissed so fast. First, it is not as *ad hoc* as it might seem: we know that modal operators should indeed distribute over alternative individuals to account for the behavior of indefinites in the antecedents of conditionals (Heim 1982). Second, despite initial appearances, once Lewis' suggestion is cast in more familiar terms, it can be shown to capture the whole range of possible readings for disjunctions in the antecedent of counterfactuals. Let me explain.

4. Unselective Binding

At the very heart of our problem lies the assumption that disjunction in the scope of the counterfactual operator has existential force. This shouldn't be taken for granted, though. Five years after Lewis made his informal suggestion, Rooth and Partee (1982) concluded —based on its atypical scopal behavior— that disjunction lacks any quantificational force whatsoever, exactly as Heim (1982) had proposed for indefinites. All disjunction does in the Rooth and Partee (1982) system is restrict the possible values of a free variable. The quantificational force disjunctive sentences seem to be equipped with comes from other quantifiers in the sentence. If there is none in sight, as in the case of (1)—repeated below as (14), with an analysis in Rooth and Partee's term—a default existential closure operator is called upon.[3]

(14) Obelix carried menhirs or ate wild boar. $\rightsquigarrow$

$$\exists \mathcal{P} \left[\mathcal{P}(\textbf{obelix}) \wedge \left[\begin{array}{c} \mathcal{P} = \textbf{carry}-\textbf{menhirs} \\ \vee \\ \mathcal{P} = \textbf{ate}-\textbf{wild}-\textbf{boar} \end{array} \right] \right]$$

Our counterfactuals contain a modal operator, a universal quantifier that ranges over possible worlds. That could very well be the source of the conjunctive force —just as Lewis suggested— if we let it range over both worlds and the alternatives introduced by disjunction. But is there any independent need for such a move? There is. Assuming that modal operators can be *unselective binders*, quantifiers that range over worlds and individual alternatives is a standard move, one already taken by Heim (1982) to explain the universal force of indefinites in the antecedent of conditionals, as in (15a).

(15) a. If a cat has been exposed to 2, 4-D, it must be taken to the vet immediately. (Heim 1982, 171)

b. $\approx$ Every cat that has been exposed to 2, 4-D must be taken to the vet immediately.

[3] In what follows,"$\rightsquigarrow$" denotes a translation function from English into a formal language with quantification over various types. $\mathcal{P}$ is a variable ranging over properties.

Let's then stick to it. We need to let the modal universally quantify over the alternatives introduced in the antecedent *and*—this is the important point—measure similarity with respect to each: we want our counterfactual to say that for *every disjunct* $\mathcal{P}$, the consequent must hold in *all* the closest worlds where $\mathcal{P}$ is true.

We start by adopting Rooth and Partee (1982) analysis of disjunction. The antecedent of our counterfactual introduces a free variable, whose possible values are restricted by means of a disjunctive condition:

(16) If Spain had joined the U.S. or Germany $\rightsquigarrow$

$$\mathcal{P}(\mathbf{sp}) \wedge \begin{bmatrix} \mathcal{P} = \mathbf{join{-}the{-}u.s.} \\ \vee \\ \mathcal{P} = \mathbf{join{-}g} \end{bmatrix}$$

To make it quantify over the alternatives introduced by the antecedent, we will define our modal operator as ranging over pairs of worlds and variable assignments (just as in Heim (1982)). The antecedent sets up a domain of quantification: the set of pairs of worlds w and variables assignments g such that the antecedent is true in w given the value g assigns to the free variable.

(17) $\{\langle w, g\rangle : w \in [\![\mathcal{P}(\mathbf{sp}) \wedge (\mathcal{P} = \mathbf{join{-}the{-}u.s} \vee \mathcal{P} = \mathbf{join{-}g})]\!]^{g}\}$

Since it contains a free variable, the antecedent will only express a proposition under an assignment of a value to its variable. There are only two types of assignments under which the antecedent can express a non-contradictory proposition: assignments mapping $\mathcal{P}$ to the property of joining the U.S. and assigments mapping $\mathcal{P}$ to the property of joining Germany. And there are only two types of worlds in the pairs in the set: those where Spain joins Germany, and those where she joins the U.S. We can now let our operator select the closest worlds *of each type* in that set: the closest where Spain joins Germany and the closest where she joins the U.S to check whether the consequent holds in them.

I illustrate the way our counterfactual operator works in (18) below. Clause (1) restricts the assignments quantified over in the usual way: it just looks at those that differ at most in the value that they assign to $\mathcal{P}$. Clause (2) restricts further the pairs of worlds and assignments in the domain of quantification: they must be worlds in which the proposition expressed under the assignment is true. That has the effect of making the operator look only at the assignments that map $\mathcal{P}$ to the property of joining the U.S. or the property of joining Spain and at worlds where Spain joins the U.S. or where she joins Germany. In fact, the antecedent of the implication lets it look only at those worlds that are the closest *of its type*. Since there are only two types of worlds so far (worlds where Spain joins Germany and worlds where she joins the U.S.) it looks at the closest worlds where Spain joins Germany *and* the closest worlds where she joins the U.S. It then checks whether the consequent is true in them.[4]

[4]"ν is a variable over variables in the intermediate language. The unselective operator takes a set of variables.

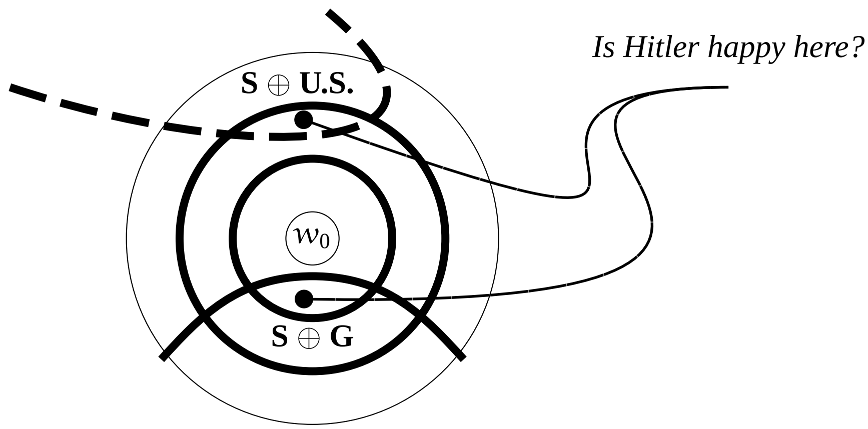

Figure 3: The Problem is solved

(18) For any w, g, and any system of spheres $\$_w$,

$$w \in \left[\!\!\left[\textbf{would}\,\{\mathcal{P}\} \left[\mathcal{P}(\textbf{sp}) \wedge \begin{pmatrix} \mathcal{P} = \textbf{join}{-}\textbf{the}{-}\textbf{u}.\textbf{s} \\ \vee \\ \mathcal{P} = \textbf{join}{-}\textbf{g} \end{pmatrix} \right] [\textbf{pleased}(\textbf{h})] \right]\!\!\right]^{g}$$

iff for all $\langle w', g' \rangle$ such that

1. For all $v \notin \{\mathcal{P}\}$, $g'(v) = g(v)$
2. $w' \in [\![\mathcal{P}(\textbf{sp}) \wedge (\mathcal{P} = \textbf{join}{-}\textbf{the}{-}\textbf{u}.\textbf{s} \vee \mathcal{P} = \textbf{join}{-}\textbf{g}]\!]^{g'}$

$$w' \in \mathfrak{M}_{\$_w}\left(\left[\!\!\left[\mathcal{P}(\textbf{sp}) \wedge \begin{pmatrix} \mathcal{P} = \textbf{join}{-}\textbf{the}{-}\textbf{u}.\textbf{s} \\ \vee \\ \mathcal{P} = \textbf{join}{-}\textbf{g} \end{pmatrix} \right]\!\!\right]^{g'} \right) \rightarrow w' \in [\![\textbf{pl}(\textbf{h})]\!]^{g'}$$

By letting the modal —a universal quantifier of sorts— range over the disjuncts, we validate Simplification. The situation is depicted in Fig. 3.

5. The Virtues

The mere fact that we *can* validate Simplification by appealing to unselective binding does not mean that we *have to*. And yet I can think of two reasons why we *may want to*. First, resorting to unselective binding not only validates Simplification, but it also gives us a full range of possible readings for disjunctions in the antecedent of counterfactuals—all of which are attested, as I will show below. That is in itself a welcome result, especially since part of the debate revolved around the issue of whether Simplification should be always valid. But second—and more importantly—resorting to unselective binding is a parsimonious move. Indefinites trigger quite the same problem and the unselective binding approach solves it in quite the same way. And we don't need to postulate anything it hasn't already been argued for independently: Rooth and Partee (1982) already resorted to unselective binding to explain the particular scopal properties of disjunction.

5.1. Two Other Readings

The standard assumption for indefinite NPs of the type of English *a* + N is that they lack quantificational force of their own. Yet Schubert and Pelletier (1989) showed that they can have existential force within the antecedent of epistemic conditionals, as in (19).

(19) If I have a quarter in my pocket, I'll put it in the parking meter.
(Schubert and Pelletier 1989, 200)

If disjunction were really parallel to an *a*-headed indefinite—as Rooth and Partee (1982) proposed—it would have existential force in the antecedent of conditionals as well. And we have already seen that it does. The counterfactual in (20) does not measure similarity with respect to each disjunct independently: it talks about worlds where *at least one* of them is true.

(20) If the U.S. devoted more than half of its national budget to defense or to education, it would devote more than half of its national budget to defense.
(Nute 1984, 414)

The analysis derives the correct reading once we have existential force within the antecedent of counterfactuals. Remember that the modal quantifies over pairs of worlds and variable assignments $\langle w, g\rangle$ such that w is one of the closest worlds where the proposition expressed by the antecedent under g is true. In the case we have analyzed in section 4, the antecedent contained a free variable. As a consequence, the proposition it expressed varied with the choice of variable assignment. Similarity was measured with respect to the different propositions expressed. Things are slighty different for the case in (20). We are now bound to assume that disjunction gets its existential force from whatever source indefinites get it. Disregarding the condition on variable assignments, the domain of quantification is restricted as follows:

(21) For each $\langle w, g\rangle$ in the domain of quantification:

1. $w \in [\![\exists\{\mathcal{P}\}[\mathcal{P}(\mathbf{u.s.}) \wedge (\mathcal{P} = \mathbf{in{-}education} \vee \mathcal{P} = \mathbf{in{-}defense})]]\!]^g$
2. $w \in \mathfrak{M}_{\$_w}\left(\left[\!\!\left[\exists\mathcal{P} \left[\mathcal{P}(\mathbf{u.s.}) \wedge \left(\begin{array}{c} \mathcal{P} = \mathbf{in{-}education} \\ \vee \\ \mathcal{P} = \mathbf{in{-}defense} \end{array} \right) \right] \right]\!\!\right]^g \right)$

The proposition expressed by the antecedent does not vary with the assignments in the pairs. Similarity is only measured with respect to the proposition that the U.S devotes more than half of its national budget to at least one of these two areas: education and defense. We can safely assume that the worlds where the U.S. devotes more than half of its budget to defense are the closest. Since we are not comparing similarity independently for each disjunct, we are throwing away the worlds where the U.S. invests more than half of its budget to education.

So far, we have attested two ways the free variable introduced by disjunction can be bound: by the modal operator or existentially—by default—within the antecedent. There is a third. Consider the following

> SCENARIO: As usual, there are two doors in the arena: A and B. But this time Caligula hid a tiger behind door A, ready to tear the gladiator to pieces. Before the games started, the strongest storm ever broke out and Caligula had to postpone the feast.

Claudius reports to Naso Caligula's cruel invention as follows:

(22) *Claudius (to Naso):* "If the gladiator had opened door A, he would have been torn to pieces by a tiger."

A day later, Naso reports to Nero what Claudius told him by uttering the following counterfactual:

(23) *Naso (to Nero):* "If the gladiator had opened door A or door B (I forgot which), he would have been torn to pieces by a tiger!"

There are two alternative properties under discussion here: opening door A and opening door B. Similarity is measured with respect to one of them. As far as the speaker knows, either of the alternatives might be the one that counts.

The reader can verify that this reading can be accounted for by assuming that the variable introduced by disjunction remains free within the scope of the modal operator and is existentially bound by the default text-level existential operator discourse representation theories resort to:

(24) $$\exists \mathcal{P} \left[\left[\begin{array}{c} \mathcal{P} = \mathbf{open}{-}\mathbf{A} \\ \vee \\ \mathcal{P} = \mathbf{open}{-}\mathbf{B} \end{array} \right] \wedge \mathbf{would}\emptyset[\mathcal{P}(\mathbf{g})][\mathbf{torn}{-}\mathbf{to}{-}\mathbf{pieces}(\mathbf{g})] \right]$$

5.2. Alternative Individuals

It is not only disjunction that triggers the problem at hand. Indefinites do too. Consider, for instance, another

> SCENARIO: All 25 local police officers are under 30—except for Honorary Inspector Gadget, who is 84. The National Local Policemen Association is awarding a prize to any officer who is at least 85 by this month.

The following sentences are both true in it:

(25) a. If Inspector Gadget were 85 by now, he would be awarded a prize.
b. If a local police officer were 85 by now, he would be awarded a prize.

But they do not mean the same. Yet if indefinites had always existential force within the scope of our modal operator, they should: given the scenario, the closest worlds where a local police officer is 85 by now would be arguably all worlds where Inspector Gadget is. Wrong. Here similarity should be measured *pointwise*, with respect to each local police officer. And yet, much as in the case of disjunction, it can still be measured with respect to at least one of the police officers. Take, for instance the following example:

(26) If a police officer were to win the prize this month, it would be Honorary Inspector Gadget.

The example cannot be read as saying that the closest worlds where, say, officer Keeny is to win the prize are worlds where Inspector Gadget is. It just says that the closest worlds where one of the officers is to win the prize are all worlds where Inspector Gadget does.

Under the unselective binding approach, the examples receive exactly the same analysis proposed for the examples with disjunctions. In the first case, the individual variable contributed by the indefinite is bound by the modal operator:

(27) $\textbf{would}\{x\}[\textbf{officer}(x) \wedge \textbf{is}{-}\textbf{85}(x)][\textbf{win}{-}\textbf{prize}(x)]$

I leave to the reader to verify that similarity is then measured with respect to each local police officer. In the second, the indefinite is existentially bound and similarity is measured with respect to worlds where at least one individual satisfies the antecedent.

(28) $\textbf{would}[\exists\{x\}(\textbf{officer}(x) \wedge \textbf{is}{-}\textbf{85}(x))][\textbf{win}{-}\textbf{prize}(x)]$

6. Concluding with a Potential Wrinkle

Let me conclude by pointing out a potential wrinkle. The unselective binding analysis grants equal rights to each disjunct in the antecedent of a counterfactual by universally quantifying over them. For the cases where Simplification is valid, it just says that for *every disjunct* $\mathcal{P}$, the consequent must hold in *all* the closest worlds where $\mathcal{P}$ is true. If the free variable introduced by disjunction is bound within the scope of **would**, the analysis predicts that Simplification should simply fail.

Larson (1985) reports a contrast between (29a) and (29b):

(29) a. If Mary is swimming or dancing, then Sue is. (Rooth and Partee 1982)
b. If Mary is either swimming or dancing, then Sue is. (Larson 1985)

According to him, the sentence in (29a) has one reading (let's call it *the copycat reading*) under which it is false if Sue is dancing when Mary is swimming or the other way around. The sentence in (29b) does not have that reading. The contrast—Larson points out—is to be expected if (i) the copycat reading is a case where the free variable introduced by disjunction is bound by a universal quantifier that also binds a free variable in the consequent (as in (30a)); and (ii) *either* blocks binding —maybe because it is itself an existential quantifier that intervenes between the universal and the free variable (as in (30b)).

(30) a. $\forall\{\mathcal{P}\}[(\mathcal{P}(\textbf{mary}) \wedge \mathcal{P} = \textbf{swimming} \vee \mathcal{P} = \textbf{dancing}) \rightarrow \mathcal{P}(\textbf{sue})]$

b. $\forall[\exists\{\mathcal{P}\}(\mathcal{P}(\textbf{mary}) \wedge \mathcal{P} = \textbf{swimming} \vee \mathcal{P} = \textbf{dancing})\ldots]$

If *either* were indeed an existential quantifier that marks the scope of disjunction, under the unselective binding analysis, it should block Simplification. The example in (31) shows that it doesn't:

(31) If Spain had fought in alliance with either the U.S. or Germany, Hitler would have been pleased.

The argument finds its parallel in the realm of indefinites. Across languages, we find a class of indefinites (dubbed "*some* indefinites" in Becker (1999)) that seem to retain their existential force everywhere. Spanish *algún*, German *irgendein* and English *some* are some examples:

(32) a. Usually, a student is tall.
b. $\approx$ Most students are tall.

(33) a. Usually, some student is tall.
b. $\not\approx$ Most students are tall.

If *some*-indefinites are real existentials, they should block Simplification. And yet, they don't. The counterfactual in (34) can be naturally read as saying that the culprit would have been brought to justice if *anyone* had witnessed the accident.

(34) If someone had witnessed the accident, the culprit would have been brought to justice. (Ellis et al. 1977)

We are missing something. Before giving up on the unselective binding analysis, though, we have to be sure that we can safely assume that both *either* and the *some* indefinites are inherently existentials. And both assumptions are problematic. Kratzer (2003) argues that, despite appearances, the existential force of the *irgendein* series in German is due to external operators. And *either* ... *or* disjunctions have well-known free-choice "conjunctive" readings that seemingly defy the existential analysis (Higginbotham (1991)):

(35) a. This machine takes either nickels or dimes (it doesn't matter which). (An *either* variant over Vainikka 1987, 177)
b. $\approx$ This machine takes nickels *and* it takes dimes.

Finding out about the semantics of *either* ... *or* disjunctions will be my next step.

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