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Counterfactual Scorekeeping*

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1 Loophole

Counterfactuals like

(1) If Sophie had gone to the parade, she would have seen Pedro dance

are supposed—by the lights of the orthodox account at any rate—to mean something very different from what any strict conditional means. Glossing the details of that account a bit, (1) is true at i iff all the worlds most like i in which Sophie is a parade goer are also worlds in which she is a witness to Pedro's dancing. There is no modal operator such that a counterfactual like this amounts to that operator taking widescope over a material conditional with the same antecedent and consequent.

But there is a loophole, mentioned by Lewis just to be dismissed:

> It is still open to say that counterfactuals are vague strict conditionals . . . and that the vagueness is resolved—the strictness is fixed—by very local context: the antecedent itself. That is not altogether wrong, but it is defeatist. It consigns to the wastebasket of contextually resolved vagueness something much more amenable to systematic analysis than most of the rest of the mess in that wastebasket. (Lewis, 1973, p. 13)

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Something in the neighborhood of this loophole is right. But it is no mere loophole, and exploiting it is not defeatist.

Very roughly: I will argue that counterfactuals like (1) are, indeed, strict conditionals after all. They amount to a necessity modal, scoped over a material conditional, just which such modal being a function of context. The denotation of the modal is a function of the set s of worlds over which it quantifies, s's value being a function of (among other things) material in the *if*-clause. Slightly—but only slightly—less roughly: counterfactuals carry *entertainability presuppositions* that their antecedents be possible with respect to the counterfactual domain. As with other presuppositions, we sometimes get by when they are not met: a *successful* assertion of a counterfactual in context can change the conversational score, selecting a domain that satisfies the presupposition. It is with respect to the score thus changed that the counterfactual is a strict conditional. If the utterance is unsuccessful—if there is disagreement between the conversational partners about whether the score should be so changed—then there is no accommodation of the entertainability presupposition and the story I want to tell will be idle. That is welcome: my interest is less in the *content* of counterfactuals than it is in getting straight about their *context change potential*—how a successful utterance of a stretch of counterfactual discourse changes the information state of a hearer when she accepts the news conveyed by it.[1]

To see that this kind of story is not the stuff of defeatism we only have to see that the interaction between context and semantic value, mediated by a mechanism of modal accommodation, can be the stuff of formal and systematic analysis. To see that this is not a mere loophole, we only have to see that facts about counterfactuals in context—the discourse dynamics surrounding them—are best got at by the kind of story I want to tell.

[1]The problems I am interested in here have to do with the relationship between counterfactual and context. So I will be setting aside how the semantics of counterfactuals interacts with factual discourse. Put another way: I am interested in how conversational score is affected by counterfactuals and not how that score, once changed, might be *reset* by some bit of factual discourse (though I do venture some tentative suggestions in Section 9). That said, the phenomena I am interested in having to do with the interaction between context and counterfactual do have obvious relatives in indicative conditionals and in cases of modal subordination. The general kind of story I offer of the former here could, with some massaging, be told for the latter.

2 Thinning

A hallmark of counterfactuals is that they do not allow for thinning—take a contingently true counterfactual: it is just not so that it always retains its truth if we conjoin an arbitrary bit to its antecedent. Lewis famously used just this fact about counterfactuals—that their antecedents cannot invariably be strengthened—to argue that they cannot be strict conditionals. An example:

(2) a. If Sophie had gone to the parade, she would have seen Pedro dance; but of course,
b. if Sophie had gone to the parade and been stuck behind someone tall, she would not have seen Pedro dance.

If counterfactuals could be thinned then conjunctions like (2)—*Sobel sequences*—would be inconsistent.[2] But sequences like this are not inconsistent. And, of course, it is a fact about strict conditionals that they permit such thinning and thus predict inconsistency where there is none.

Take any strict conditional $\Box(p \rightarrow q)$, and suppose that the modal is given a very standard semantics relativized to a relevant domain s_c (assigned or inherited from context c):

(3) $[\![\Box\varphi]\!]^{c,i} = 1$ iff $s_c \subseteq [\![\varphi]\!]$

Analyzing (2) as a conjunction of such strict conditionals is a disaster.[3] For assuming (2a) is true, there is no room for (2b) to be (non-vacuously) true as well. The set of worlds in which Sophie is a parade goer includes the worlds in which she is a parade goer *and* gets stuck behind someone tall—*a fortiori* the set of worlds in s_c in which Sophie is a parade goer includes the worlds in s_c in which she is a parade goer *and* gets stuck behind someone tall. Whence, if the former are included in the set of worlds where she is a witness to Pedro's dancing, so must be the latter. And that—barring our loophole—is pretty bad news for any strict conditional analysis.

[2] Sobel (1970).

[3] Three formal conventions. First: officially a context determines a domain s_c and a world i_c. But we will ignore embeddings throughout; so the world of the index will not differ from i_c. For the same reasons, we can omit reference to c outright. Second: never mind that i appears only on the left-hand side of (3): s_c will, in general, be a function of i. Third: assume, for now, that if a strict conditional is true throughout a given relevant domain, then that domain has some antecedent worlds in it.

But thinning cuts both ways. Although the conjunction in (2) is unremarkable, not so in reverse order:

(4) ??If Sophie had gone to the parade and been stuck behind someone tall, she would not have seen Pedro dance; but of course, if Sophie had gone to the parade, she would have seen Pedro dance.

Far from unremarkable, this sounds for all the world like a contradiction.[4]

We might try to explain away this asymmetry insisting that, despite appearances, (4) is equally unremarkable—we have merely elided the qualification *Sophie's view is unobstructed* in the antecedent of the second conditional. Making this qualification explicit:

(5) If Sophie had gone to the parade and had her view been unobstructed, she would have seen Pedro dance.

Swapping (5) for the second conjunct of (4) would give us a pretty unremarkable sequence of counterfactuals—about as unremarkable as (2).

This clearly will not do. Agreed that such a sequence is unremarkable. Nothing much follows from that. If the qualification is implicit in (4) it must also be implicit in the original Sobel sequence (2). Consider:

(6) a. If Sophie had gone to the parade and had her view been unobstructed, she would have seen Pedro dance; but of course,
b. if Sophie had gone to the parade and been stuck behind someone tall, she would not have seen Pedro dance.

But such a pair of counterfactuals could scarcely be evidence against thinning. The antecedent *Sophie goes to the parade and she is stuck behind someone*

[4]This was, I think, first pointed out by Heim and reported in von Fintel (2001). The classic Lewis example is:

(i) If the USA were to throw its nukes into the sea tomorrow, there would be war; but of course, if the USA and all the other superpowers were to throw their nukes into the sea tomorrow there would be peace.

Commuting the conjuncts is not good:

(ii) ??If the USA and all the other superpowers were to throw their nukes into the sea tomorrow there would be peace; but of course, if the USA were to throw its nukes into the sea tomorrow, there would be war.

We will look at von Fintel's analysis in Section 5.

tall is simply not got by conjoining *Sophie is stuck behind somone tall* and *Sophie goes to the parade and her view is unobstructed*. So there is no elided qualification in (2), and this speaks—conclusively, I think—against positing it in (4).[5]

The asymmetry between (2) and (4) is troublesome if, like the classic Stalnaker–Lewis semantics, counterfactuals are treated as variably strict conditionals. Since the set of most similar worlds in which Sophie goes to the parade is not guaranteed to include the set of most similar worlds in which both Sophie goes to the parade and is behind someone tall, (2) is rightly predicted to be consistent: the former can easily be worlds in which she sees Pedro dance and the latter worlds where she does not. Changing the order in which we find these sets of worlds does nothing to change these facts, and so (4) is also predicted to be consistent.

The point of a Sobel sequence is that counterfactuals are resource-sensitive. The point of a Sobel sequence's ugly cousin—got by reversing the order of the counterfactuals—is that counterfactuals are resource-affecting. In both cases there seems to be important interaction between counterfactual antecedents and the parameters of context relevant to the semantics of the conditionals as a whole. And that is something a story exploiting the loophole might shed some light on.

3 Gloss

Suppose counterfactuals are strict conditionals: a necessity modal—just which modal depending on very local context—scoped over a plain conditional.

Here is an intuitive gloss of the interaction between context and counterfactual. One of the resources provided by context is a domain of worlds over which modals quantify. *If*-clauses presuppose that their complements are entertainable. In the case of a counterfactual *if*-clause, the presupposition is that the complement be possible relative to the counterfactual domain—the domain of worlds over which counterfactual modalities quantify. Call such a (modal) presupposition an *entertainability presupposition*. This presupposition projects to the entire conditional.[6] If the presupposition isn't met—*ceteris paribus* and within certain limits—it is accommodated, the domain undergo-

[5] Similarly for the pair in footnote 4: there may be some temptation to argue that the second (unhappy) sequence has an elided *only* or *alone* in the antecedent of the second (thinned) conditional. We had better resist such temptations.

[6] A familiar sort of example of a presupposition triggered in an antecedent projecting:

ing a bit of change to satisfy the presupposition. It is with respect to this post-accommodation domain that the counterfactual is a strict conditional.

It is easy enough to see how a story along these lines might handle the delicate facts about thinning. Take a Sobel sequence:

(7) If had been p, would have been q; but of course, if had been $(p \wedge r)$, would have been $\neg q$

The first conjunct presupposes (in the relevant sense) $\Diamond p$, and asserts that $\Box(p \rightarrow q)$. Suppose the intial domain s_c has no p-worlds, but that we accommodate: s_c shifts to a slightly larger domain incuding some. The necessity modal then takes this shifted domain as input to its semantics. Suppose that all p-worlds in this posterior domain are q-worlds (so that the first counterfactual is true with respect to this domain). The second (thinned) conditional presupposes (in the relevant sense) $\Diamond(p \wedge r)$ and asserts $\Box(p \wedge r \rightarrow \neg q)$. But the domain s_c-shifted-by-the-first-*if* may well contain no $(p \wedge r)$-worlds—the nearest p-worlds, after all, need not include the nearest $(p \wedge r)$-worlds. And so the domain expands a bit further, the necessity modal for *this* conditional taking this even larger domain as input to its semantics. And it is quite possible that every $(p \wedge r)$-world in this new domain is a $\neg q$-world. So it is that the second counterfactual is a strict conditional over a different, larger domain than is the first. No wonder Sobel sequences can be consistent.

Things are different when we look at a Sobel sequence's ugly cousin. For if we *first* interpret the thinned counterfactual, our domain gets pretty big straightaway: the thinned conjunct presupposes $\Diamond(p \wedge r)$ and asserts $\Box(p \wedge r \rightarrow \neg q)$. Suppose that in the (comparatively larger) post-accommodation domain all the $(p \wedge r)$-worlds are $\neg q$-worlds. This domain is the input for interpretting the original (unthinned) counterfactual. But the presupposition $\Diamond p$ is already met here, and so there is no accommodating shift. But, by hypothesis, all of the $(p \wedge r)$-worlds in the big domain are $\neg q$-worlds. Hence not all of the p-worlds in this domain are q-worlds. The two strict conditionals end up quantifying over the same domain. No wonder a Sobel sequence's ugly cousin cannot be consistent.

(iii) If Sophie realizes that there is no more ice cream, there will be trouble.

The presupposition that there is no more ice cream, triggered by the factive *realizes*, projects to the whole sentence. So if counterfactual antecedents trigger entertainability presuppositions we should expect them to project to the counterfactuals as a whole.

What is left is to turn this intuitive gloss into a proper analysis. I will offer a first pass at an analysis, and then draw some initial comparisons. Finally, we will look at *might*-counterfactuals and refine the analysis.

4 Basics

The basic idea is simple. Suppose we divide the semantic labor of counterfactuals, factoring the meaning of a counterfactual into its entertainability presuppositions and its semantic value. Accommodating a missing presupposition can change the relevant contextual parameter for the assignment of semantic value. I have assumed that it is a domain—a set of worlds—that is assigned by or inherited from context. But it is a bit tidier to think of this parameter as a *nested set* of domains assigned by or inherited from context. Let's call it a *hyperdomain*. The semantics first computes the accommodation-induced changes to this parameter. That is the context change potential (CCP) of a counterfactual. The value of the parameter so changed is the relevant domain for the modals, and the domain with respect to which the counterfactual is a strict conditional.

A domain is simply a set of worlds; a hyperdomain is a set of such domains, ordered by $\subseteq$. But not all worlds are created equal. Some worlds—perhaps because they violate laws that we take to be non-negotiable when we entertain counterfactual antecedents or because our particular conversation presumes that such worlds are beyond the pale—are just not relevant for the truth of counterfactuals. Since such worlds are not relevant, they do not make it into a domain and *a fortiori* sets that include them do not make it into a hyperdomain.

An example: Jones invariably wears his hat on rainy days; on days with no rain, he wears his hat or leaves it home at random. Suppose that, as a matter of fact, it is rainy (and so Jones is hatted). Counterfactual antecedents like *If the weather had been fine* ask us to entertain various fine-weather possibilities, looking to sets of worlds consistent with the weather being fine. But no such domain will include worlds in which Jones has no hat at all. Nor will any of them include worlds in which Jones has different hat-wearing predilections, or worlds in which Jones forgets his hat on a rainy day. This is so even though: it is compossible with fine weather that Jones has no hat, compossible with fine weather that Jones has different hat-wearing predilections, and compossible with fine weather that Jones forgets his hat on a rainy day. The invariance between Jones's hat-wearing and rainy weather is just not up for grabs, actually or counterfactually, and so such worlds do not make it into any of the domains over which the counterfactuals quantify.[7]

Given a set W of possible worlds, assume that for a given bit of counterfactual discourse we can settle upon some upper-bound $U \subseteq W$ encoding the information not up for grabs, actually or counterfactually.[8] A hyperdomain at i will have to respect this by not ordering any domain that is not included in U. Just as clearly, all of the nested domains are domains *around* i—the actual state of affairs at i is always relevant, though not decisive, to interpreting a counterfactual at i. Begin by ordering the worlds in U relative to i, the ordering reflecting relative proximity between worlds. Admissible domains are sets of worlds marked off by the ordering: all the worlds not above a chosen w in the ordering form a domain. A hyperdomain is a nested collection of such admissible domains. Insisting that the ordering treat i as (uniquely) minimal guarantees both that i is a lower-bound on domains and that its information is present in all the weaker domains.[9]

Definition 1. Let $\preceq_i$ be a total preorder of $U \subseteq W$ ($\preceq_i$ is transitive and connected) centered on i.

1. ADMISSIBLE DOMAINS
   $\mathbb{D}_i$ is the set of *admissible domains* around i:

   $$s \in \mathbb{D}_i \text{ iff } \exists w \in U \text{ such that } s = \{v : v \preceq_i w\}$$

2. HYPERDOMAINS
   A hyperdomain π (at i) is a subset of $\mathbb{D}_i$ ordered by $\subseteq$.

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[7] See Pollock (1976) and Veltman (2005) for the special status of laws in the semantics of counterfactual constructions.

[8] I will be happy to assume that W is finite.

[9] To say this properly I need some auxiliary notation. I have taken no stand on the nature of the indices involved in the story so far: counterfactuals might traffic in—have their semantic values at and their entertainability presuppositions induce accommodation of—*points* of evaluation (worlds, world–time pairs, or whatever) or they might instead traffic in—have their semantic values at and their entertainability presuppositions induce accommodation of—*sets* of such points. I would like to put off taking that stand. (For now. Later, in the refined analysis, I will take i to be a set of worlds.) But this generality means that we cannot—not straightaway, at any rate—say what we mean when we insist that the ordering over U is centered on i: if i is a point, then we mean that i is the (unique) minimal element in the ordering; if i is a set of such points, then we mean that all and only the points in i are minimal in the ordering. This is more annoyance than problem, so we can define it away: let $\hat{\imath}$ be $\{i\}$ if i is a point, and let $\hat{\imath}$ be i itself if it is a set of such points. Saying that an ordering is centered on i is a bit of natural, but not quite right, shorthand for saying that it is centered on $\hat{\imath}$. I propose we adopt it.

A hyperdomain π at i is a $\subseteq$-nested set of admissible domains from $\mathbb{D}_i$. Equivalently: it is a system of spheres (weakly) centered on i. (Thus: it is a poset; as with all posets it is sometimes convenient to think of it as the set bearing the ordering, leaving the underlying ordering implicit.) And so $\langle s_n, s_m \rangle \in \pi$ only if $s_n \subseteq s_m$. Insisting that $\preceq_i$ is centered on i guarantees that i alone occupies the minimal domain at i. And if i shows up in the innermost domain in $\mathbb{D}_i$, it shows up in all of them. This makes precise the requirement that i be both a lower-bound on domains and that its information is present in all weaker domains.[10]

The intuitive picture is that the context change induced by a counterfactual amounts to a filter on the hyperdomain, only letting those domains pass through that satisfy the relevant entertainability presupposition.[11] Since a hyperdomain is nested, that amounts to successively eliminating innermost domains in it until the entertainability presupposition is met. The (default) initial hyperdomain at i, $\pi_{\mathbb{D}_i}$, is $\mathbb{D}_i$ ordered by $\subseteq$; here no domain compatible with U has been ruled out and only the possibilities compatible with i are entertainable. The other limiting case: $\pi_\perp = \emptyset$; here we have ruled out too much, leaving no domain consistent with the non-negotiable U. Between the extremes are the hyperdomains reachable by accommodating. A relative modal figuring in counterfactual constructions simply acts as a quantifier over the smallest (i.e., most informative) post-accommodation domain. Equivalently: a *would*-counterfactual is a necessity modal indexed to the smallest post-accommodation domain and scoped over a plain conditional.

Assembling the pieces thus far gives us the following:

Definition 2.

1. COUNTERFACTUAL CCP

$$\pi|\textit{if had been p, would have been q}| = \{\langle s_n, s_m \rangle \in \pi : s_n \cap [\![p]\!] \neq \emptyset \text{ and } s_m \cap [\![p]\!] \neq \emptyset\}$$

[10] The appeal to such underlying orderings in constructing hyperdomains, I admit, leaves the impression that the kind of story I want to tell ultimately relies on the same formal apparatus that drives the (classic) variably strict semantics for counterfactuals. The impression is misleading. All that is needed is that we can order domains (sets of worlds) according to the relative ease with which we fall back to them to entertain possibilities. Nothing in that requires a similarity metric on worlds. We can tell the story that I want to tell—I'll gesture at just how toward the end of the paper—so that it is parametric on a choice of a fallback relation, omitting talk of similarity altogether.

[11] See Beaver (1992, 1999) for a similar picture of accommodation.

2. TRUTH-CONDITIONS: COUNTERFACTUALS

$$[\![\textit{if had been } p, \textit{ would have been } q]\!]^{\pi,i} = 1 \text{ iff}$$
$$[\![\Box(p \to q)]\!]^{\pi',i} = 1$$

where $\pi' = \pi|\textit{if had been } p, \textit{ would have been } q|$

3. TRUTH-CONDITIONS: *must*

$$[\![\Box\varphi]\!]^{\pi,i} = 1 \text{ iff } s_\pi \subseteq [\![\varphi]\!]$$

where φ is non-modal and s_π is the $\subseteq$-minimal domain in π

Interpretation of a counterfactual takes a prior hyperdomain as argument, manipulates it so that the entertainability presuppositions are met in every domain in it, and outputs the posterior hyperdomain. That is the job of the CCP-assigning bit of semantic machinery. This is the context that enters into the truth-conditions for the counterfactual: the smallest—i.e., most factually informative—surviving domain is the set of worlds relative to which the counterfactual is a strict conditional. That is the job of the content-assigning bit of semantic machinery. The posterior hyperdomain is also the context that serves as input to the interpretation of the next bit of counterfactual discourse, should there be any.

5 *Would*s

So far I have been happy enough to only consider *would*-counterfactuals. The proposal is that such conditionals are in fact strict: they are some necessity modal, scoped over a plain conditional. Just which necessity modal depends on context.

For limiting-case sequences of counterfactuals—counterfactual discourses that stretch only one conditional long—there is no predictive difference between the truth-values assigned by the classic variably strict semantics and a special case of the strict conditional story I have told. Precisely: assume that i is a world, not a set of such worlds. Then:

(8) If had been p, would have been q

is true at i by the lights of the variably strict semantics iff it is true at $\langle \pi_{\mathbb{D}_i}, i\rangle$ by the lights of our strict semantics.

For the variably strict semantics says that (8) is true at i iff the ($\preceq_i$-)nearest p-worlds are q-worlds; if i is a p-world, then the counterfactual is true at i iff q is true at i. And the strict semantics agrees: we begin with the default hyperdomain $\pi_{\mathbb{D}_i}$ around i, and figure the CCP of the counterfactual, accommodating any entertainability presuppositions that are not met. If i is a p-world, then $\{i\}$—the minimal domain in $\pi_{\mathbb{D}_i}$—admits the presupposition, and accommodation idles. Thus, since $s_{\pi_{\mathbb{D}_i}} = \{i\}$, if p is true at i, then (8) is true at $\langle \pi_{\mathbb{D}_i}, i \rangle$ iff $\{i\} \cap [\![p]\!] \subseteq [\![q]\!]$—that is, iff q is true at i as well. If p is not true at i, then the CCP is non-trivial; the post-accommodation hyperdomain π' orders all domains from $\pi_{\mathbb{D}_i}$ allowing p. The minimal such domain ($s_{\pi'}$) is just the set of worlds at least as close (by the lights of $\preceq_i$) as the nearest p-world. But then $\Box(p \rightarrow q)$ is true at $\langle \pi', i \rangle$ iff $s_{\pi'} \cap [\![p]\!] \subseteq [\![q]\!]$—that is, iff the ($\preceq_i$-)nearest p-worlds are q-worlds.

It is on non-limit-case sequences that differences emerge. But not on Sobel sequences. Here, though, the explanations for the phenomenon are different, and the explanation on offer from a strict semantics like the one we have been considering makes way for predicting the asymmetry between a Sobel sequence and its ugly cousin.

Take a Sobel sequence like that in (2):

(2) a. If Sophie had gone to the parade, she would have seen Pedro dance; but of course,
  b. if Sophie had gone to the parade and been stuck behind someone tall, she would not have seen Pedro dance.

Assume that Sophie was not a parade goer at i, that Pedro was a dancer at i, and that worlds are ordered in a sensible way (Pedro was conspicuous in his dancing, Sophie is short and has no stilts). Begin at the beginning: $\langle \pi_{\mathbb{D}_i}, i \rangle$ is the context–index pair at which (2a) is interpreted. Since Sophie was not a parade goer at i, the minimal domain in $\pi_{\mathbb{D}_i}$—that is, $\{i\}$—does not admit the possibility that she was; there are no p-worlds in it. Thus the initial context change induced by the antecedent is non-trivial; the posterior hyperdomain π_1 is the ordering of those domains from $\pi_{\mathbb{D}_i}$ compatible with Sophie's parade going. In the minimal such domain s_{π_1}, say that all the worlds where Sophie is a parade goer are worlds where she is a witness to Pedro's dancing; $\Box(p \rightarrow q)$ is true at $\langle \pi_1, i \rangle$.

Continuing with the thinned (2b), we first figure its effect on context. The entertainability presupposition is that it is possible that Sophie goes to the parade and is stuck behind someone tall ($p \wedge r$). Accommodating this will be non-trivial: there are domains ordered in π_1 that do *not* allow that Sophie goes to the parade and is stuck behind someone tall, the minimal domain s_{π_1} among them. These domains are thereby ruled out. The remaining domains are ordered in π_2, and we can easily imagine (given assumptions about Sophie's height and her not having stilts) that the smallest such domain is one whose only ($p \wedge r$)-worlds are $\neg q$-worlds. In that case $\Box(p \wedge r \rightarrow \neg q)$ is true at $\langle \pi_2, i \rangle$. So the truth of (2a) at $\langle \pi_{\mathbb{D}_i}, i \rangle$ does nothing to preclude the truth of (2b) at $\langle \pi_1, i \rangle$. Our contextual parameter has accommodated the extra information introduced by the thinned antecedent. This effect on context shows itself in the contents: the two counterfactuals are each strict conditionals, each with a different modal governing its strength. The first is weaker than the second.

Of course the variably strict semantics predicts the same consistency of (2a)–(2b). The ($\preceq_i$-)nearest ($p \wedge r$)-worlds need not be among the ($\preceq_i$-)nearest p-worlds. Whence it follows that the latter's being included in $[\![q]\!]$ does not preclude the former from being included in $[\![\neg q]\!]$. But this explanation of the phenomenon is decidedly different—it straightaway predicts no difference between a counterfactual discourse unfolding as in (2a)–(2b) and the defective reverse order in (4).

A strict semantics like the one we have been considering predicts this asymmetry. Interpreting the thinned (2b) in $\pi_{\mathbb{D}_i}$ and following this with (2a) produces something very different from interpreting a counterfactual discourse that unfolds from (2a) to (2b). By hypothesis i is not a ($p \wedge r$)-world, and so $\pi_{\mathbb{D}_i}|$*if had been* $p \wedge r$*, would have been* $\neg q|$ will differ from $\pi_{\mathbb{D}_i}$ by removing all domains that do not have a world at which Sophie goes to the parade and is stuck behind someone tall ($p \wedge r$), and will order those that are left. This is just the hyperdomain π_2. Given the assumptions about the case, all of the Sophie-goes-and-is-stuck-behind-someone-tall-worlds in the smallest domain in π_2 will be worlds in which she does not see Pedro dance: $s_{\pi_2} \cap [\![p \wedge r]\!] \subseteq [\![\neg q]\!]$, and so (2b) is true at $\langle \pi_{\mathbb{D}_i}, i \rangle$.

Interpreting (2a) after the score has been thus changed is very different. By hypothesis s_{π_2} is compatible with *Sophie goes to the parade and is stuck behind someone tall* ($p \wedge r$), whence it is also compatible with *Sophie goes to the parade* (p). Since hyperdomains are $\subseteq$-nested, every domain ordered by π_2 has such witnessing worlds. And so accommodation on the antecedent of (2a) idles—its only entertainability presupposition (that p is possible) is met. Thus (2a) is true at $\langle \pi_2, i \rangle$ iff every p-world in s_{π_2} is a q-world. But by assumption *some* of these p-worlds in s_{π_2} are also r-worlds—and all of *those* are $\neg q$ worlds. So there is just no way for (2a) to be true here, given the score as it stands after interpreting (2b). And that means that conjunctions representing such a discourse—conjunctions like (4)—are seriously defective. Successful interpretation of the first conjunct creates a context in which interpreting the second is doomed to failure.

This kind of explanation of the delicate facts about thinning exploits something very much like the the loophole Lewis mentions. This way of exploiting it—for *would*-counterfactuals—agrees, plus or minus a bit, with the account of counterfactuals von Fintel (2001) proposes.[12] Take conditionals to be quantifiers, their *if*-clauses restricting their domains—a counterfactual at i is a quantifier over a "modal horizon", a set of counterfactually relevant worlds at i. Thus a counterfactual like (8) has a logical form along the lines of

(9) $would(p)(q)$

The semantics says that such a quantifier at i takes a contextually inherited modal horizon (domain) D_i, and that it is a universal quantifier over this domain restricted by p. But universal quantifiers carry an existence presupposition on their first argument. Here that amounts to a presupposition that there are p-worlds in D_i. If the presupposition is not met, then—*ceteris paribus* and within certain limits—we accommodate.

Definition 3 (VON FINTEL-ISH STRICT SEMANTICS)**.**

1. COUNTERFACTUAL CCP

$$D_i|\textit{if had been } p, \textit{ would have been } q| = D_i \cup \{w : \forall v \in \min(p, \preceq_i) \Rightarrow w \preceq_i v\}$$

   where $\min(p, \preceq_i)$ is the set of ($\preceq_i$-)nearest p-worlds

2. TRUTH-CONDITIONS

$$[\![would(p)(q)]\!]^{D_i,i} = 1 \text{ iff } D_i|\textit{if had been } p, \textit{ would have been } q| \cap [\![p]\!] \subseteq [\![q]\!]$$

[12]The accounts, as I say, agree on *would*-counterfactual sequences. The version of von Fintel's proposal in the text is a bit of a reconstruction: it is equivalent to the form he gives, but it suits my purposes better.

Assuming a well-behaved ordering around each point of evaluation i that drives the accommodation, and assuming that the default $D_i^0 = \{i\}$, we have a picture no different from (a special case of) the strict conditional semantics we have been considering. Assume that i is a point of evaluation and (as we have thus far) that the structure of hyperdomains around i are got by appeal to $\preceq_i$. Then the story as I have told it and von Fintel's telling of it come to the same thing.

For let an ordering $\preceq_i$ centered on i govern both the expansion of modal horizon and the structure of hyperdomains around i. And let D_i' be the result of applying the CCP $|$*if had been p, would have been q*$|$ to D_i, and π' be the result of applying it to π. Then: (i) the default modal horizon at i, D_i^0, is just $s_{\pi_{\mathbb{D}_i}}$; (ii) $D_i' = D_i$ iff there is a p-world in D_i iff there is a p-world in s_π iff the counterfactually induced accommodation on s_π idles; and (iii) if there is no p-world in D_i (and so none in s_π), then $s_{\pi'} = D_i'$. Thus accommodating the possibility that p into a modal horizon D_i amounts to adding all worlds between i and the nearest p-world and treating the counterfactual as strict over this set. That is just the same as eliminating domains that do not permit p, and treating the counterfactual as a strict conditional over the smallest domain left. And the equivalence then follows straightaway.

We might well wonder if anything as exotic as an analysis that exploits the loophole is really needed to explain the delicate facts about thinning. If we allow shifts in context to enter into the explanation, then amending the variably strict semantics accordingly can also predict the kind of asymmetry between a Sobel sequence and its ugly cousin.[13] The central apparatus in the variably strict semantics is an ordering over possible worlds, centered on the point of evaluation (or, what comes to the same thing, a well-behaved partition- or premise-function from worlds to sets of sets of worlds). A counterfactual is then true at a point iff its consequent is true at all the closest antecedent worlds in the ordering. But suppose we allow the ordering to evolve, changing as counterfactual assumptions are made: the effect of a successful utterance of a counterfactual *if had been p, would have been q* is to promote the closest p-worlds in the ordering so that they are among the closest worlds *simpliciter*.[14] This amounts to changing the ordering by lumping together antecedent-facts,

[13] Something like this alternative was suggested by Angelika Kratzer (p.c.) to Kai von Fintel who in turn posed it to me.

[14] It is cleanest to think of the posterior ordering as the prior ordering plus new pairings between the closest p-worlds and any world in U. The more pairs in an ordering, the more worlds that ordering treats as indistinguishable, and the less discerning that ordering is.

and that means that the ordering becomes coarser as more counterfactual antecedents get interpreted.

Formally put:

Definition 4 (VARIABLY STRICT CONTEXT-SHIFTING SEMANTICS)**.**

1. ORDERING CCP

$$\preceq_i |\textit{if had been } p, \textit{ would have been } q| = \preceq_i \cup \{\langle w, v\rangle : w \in \min(p, \preceq_i) \text{ and } v \in U\}$$

2. VARIABLY STRICT TRUTH-CONDITIONS

$$[\![\textit{if had been } p, \textit{ would have been } q]\!]^{\preceq_i, i} = 1 \text{ iff } \min(p, \preceq'_i) \subseteq [\![q]\!]$$

where $\preceq'_i = \preceq_i |\textit{if had been } p, \textit{ would have been } q|$

So long as the changed ordering gets passed downstream, such an amendment would explain the asymmetry. Assume an initial ordering $\preceq_i^0$ centered on a world i. Interpreting the first conjunct of (2a) results in an ordering $\preceq_i^1$ in which the ($\preceq_i^0$-)nearest p-worlds are promoted to the closest worlds *simpliciter*. It is then true iff all the ($\preceq_i^1$-)nearest p-worlds are q-worlds—iff all the closest worlds *simpliciter* make the material conditional $p \to q$ true. Interpreting (2b) then coarsens the ordering further, promoting the ($\preceq_i^1$-)closest $(p \wedge r)$-worlds in $\preceq_i^2$. It is true iff, in the posterior ordering, all the closest worlds *simpliciter* make the material conditional $(p \wedge r) \to \neg q$ true. And this is surely possible. Reversing the conjuncts makes a difference because the ($\preceq_i^2$-)nearest worlds *simpliciter* have p-worlds that are not q-worlds in their midst, and these witness the falsity of the first conjunct. And that is enough to predict the asymmetry between a Sobel sequence and its ugly cousin.

Amending the variably strict semantics in this way is not altogether wrong—for sequences of *would*-counterfactuals, it agrees with the strict conditional stories—but it is defeatist. The semantics is now variably strict in name only. Making an ordering coarser idles exactly when accommodation idles, and the smallest post-accommodation domain coincides exactly with the set of nearest worlds *simpliciter*. Variability—that the set of nearest p-worlds neither includes nor is included in the set of nearest $(p \wedge r)$-worlds—plays no role in explaining why counterfactuals do not allow for thinning. That is a role now played by pointing to different orderings of similarity, one for the first conjunct in a Sobel sequence and a coarser one for the second. Nor does the variability recorded in the ordering bear any serious weight in assigning truth-conditions. Once the ordering is coarsened by a counterfactual antecedent *if had been p*, the set of nearest p-worlds in the posterior ordering coincides with the set of nearest worlds *simpliciter* in that ordering. Thus a counterfactual is simply a strict conditional over the set of nearest worlds *simpliciter*. The amended variably strict semantics is an inelegant notational variant of the strict conditional semantics.

I conclude that the amended version of the variably strict semantics is not right. We do better with some version or other of the strict conditional story. But *neither* my way nor von Fintel's way of cashing that out is quite right. They get the data about Sobel sequences right, but they mislocate the phenomenon. This turns up when we look to the context effects triggered by *might*-counterfactuals. I can see how to amend the story as I have told it, but can see no way to amend von Fintel's.

6 *Might*s

The sort of asymmetry between a Sobel sequence and its ugly cousin is not confined to counterfactual antecedents. The thinned counterfactual in a Sobel sequence represents a way of weakening the unthinned conditional connection between antecedent and consequent. In the examples we have considered, it is weakened to the point of reversal: the counterfactual connection between p and q is flipped, in the presence of r, to a connection between p and $\neg q$. Since accommodating this extra bit r is comparably easier to do than undo, no wonder sequences of such counterfactuals do not always happily commute.

But we might well weaken a claimed counterfactual connection between p and q by calling attention to a substantially weaker connection between p and something incompatible with q. That is one thing *might*-counterfactuals are good for, and the relevant discourses exploiting them exhibit the same resistance to commutation that Sobel sequences do.

Some examples:

(10) a. If Sophie had gone to the parade, she would have seen Pedro dance; but, of course,
b. if Sophie had gone to the parade, she might have been stuck behind someone tall and then wouldn't have seen Pedro dance

(11) a. If Hans had come to the party he would have had fun; but, of

course,

b. if Hans had come to the party, he might have run into Anna and they would have had a huge fight, and that would not have been any fun at all

These are consistent, even if complicated, stretches of counterfactual discourse. Call such stretches *Hegel sequences*.[15] As with a Sobel sequence, a Hegel sequence's ugly cousin is dramatically worse:

(12) a. ??If Sophie had gone to the parade, she might have been stuck behind someone tall and then wouldn't have seen seen Pedro dance; but, of course, if Sophie had gone to the parade, she would have seen Pedro dance

b. ??If Hans had come to the party, he might have run into Anna and they would have had a huge fight, and that would not have been any fun at all; but, of course, if Hans had come to the party he would have had fun

These are pretty bad—about as bad as their Sobel counterparts. Sobel sequences (and their ugly cousins) show how entertainability presuppositions triggered in counterfactual *antecedents* can contribute to a certain kind of shifty behavior of whole conditionals. Hegel sequences (and their ugly cousins) show how entertainability presuppositions triggered in counterfactual *consequents* can contribute to the same kind of shifty behavior. This is good reason to hold out for a unified account of both.[16]

The variably strict semantics, of course, has no trouble predicting that

[15] Kratzer (1981b) story about counterfactuals predicts that, depending on context, they can be interpreted as strong as entailment and as weak as material conditionals. But can they ever plausibly be that strong? Yes, she says, if we find ourselves in a conversation in which the prevailing partition function is "Hegelian": if we have a view of the world that links all facts together, then changing one fact may change all facts; and so a partition function that respects this will render a counterfactual *if had been p, would have been q* as true iff p entails q. That's Hegel's counterfactual. The kinds of sequences involving *might*-counterfactuals that I am interested in seem to push us, even if just a bit, toward it. Hence the name.

[16] There are also modal subordination facts in the vicinity:

(iv) a. Sophie might have gone to the parade.
b. She would have seen Pedro dance.
c. Of course, she might have gone to the parade and been stuck behind someone tall and then wouldn't have seen Pedro dance.

Once the possibility of Sophie's parade going is made available by (iv-a) we can continue with (iv-b) and then (iv-c). But not *vice versa*.

a Hegel sequence's ugly cousin is somehow defective. For assume that *would*- and *might*-counterfactuals are duals. Then we have outright inconsistency. The first conjunct of (12a) is true at i just when some of the ($\preceq_i$-)nearest worlds where Sophie is a parade goer are worlds where she gets stuck behind someone tall and misses out on seeing Pedro dance. And those same worlds are exactly those that make the counterexample to the second conjunct true. But that makes it hard to see how—by the lights of the variably strict semantics—(10) could be anything but inconsistent. But it is not.

The trick is to predict that the Hegel sequences are consistent, that their ugly cousins are not, and to do both while still treating *would*s and *might*s—if not the conditional constructions involving them, then at least the unary modals that figure prominently in them—as duals.

That is a trick that a story exploiting the loophole seems just right for. That is good news since the shifty behavior of Hegel sequences is all too like the shifty behavior of Sobel sequences to settle for anything less than a unified account. But not every story exploiting the loophole is up to pulling this off.

Part of the appeal of von Fintel's proposal lies in assimilating entertainability presuppositions to a more familiar and less exotic fact about quantifier domains. A counterfactual *if had been p, would have been q* is just a two-place quantifier $would(p)(q)$, and so the entertainability presupposition triggered by the antecedent is just an instance of an existence presupposition on the quantifier's first argument. That is very tidy. I can claim no such strength since I have only gestured that a counterfactual antecedent presupposes in some sense or other $\Diamond p$ without saying how or why or in just what sense.

But this is a strength only if the facts about nearby constructions cooperate. Suppose we extend von Fintel's story in the obvious way to *might*-counterfactuals—the relevant logical form is got by swapping the universal *would* for the existential *might*:

(13) $might(p)(\neg q)$

Assimilating the triggering of entertainability presuppositions to existence presuppositions on the quantifier in (13) does not seem right. The phenomenon is not where we would expect it, given that kind of assimilation. Since (10a) and (10b) have the same antecedent—the same restrictor—there can be no shifting triggered by the latter that isn't already triggered by the former. And so, given the existence presupposition diagnosis, we should have no asymmetry between a Hegel sequence and its ugly cousin. And that prediction just does not square with the facts.

Nor will it do to posit further existence presuppositions for the existential *might* to cover its second argument. First, because that is not sufficient—Hegel sequences point to shiftiness to the effect that there are antecedent-plus-consequent possibilities, not that there are antecedent possibilities and there are consequent possibilities. And second, because while I am happy enough to agree that

(14) a. Some students smoke Reds
 b. $some(S)(R)$

presupposes that there are some (relevant) students, this does not presuppose that there are (relevant) smokers of Reds. It asserts that.

I have hedged on whether entertainability presuppositions are real presuppositions. Treating the shiftiness of counterfactuals as the shiftiness of quantifier domain presupposition removes that hedge. This would be a good thing if the distribution of facts lines up in a neat way. But I do not think it does. A typical *might*-counterfactual *if had been p, might have been* $\neg q$ triggers some shiftiness to the effect that $\Diamond(p \wedge \neg q)$, but this material fails standard presupposition tests: it is not backgrounded, the negated *might*-counterfactual doesn't trigger it (making negation a plug, not a hole), and—what I take to be decisive—it fails the "Hey, wait a minute" test.[17] If you utter (11b), I cannot reply with

(15) ??Hey, wait a minute. I had no idea that Hans might have run into Anna.

Informing (or, perhaps, reminding) me that Hans might have run into Anna at the party is why you said what you did. So that I had no idea that might have happened cuts little ice.

Although the failure here contrasts rather sharply with the behavior of other presuppositions, it patterns better with the sort of entertainability triggered by

[17] If φ presupposes ψ a hearer can legitimately complain when her conversational partner utters φ by stopping her in her tracks—"Hey, wait a minute. I had no idea that ψ." Compare:

(iv) a. *A*: If Sophie realizes that there is no more ice cream, there will be trouble
 b. *B*: Hey, wait a minute. I had no idea there was no more ice cream.
 c. *C*: ?? Hey, wait a minute. I had no idea Sophie would get mad.

See von Fintel (2003) for an account of these facts about presupposition (at least presuppositions concerning certain European monarchs).

counterfactual antecedents. You say *if Hans had come to the party, we would have run out of punch.* I cannot register a complaint

(16) ??Hey, wait a minute. I had no idea that Hans might have come.

One cannot easily complain about supposings.

That Sobel sequences cannot be happily commuted points to shifty behavior of counterfactual antecedents. That Hegel sequences cannot be happily commuted points to shifty behavior of counterfactual consequents. It is better to have one explanation for both phenomena, and that means that this shiftiness is not the shiftiness of accommodating existence presuppositions on quantifier domains.

7 Schmontent

There is reason to think that the relationship between a counterfactual and its entertainability presuppositions is not quite the relationship between a quantifier and its existence presuppositions.

Both von Fintel's proposal and the strict conditional story I offered earlier divide semantic labor. We are pretending that the only relevant changes to context are changes by accommodation—expanding domains to make entertainability presuppositions of modal constructions met. Contents are figured by reference to post-accommodation domains. Each story thereby divided semantic labor: there is the CCP-assigning bit of semantic machinery, and there is the (truth-conditional) content-assigning bit of semantic machinery.

I do not think this is the way to go. Insisting on dividing semantic labor in the way we have when it comes to *might*-counterfactuals raises problems I cannot solve. Very roughly: the problem is that if we follow the example of *would*-counterfactuals for how the labor is divided, all (or, anyway, too many) *might*-counterfactuals are everywhere true; if we do not follow the *woulds*, then we introduce truth-value gaps where there were none before. Since it is best to hold out for a unified story of *might*- and *would*-counterfactuals, we should not divide semantic labor in this way.

Before making that argument less rough, consider the shiftiness of the (one-place) relative modal *might*. We are trying to see if Ruud is at the party, and have been only going by the bikes and scooters parked outside. Ruud's is nowhere to be seen (though I have spotted Alex's), and so we conclude that he is not at the party. But you bring up a possibility we had been ignoring:

(17) He might have come with Alex on her Vespa.

The set of worlds relevant for our modal talk just before that had no such scooter-sharing worlds in it. But now that you mention the possibility, we cannot just go on ignoring it. And accommodating the possibility—not ignoring it any longer—lands us in a context that makes what you said true. An existential modal claim needs just one witnessing world to come out true, so if Alex and Ruud riding together on her Vespa is entertainable then (17) is true. Whereas accommodating standard presuppositions guarantees definedness, accommodating the entertainability presupposition of an existential modal (pretty much) guarantees satisfaction.[18]

Hegel sequences trade on a certain kind of shiftiness, and I say that is the shiftiness of *might*.

(18) If had been p, would have been q; but of course, if had been p, might have been r (and so $\neg q$)

The second conjunct triggers shiftiness to the effect that $\Diamond(p \wedge r)$. Accommodating the entertainability presupposition of a *might*-counterfactual (pretty much) guarantees satisfaction. That is a guarantee best explained by requiring that *might*-counterfactuals change the conversational score (if need be) by making some antecedent-plus-consequent worlds available; they then act as existential quantifiers over this bit of the score thus changed.[19] If there are such antecedent-plus-consequent worlds (modulo the laws), satisfaction is guaranteed.

But satisfaction *where*? For *would*-counterfactuals—in my initial telling of the story and in von Fintel's way—we unthinkingly assigned semantic values at a *prior* context based on facts that obtain at a *posterior*, post-accommodation context. Such a conditional is true at $\langle c, i\rangle$ just in case the strict conditional is true at $\langle c\text{-changed-just-a-bit}, i\rangle$. Following this lead for *might*-counterfactuals is not right. For, given the constraints on accommodation, this straightaway implies that *might*-counterfactuals are everywhere true.

[18] Accommodation for relative modalities is discussed (*very* briefly) in Lewis (1979, pp. 246–247) and Kratzer (1981a). But neither probes very far into the phenomenon, Kratzer summing it up this way: "This is black magic, but it works in many cases" (p. 311).

[19] I assume two further constraints: accommodation idles when entertainability presuppositions are met; and accommodation increases the domain over which the modal acts as quantifier.

For any context c, let s_c be the domain of worlds determined by it (or the inner most domain, if c gives us a nested set of worlds). I utter *if had been p, might have been r* in a context c. The facts about Hegel sequences—that they, but not their ugly cousins, are consistent—mean that whether or not this is true depends on whether or not there are any p-and-r-worlds in $s_{c\text{-changed-just-a-bit}}$.

Now, suppose we relativize truth-values—as we did for *woulds*—to the contexts in which they are issued. Either there are $(p \wedge r)$-worlds in s_c, or there are none. If there are, then accommodation idles and what I said is true. If there are none, then (assuming you do not complain) the score is changed, satisfaction guaranteed, and so what I said is true—*not* true merely at the posterior context, true at c. Whence *might*-counterfactuals are (pretty much) everywhere true. But *might*-counterfactuals are not all everywhere true—if they were, then Hegel sequences could not be consistent: if *if had been p, might have been r* expresses a truth at a context and, modulo the laws, r implies $\neg q$, then *if had been p, would have been q* cannot also be true there.

Relativizing the truth of *might*-counterfactuals to contexts in which they are uttered makes too many of them true at too many contexts. But relativizing to any other context does no better: it straightaway implies gappiness where there was none before. For then if s_c does not already include any p-and-r-worlds—that is, if c is the kind of context the consistency of Hegel sequences trades on—the interpretation function is undefined at c. There just is no fact of the matter about the truth at that context.

I can live with gappiness, but not here. Suppose that *might*- and *would*-counterfactuals are duals: whatever function $[\![$*if had been p, might have been r*$]\!]$ picks out is the same as $[\![\neg($*if had been p, would have been* $\neg r)]\!]$. I utter *if had been p, might have been r* in a context c where effects on conversational score will be non-trivial. What I utter will be undefined there, and true in the context thus changed. But since my *might*-counterfactual is undefined at c, so must be its dual $\neg($*if had been p, would have been* $\neg r)$. Whence it follows, since negation never turns the defined into the undefined, that *if had been p, would have been* $\neg r$ must be undefined at c. That is too many *would*-counterfactuals undefined at too many contexts; I have no in-principle beef with gappiness, but this gappiness is unwelcome. We won't get an explanation for the shiftiness of Hegel sequences this way.

So assuming that we divide semantic labor, *might*-counterfactuals pose a dilemma. Either they are everywhere true, whence it follows that their contradictory *woulds* are everywhere false; or they are neither true nor false, whence it follows that their contradictory *would*s are also neither true nor false.[20] That is an embarrassment.

But the truth of the matter is nearby. It is not that *might*-counterfactuals are pretty much always true, but that successfully uttering one always lands you in a context in which it is true. That is something hard to say if we divide semantic labor. But we can say it easily if we take the semantics of counterfactuals to be CCPs all the way down, dispensing with the division of semantic labor by dispensing with the assignment of contents of the normal sort. I can see how to amend accordingly my way of telling a strict conditional story about counterfactuals, but cannot see how to do that with von Fintel's way.

8 Refinement

Counterfactuals are shifty through and through. Sobel sequences and their ugly cousins point to shiftiness triggered by counterfactual antecedents; Hegel sequences and their ugly cousins point to shiftiness triggered by the consequents of *might*-counterfactuals. But these two phenomena are really one, and this can be explained by a strict conditional account that locates the source of shiftiness in the shiftiness of the relative modal *might*.

Here is how. Counterfactual antecedents test incoming contexts to see if the antecedent is possible with respect to that context. If not, and assuming the conversation does not derail, accommodation makes it so and the conditional is interpreted in the changed context. A *would*-counterfactual is a strict conditional where the universal modal quantifies over the post-accommodation domain. It tests the context again, checking whether all antecedent worlds are consequent worlds. A *might*-counterfactual is dual to the corresponding *would*: thus it is the conjunction of antecedent and consequent, under the scope of *might*. This invites another test of the context, but (assuming antecedent and consequent are compatible modulo the laws) it is a test that will

[20]Put another way: dividing semantic labor amounts to specifying the semantics for a *might*-counterfactual uttered in context c by saying what values x and f can and must have in

$$[\![\textit{if had been p, might have been r}]\!]^{x,i} = 1 \text{ iff } f(s_c, p, r)$$

That Hegel sequences are consistent constrains $f(s_c, p, r)$ by requiring that it satisfy $\Diamond(p \wedge r)$; that a Hegel sequence's ugly cousin is not consistent constrains $f(s_c, p, r)$ by requiring it to be s_c-changed-just-a-bit. Given these constraints, we can either take $x = s_c$ or $x \neq s_c$. Neither option is without discomfort.

either succeed or be accommodated. Either way satisfaction is guaranteed: after successfully updating the information at hand with a *might*-counterfactual, the relevant domain will contain some antecedent-plus-consequent worlds. The refined account will make this precise. The resulting proposal will be a semantics for stretches of counterfactual discourse that identifies their meaning with how they affect conversational score.

It is useful, though not required, to think of the proposal as offering a semantics of counterfactual constructions that is mediated twice over. A counterfactual *if had been p, would have been q* gets represented as a sequence of modal claims: that the antecedent is possible, $might(p)$; and that the corresponding plain conditional must be, $must(p \rightarrow q)$. A *might*-counterfactual follows suit: the *if*-clause claiming that the antecedent is possible; the conditional as a whole that $might(p \wedge q)$. The accommodation-inducing behavior of the relative modals is figured and those are projected into the formal representation in terms of $\Box$ and $\Diamond$ and a presupposition operator ∂. That $might(p)$ triggers accommodation so that it comes out true can then be modeled as $might(p)$ presupposing $\Diamond p$ and asserting $\Diamond p$. Since $must(p)$ has no such presuppositions it simply asserts $\Box p$. The semantics assigns values—CCPs—over the fragment with boxes, diamonds, and presupposition operators.[21]

The fiction is useful, so I adopt it. For *would*s things go pretty much as before, using $\partial\varphi$ to represent that φ is, in the relevant sense, presupposed:

(19) a. If had been p, would have been q
b. $might(p); must(p \rightarrow q)$
c. $(\partial\Diamond p; \Diamond p); \Box(p \rightarrow q)$

Since the entertainability presupposition is importantly different from other

[21]The picture can be formalized. Define the translation function Tr—from the (quasi) English expression of counterfactuals to the relevant sentences of the fragment with boxes, diamonds, and presupposition operators—as follows:

1. $\mathsf{Tr}(\text{if had been } p, \text{ would have been } q) = \mathsf{Tr}(might\ p; must(p \rightarrow q))$
2. $\mathsf{Tr}(\text{if had been } p, \text{ might have been } q) = \mathsf{Tr}(might\ p; might(p \wedge q))$
3. $\mathsf{Tr}(\phi; \psi) = \mathsf{Tr}(\phi); \mathsf{Tr}(\psi)$
4. $\mathsf{Tr}(might\ \phi) = \partial\Diamond\phi; \Diamond\phi$
5. $\mathsf{Tr}(must\ \phi) = \Box\phi$

Assuming—as I am happy to—that *might* and *must* are duals straightaway yields that $might(p \wedge q)$ abbreviates $\neg must(p \rightarrow \neg q)$, whence that *might*- and *would*-counterfactuals are duals. Put the other way around: assuming duality, the representation of *might*-counterfactuals (modulo the entertainability presupposition of the *if*-clause) is got by artless compositional manipulation of the corresponding (dual) *would*.

presuppositions—it does not pass the "Hey, wait a minute test"—we do just as well to treat it as something that the conditional flat-out claims. That is really what we have done here.

The case with *might*-counterfactuals:

(20) a. If had been p, might have been q
b. $might(p); might(p \wedge q)$
c. $(\partial\Diamond p; \Diamond p); (\partial\Diamond(p \wedge q); \Diamond(p \wedge q))$

But (20c) is clearly overkill: since $\Diamond\varphi$ is an existential modal, the second sequence will (on any sensible semantics) entail the first. So we can replace (20c) with the equivalent, and simpler:

(20) c′. $\partial\Diamond(p \wedge q); \Diamond(p \wedge q)$

The semantic value of a counterfactual is the semantic value of its representation in the fragment with boxes, diamonds, and presupposition operators.

I confessed early on that my interest here is less in the content of counterfactuals than it is in getting straight about their context change potential—how successful utterances of stretches of counterfactual discourse change the information state of a hearer when she accepts the news conveyed by it. So, as before, assume a set $U \subseteq W$ of worlds. Given a set i of worlds—characterizing what is settled in the conversation or the hearer's factual information—I will say how $\langle c, i\rangle$ is changed by a successful utterance of a counterfactual by saying how it impacts the hyperdomain π_c provided by context.[22] Given i we form the set of admissible domains $\mathbb{D}_i$ as before; hyperdomains around i are as before. Since the only bits of context that are relevant are the hyperdomains, and since π_c is a function of i, we generally suppress mention of c and of i and treat the semantics as taking hyperdomains to hyperdomains.

Changes to hyperdomains are changes brought by looking to the would-be changes to the domains that make them up. The would-be changes on individual domains record both the satisfaction of the entertainability presuppositions associated with the modals—if they are not met the would-be update is undefined—and the quantificational force of those modals. These effects then percolate to the hyperdomain.

It is easier to digest this if we break it into two separate definitions. First,

[22] Formally, this gloss of the machinery is not obligatory: i could just as well be a point of evaluation.

domains:

Definition 5.

1. DOMAIN CCP

    a) $s[\Diamond\varphi] = \{w \in s : s \cap [\![\varphi]\!] \neq \emptyset\}$

    b) $s[\Box\varphi] = \{w \in s : s \subseteq [\![\varphi]\!]\}$

    c) $s[\partial\varphi] = s$ if $s[\varphi] = s$

2. TRUTH AT DOMAINS

    $s \vDash \varphi$ iff $s[\varphi] = s$

In order: relative modals test the domain. The existential *might* testing that it has some φ-worlds, *must* that it has only φ-worlds. (These clauses are not defined if φ carries another modal, but that situation will not arise for us.) The presupposition operator tests that its complement—the *non-proffered* material—must be satisfied: if the presupposed material isn't satisfied in a domain, then the would-be change to that domain is undefined. (That will be how accommodation trims a hyperdomain: undefined would-be changes signal that a domain will not pass through.) Finally, a relative modal is true at a domain just in case the information it carries is already present in that domain.

Now lift the whole process to hyperdomains:

Definition 6.

1. HYPERDOMAIN CCP

    a) $\pi + \Diamond\varphi = \{\langle s_n, s_m\rangle \in \pi : s_\pi \vDash \Diamond\varphi\}$

    b) $\pi + \Box\varphi = \{\langle s_n, s_m\rangle \in \pi : s_\pi \vDash \Box\varphi\}$

    c) $\pi + \partial\varphi = \{\langle s_n, s_m\rangle \in \pi : \exists\langle s'_n, s'_m\rangle \in \pi$ such that $s'_n[\partial\varphi] = s_n$ and $s'_m[\partial\varphi] = s_m\}$

2. TRUTH AT HYPERDOMAINS

    $\pi \vDash \varphi$ iff $\pi + \varphi = \pi$

It follows straightaway that $\Box\varphi$ is true at a hyperdomain π iff the minimal domain in π has only φ-worlds in it. For $\Box\varphi$ is true at π iff $\pi + \Box\varphi = \pi$ iff $s_\pi \vDash \Box\varphi$. And this iff $s_\pi[\Box\varphi] = s_\pi$—iff, that is, all the worlds in s_π are

φ-worlds. Similarly for $\Diamond\varphi$: it is true at π iff the minimal domain in π has some φ-worlds in it.

An entertainability presupposition like $\partial\Diamond\varphi$ affects a context $\langle\pi, i\rangle$ by seeing just what domains in π allow φ. It does this by only allowing pairs $\langle s_n, s_m\rangle$ to survive for which the would-be changes brought by $\partial\Diamond\varphi$ to s_n and s_m are defined. Take the case of s_n: the domain CCP $[\partial\Diamond\varphi]$ applied to s_n is defined at all only if the would-be change to s_n brought by the complement $\Diamond\varphi$ is null. That is, only if: $s_n[\Diamond\varphi] = s_n$. But that is so iff s_n has some φ-worlds in it. Of course, since π is nested, if s_n passes this test so must s_m. And so $\langle s_n, s_m\rangle$ passes the test posed by the entertainability presupposition only if s_n (and so s_m) permits the possibility that φ. Put the other way around: let s be any domain ordered by π. If s has no φ-worlds, then $s[\Diamond\varphi] = \emptyset$ and hence $s[\partial\Diamond\varphi]$ will be undefined. Whence it follows that no pair in π in which s occurs will survive the update of π with $\partial\Diamond\varphi$. Entertainability presuppositions do just what we wanted to hyperdomains: they filter the ordering, eliminating domains that do not meet the presupposition.

Counterfactuals induce just the changes that their representations induce, and are true just when their induced changes idle. Officially:

Definition 7.

1. *would*-COUNTERFACTUAL CCP

$$\pi + \textit{if had been } p\textit{, would have been } q = \pi + \partial\Diamond p; \Box(p \rightarrow q)$$

2. *might*-COUNTERFACTUAL CCP

$$\pi + \textit{if had been } p\textit{, might have been } q = \pi + \partial\Diamond(p \wedge q); \Diamond(p \wedge q)$$

3. TRUTH

$$\langle\pi, i\rangle \vDash \textit{if had been } p\textit{, would/might have been } q \text{ iff}$$
$$\pi + \textit{if had been } p\textit{, would/might have been } q = \pi$$

This is definitely an analysis in the spirit of the loophole: *would*-counterfactuals are strict conditionals, a universal modal scoped over a material conditional—just which modal a function of context; *might*-counterfactuals are dual to *would*s; and the semantics of each construction is driven by the semantics given to the unary relative modals that figure prominently in them. But it is not defeatist.

Defeatist or not, however, this would not be worth the bother if it buys no better explanation of the shiftiness of counterfactual antecedents and consequents. Saying just when stretches of counterfactual discourse are consistent gives us the makings of that explanation. There are two semantic concepts nearby. A sequence of counterfactuals is *consistent* just in case it can be interpreted without collapse into absurdity. That sequence is *cohesive* iff there is a non-trivial hyperdomain that is a fixed point of the update with the sequence.

Definition 8.

1. (CONSISTENCY) $\varphi_1; \ldots; \varphi_n$ is *consistent* iff there is a $\langle \pi, i \rangle$ such that $(\pi + \varphi_1) + \cdots + \varphi_n \neq \pi_\perp$
2. (COHESIVENESS) $\varphi_1; \ldots; \varphi_n$ is *cohesive* iff there is a $\langle \pi, i \rangle$ such that $(\pi + \varphi_1) + \cdots + \varphi_n = \pi \neq \pi_\perp$

Cohesiveness implies consistency, but not conversely. Consistency requires the possibility of successful update; cohesiveness requires the possibility of a non-absurd fixed point of an update. Whence, while consistency requires only that the information lead somewhere without collapse, cohesiveness requires that all the information in the sequence hang together in a single state. That means that cohesiveness, but not consistency, is sensitive to accommodating shifts—such shifts are compatible with consistency but not cohesiveness. The explanation is now straightforward: Sobel sequences and Hegel sequences are consistent, but not cohesive. Their ugly cousins are neither.

Sobel sequences are explained pretty much as before. Take a simple counterfactual *if had been p, would have been q* and update $\langle \pi_{\mathbb{D}_i}, i \rangle$ accordingly. The change to $\pi_{\mathbb{D}_i}$ induced by $\partial \Diamond p; \Box(p \to q)$ is, first, to make room for $\Diamond p$. Assume that i contains no p-worlds. Then $\pi_{\mathbb{D}_i} + \partial \Diamond p$ will allow $\langle s_n, s_m \rangle$ from $\pi_{\mathbb{D}_i}$ to pass through to π_1 just in case each of the s's has a p-world. It is easy to imagine that $\Box(p \to q)$ is true at π_1 in virtue of its being true at s_{π_1}—that is, in virtue of the ($\preceq_i$-)nearest p-worlds being q-worlds. And now the thinned counterfactual *if had been* $(p \wedge r)$*, then would have been* $\neg q$. Update π_1 with $\partial \Diamond (p \wedge r)$ and update the result with $\Box(p \wedge r \to \neg q)$. So π_1 is refined further to π_2: all ordered domains in π_1 not allowing $(p \wedge r)$ are removed. It is easy to imagine the facts about relative proxmity allowing that in the smallest domain left all of the $(p \wedge r)$-worlds are $\neg q$-worlds. And so, since $s_{\pi_2} \cap [\![p \wedge r]\!] \subseteq [\![\neg q]\!]$, $\Box(p \wedge r \to \neg q)$ is true at π_2. In the normal case, such a π_2 will not be absurd and so the sequence is consistent.

But not so in reverse order. Jumping straightaway to π_2 from $\pi_{\mathbb{D}_i}$ is very different. Although it is still fine that $\Box(p \wedge r \rightarrow \neg q)$ is true at π_2, attempting to interpret the unthinned, simple counterfactual would now be a disaster. Updating π_2 with $\partial\Diamond p$ idles—every domain ordered in π_2 allows $(p \wedge q)$ and *a fortiori* allows p. But on the assumption that $\Box(p \wedge r \rightarrow \neg q)$ is true at π_2, it follows that $s_{\pi_2} \cap [\![p]\!] \not\subseteq [\![q]\!]$. Hence $s_{\pi_2}[\Box(p \rightarrow q)] = \emptyset$. And so the hyperdomain collapses upon updating with the simple counterfactual: $\pi_2 + \Box(p \rightarrow q) = \pi_\perp$. So a Sobel sequence's ugly cousin is inconsistent.

The explanation for Hegel sequences is exactly the same—that is an advantage worth claiming. Take the first bit of a Hegel sequence: *if Hans had come to the party, he would have had fun.* Update $\langle \pi'_{\mathbb{D}_i}, i \rangle$ accordingly, first by updating $\pi'_{\mathbb{D}_i}$ with the entertainability presupposition $\partial\Diamond p$. Only those domains ordered by $\pi'_{\mathbb{D}_i}$ that have p–worlds survive to π'_1. And, as before, we test $\Box(p \rightarrow q)$ here. Assume that, indeed, $s_{\pi'_1} \cap [\![p]\!] \subseteq [\![q]\!]$. Now the second bit of a Hegel sequence: *But, of course, if Hans had come to the party, he might have run into Anna and they would have had a huge fight, and that would not have been any fun.* For simplicity, let's gloss this as *if had been p, might have been r* where, modulo the laws in U, there are no r-and-q possibilities (i.e., $U \cap [\![r]\!] \subseteq [\![\neg q]\!]$). Update accordingly, first resolving the effects of accommodation: $\pi'_1 + \partial\Diamond(p \wedge r)$. We thus get rid of any domains ordered by π'_1 that have no $(p \wedge r)$-worlds—$s_{\pi'_1}$ will be one such casualty. In the resulting hyperdomain π'_2 every domain will have some $(p \wedge r)$-worlds, and hence some $(p \wedge \neg q)$-worlds. Those worlds—in particular those in $s_{\pi'_2}$—are sufficient to guarantee the truth of $\Diamond(p \wedge \neg q)$ at π'_2. Such a π'_2 will not be absurd and so the sequence is consistent.

But not so in reverse order. Jumping straightaway to π'_2 from $\pi'_{\mathbb{D}_i}$ is very different. It is still true at π'_2 that $\Diamond(p \wedge \neg q)$. But attempting to update π'_2 with $\partial\Diamond p; \Box(p \rightarrow q)$ would be a disaster. The entertainability presupposition is met, and so accommodation idles. But no non-absurd hyperdomain—and so not π'_2—that makes $\Diamond(p \wedge \neg q)$ true can be updated with $\Box(p \rightarrow q)$ without collapse. Since $s_{\pi'_2} \cap [\![p \wedge \neg q]\!] \neq \emptyset$, it follows that $s_{\pi'_2} \cap [\![p]\!] \not\subseteq [\![q]\!]$ and thus that $s_{\pi'_2}[\Box(p \rightarrow q)] = \emptyset$—and hence $\pi'_2 + \Box(p \rightarrow q) = \pi_\perp$. So a Hegel sequence's ugly cousin is inconsistent.

Sobel and Hegel sequences are consistent. But the information they carry cannot all hang together at once. Both require an accommodating shift midway through—that is the mark of incohesiveness. In each case some non-trivial shift is needed to make that bit of counterfactual discourse make sense. But once shifted, there is no guarantee that the preceding stretch could be successfully uttered in the context thus changed. That is why they cannot be consistently reversed.

9 Shrinkage

Lack of cohesiveness covaries with accommodating shifts over a stretch of counterfactual discourse. These shifts—both in Sobel and Hegel sequences—amount to shifts outward, the domain over which counterfactuals act as quantifiers getting monotonically ever larger. And they are *smooth* shifts: when we accommodate the entertainability presuppositions of counterfactuals, we do so without any fuss. Strict conditional analyses that exploit the loophole predict this by making accommodation a properly semantic mechanism.

If stretches of counterfactual discourse equally show evidence of *downshifts*—shrinkings of the counterfactual domain—and show evidence that downshifts happen with equal ease, then that would mean that the kind of shiftiness we have been worried about is pretty fleeting. And that would be pretty bad news for any strict conditional story exploiting the loophole. Downshifting is possible, to be sure, but it is not smooth and does not happen without some fuss. That is reason to think that the kind of resetting of context that downshifting achieves is a bit of post-semantic repair, and that is reason to think that the kind of shiftiness of counterfactuals is not fleeting. Once a possibility is made ripe for quantifying over by accommodating it, I cannot arbitrarily expect you to ignore it.

An apparent case of downshifting:

(21) a. If Sophie had gone to the parade and been stuck behind someone tall, she wouldn't have seen Pedro dance
b. Still, if Sophie had gone to the parade, she wouldn't have been stuck behind someone tall

If such a stretch of counterfactual talk were just as smooth as a typical Sobel sequence, then the facts would not neatly align with the commitments of the kind of story I want to tell. (Such sequences are, in fact, awkward in my English, but I do not want to rest my defense on that alone.) The force of the example is that the possibilities introduced by the antecedent of (21a)—in particular the stuck-behind-someone-tall possibilities—are fleeting, quantified over by (21a) but not (21b). But there is reason to think that to the extent that this is so—the extent to which such a sequence is unproblematic—is not without some conversational fuss.

Assume that *So* is an inference marker: φ; *So*: ψ is acceptable just in case ψ is true in—induces no relevant context shift from—the context that results from interpreting φ. Thus, while both Sobel and Hegel sequences are consistent, since neither is cohesive neither should tolerate *So* between the conjuncts. And neither does:

(22) a. If Sophie had gone to the parade, she would have seen Pedro dance
b. ??So: If Sophie had gone to the parade and been stuck behind someone tall, she wouldn't have seen Pedro dance

(23) a. If Sophie had gone to the parade, she would have seen Pedro dance
b. ??So: If Sophie had gone to the parade, she might have been stuck behind someone tall and then she wouldn't have seen Pedro dance

I utter (21a). I can continue with any of these:

(24) a. ... So: if Sophie had gone to the parade, she might not have seen Pedro dance since she might have been stuck behind someone tall
b. ... So: Sophie might have gone to the parade and been stuck behind someone tall
c. ... So: if Sophie had gone to the parade, she might have been stuck behind someone tall and so might not have seen Pedro dance

But not with:

(23) b′. ... ??So: if Sophie had gone to the parade, she wouldn't have been stuck behind someone tall

That the continuations in (23) are acceptable, and the *So*-inserted (21b) is not, means that former but not the latter are true in—induce no relevant context shift from—the context that results from interpreting (21a). But in each case the claim can only be true in a context if there are Sophie-goes-and-is-stuck-behind-someone-tall-worlds in the counterfactual domain provided by it. Whence the possibilities raised by (21a) are not fleeting, and the purported downshifting in (21b) not automatic. The extent to which the domain can be shrunk reflects the extent to which we manage to engage in a bit of post-semantic repair.

But it can be made smoother by giving you some clear signal that some shrinking of the domain is needed, facilitating the repair:

(25) If Sophie had gone to the parade and been stuck behind someone tall, she wouldn't have seen Pedro dance. But that wouldn't happen. So: if Sophie had gone to the parade, she would have seen Pedro dance.

Once a possibility is made ripe for quantifying over by accommodating it, I cannot arbitrarily expect you to ignore it. But I can ask you to ignore it by saying something that would be patently false if you did not.[23] Non-modal talk can induce the same sort of repair:

(26) If Sophie had gone to the parade and been stuck behind someone tall, she wouldn't have seen Pedro dance. But only little kids were at the parade. So: if Sophie had gone to the parade, she would have seen Pedro dance.

While I have no good story to offer—indeed, no story at all—for how or why or in what cases such shrinkage is possible, this is reason to think that the resetting it achieves is not the no-fuss automatic shifting of contexts that accommodation induces. All of this does confirm the relevant prediction that strict conditional stories make: accommodation is comparably easier to do than undo.

It also makes plausible a way of marking the difference between counterfactuals and their indicative counterparts. Stories like mine that exploit the loophole take *would*-counterfactuals to be strict conditionals, a universal modal scoped over a material conditional. But the force of that modal is highly context dependent. Most of the work lies in getting straight about the interaction between context and semantic value. Suppose indicative conditionals are strict, too, amounting to a universal (epistemic) modal scoped over a material.[24] The interpretation of the epistemic modal is highly context dependent. Most of the work lies in getting straight about the interaction between context and semantic value. The semantics of the conditional constructions are largely the same. They differ in what domains they test and so on what parameter accommodation operates.

Let i be the set of worlds compatible with the facts I have. The change induced by an indicative *if p, q* amounts to testing i with the strict $\Box(p \rightarrow$

[23] For a similar gloss on resetting see von Fintel (2001, pp. 139–141).
[24] That picture is developed in Gillies (2004).

q). If there are p-worlds in i, this looks just like the counterfactual. But if accommodation does not idle a difference emerges. Accommodation triggered by counterfactuals—either in the *would-* or *might-* flavors—has the result of shifting the counterfactual domain. Accommodation triggered by indicatives, on the other hand, shifts the set of worlds contending for the actual world. That is a different thing and predicts that accommodation in the two constructions will be sensitive to different pressures. Since accommodation triggered by an indicative introduces new worlds previously ignored or ruled out as contenders, we should expect accommodation here to interact in interestingly different ways with factual discourse. Or so I conjecture.

10 Reformulations

I have tried to make a case for exploiting a loophole. It is not a *mere* loophole because the facts about counterfactuals in context push us toward it, and exploiting it is not at all defeatist.

I want to conclude by offering two reformulations of the analysis. Two features loom large in how I have told the strict conditional story: there is a nested set of domains that accommodation operates as a filter on, and that set is generated in a more or less straightforward way from an underlying ordering recording relative proximity between worlds. The first feature is inessential in the sense that we might instead—with equivalent results—treat accommodation as a means of making (unstructured) domains ever-larger. The second feature is inessential in the sense that nothing I have said at all depends on making any assumptions about an underlying ordering of proximity between worlds. The reformulations are meant to make this clear.

The first reformulation takes the semantics of counterfactual discourse to affect and be affected by domains, not hyperdomains. As before, admissible domains around i are got by forming sets around i in a way that is faithful to the underlying ordering $\preceq_i$. Each domain around i is simply a sphere centered on i. Before, we separated the accommodation-induced effects of *might* from its quantificational-effects. That is why *might*(p) gave rise to the representations $\partial\Diamond p$ and $\Diamond p$. I still think that is useful and we can stick to that if we like. But there are other options. We can model the impact that *might* has on a context without this separation, making accommodation part of the update directly.[25] The picture is that accommodation triggers a domain shift by making the prior

[25] See Gillies (2003).

domain bigger. I assume that a domain shifts to allow the possibility that φ only if $[\![\varphi]\!] \neq \emptyset$.

Definition 9.

1. DOMAIN SHIFT
   $s \diamond \varphi = s'$ iff s' is the smallest set in $\mathbb{D}_i$ such that $s \subseteq s'$ and $s' \cap [\![\varphi]\!] \neq \emptyset$.

2. DOMAIN CCP

   a) $s[\Diamond\varphi] = \{w \in s \diamond \varphi : s \diamond \varphi \cap [\![\varphi]\!] \neq \emptyset\}$

   b) $s[\Box\varphi] = \{w \in s : s \subseteq [\![\varphi]\!]\}$

3. COUNTERFACTUALS

   a) s[*if had been p, would have been q*] $= s[\Diamond p][\Box(p \rightarrow q)]$

   b) s[*if had been p, might have been q*] $= s[\Diamond p][\Diamond(p \wedge q)]$

Consistency and cohesiveness are redefined to appeal to domains instead of hyperdomains:

Definition 10.

1. (CONSISTENCY, DOMAIN-WISE) $\varphi_1; \ldots; \varphi_n$ is *consistent*$_d$ iff there is an $\langle s, i\rangle$ such that $s[\varphi_1] \ldots [\varphi_n] \neq \emptyset$

2. (COHESIVENESS, DOMAIN-WISE) $\varphi_1; \ldots; \varphi_n$ is *cohesive*$_d$ iff there is an $\langle s, i\rangle$ such that $s[\varphi_1] \ldots [\varphi_n] = s \neq \emptyset$

Assume that the default, initial domain is $s_0 = i$. Clearly $s_{\pi_{\mathbb{D}_i}} = s_0$. And, just as clearly, if π results from updating $\pi_{\mathbb{D}_i}$ with a stretch of counterfactual discourse $\varphi_1; \ldots; \varphi_n$ and if s results from updating s_0 with that same stretch, then $s_\pi = s$. That stretch is consistent (cohesive) iff it is consistent$_d$ (cohesive$_d$). The two stories are notational variants.

But there is a (small) point to the variation. The reformulation invokes a change operation on sets of worlds. Updating a domain s with $\Diamond\varphi$ tests whether the post-accommodation domain $s \diamond \varphi$ has any φ-worlds in it. But of course it does since it, in effect, is s plus every world intermediate between s and the nearest φ-worlds. Thus the result of updating s with $\Diamond\varphi$ will be to make room for the possibility that φ is true.

This change operation corresponds to a specific contraction operator in belief dynamics. Contraction functions model a limit case of belief change where beliefs are removed but no new beliefs are added. Since belief states are in a state of logical equilibrium, constructing such operations from states to states is non-trivial. Each such construction represents some trade-off between conservatism (keep believing as much as you can) and egalitarianism (treat like beliefs alike, where likeness is measured by resistance to change or importance or whatever). One such construction—*severe withdrawal*—favors the egalitarian over the conservative.[26] Our reformulation coincides exactly with this construction. Less impressionistically: the accommodating test of s with $\Diamond\varphi$ coincides exactly with taking the severe withdrawal of $\neg\varphi$ from the belief set characterized by s.[27] And since the reformulation is just another way of putting the picture of accommodating entertainability presuppositions, we have that accommodation coincides with severe withdrawal. Different stories about accommodation might have opted for different constraints, and corresponded to more conservative change operations. We might have missed this connection between accommodation and the dynamics of belief if we did not bother to reformulate.

The second reformulation serves a different purpose. Accommodation looms large in any strict conditional story exploiting the loophole. As I have told the story, the dynamics of counterfactual domains are driven in large part by an underlying ordering of worlds. That leaves the impression that the strict conditional story ultimately relies on the same apparatus that drives the classic variably strict semantics for counterfactuals. But, even setting aside issues of contextual dynamics, there are problems with *any* similarity-based semantics for counterfactuals—facts and predictions do not happily align.[28] Better to tell the story in a way that is independent of this issue.

The strict conditional analysis exploits hyperdomains—ordered sets of domains around a given i. These hyperdomains inherit their structure from an underlying ordering: accommodation trims a hyperdomain, and this amounts to taking a system of spheres and successively eliminating the inner-most spheres. But such systems need not be generated by orderings of overall comparative similarity. All that is needed is a *fallback relation* and a proposition—these generate a *hyperproposition*; hyperdomains inherit both their name and their structure accordingly.[29]

[26] See Rott and Pagnucco (1999).
[27] See Gillies (2003).
[28] See Kratzer (1989) and Veltman (2005).
[29] See Fuhrmann (1999) for more on the structure of hyperpropositions. Grove (1988) was the first to use (a version of) them in belief dynamics.

Given a proposition x, suppose we have associated with it a fallback relation F—a relation recording the series of propositions we fall back to if retreating from x. A hyperproposition about x is just the closure of x under the fallback relation: $H_x = x^* = \{y : xFy\}$. The structure of a hyperproposition is determined by the properties of the fallback relation. Assume at least this structure: F is reflexive, transitive, inclusive, and quasi-connected.[30] Quasi-connectedness plus inclusion entail that F induces a linear order. Where W is finite, this implies the Limit Assumption for F.[31] Orderings of similarity induce one choice of F—that is why a system of spheres is equivalent to a set-valued selection function—but others are possible.[32] Although officially a hyperproposition H_x is a set of propositions, it is sometimes convenient to think of it simultaneously as the ordering of H_x by F. Let's not fuss over the difference.

The set $\mathbb{D}_i$ of admissible counterfactual domains (at i, with repsect to a choice of fallback relation F) is simply the hyperproposition H_i. A hyperdomain around i is an ordered set of admissible domains, the structure of the ordering inherited from the structure of the hyperproposition H_i. From here, the analysis goes as before. What I have said about counterfactual score can be said so that it is parametric on a choice of F.

[30] Inclusion: xFy implies $x \subseteq y$; Quasi-Connectedness: xFy and xFz implies yFz or zFy.

[31] Limit Assumption: if H_x is a hyperproposition about x and y is a proposition, there is a smallest $z \in H_x$ such that $z \setminus x \neq \emptyset$.

[32] Veltman's (2005) counterfactual retraction operator induces a particularly nice fallback relation since the fallbacks thus induced respect dependencies between facts in a context.

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