Counterfactuals as Strict Conditionals
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This paper presents a new deductive argument for the strict conditional analysis of counterfactual conditionals, as against the dominant variably strict analysis due to Robert Stalnaker (1968) and David Lewis (1973). Counterfactual conditionals belong to a broader linguistic family of counterfactual modals. The argument offered here turns on facts about the logical interaction of counterfactual conditionals and counterfactual possibility modals (like “could” and “might”). I call this the Coordination Argument. The argument not only validates the strict conditional analysis of counterfactual conditionals, it also implies a distinctive account of their semantic relationship to counterfactual modality generally. I call this the Coordinated Analysis. This view in turn sheds light on the division of communicative labor between semantics and pragmatics in counterfactual discourse.

The paper is divided into three major parts. In Section 1, I review the necessary theoretical background: the semantics of counterfactual possibility modals, the semantics proposed by the rival theories of counterfactual conditionals, and the precise distinction between these theories. Section 2 is the heart of the paper: here I present the Coordination Argument for the strict analysis. In Section 3, I reply to a range of possible objections. Section 4 is a conclusion.

1 The semantics of counterfactual modals

This section reviews semantic theories that have been proposed for two kinds of counterfactual modals in English. I first outline a widely accepted accessibility-based account of counterfactual possibility modals, which I will assume for the remainder. I then describe the competing strict and variably strict analyses of counterfactual conditionals.

1.1 Counterfactual possibility modals

We begin with sentences like the following:

(1) It could have rained today.

(2) It might have rained today.

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By “counterfactual” modals I mean to designate modals in the “subjunctive” or “irrealis” mood. The boundaries of this linguistic class, both intra- and cross-linguistically, are not well understood and remain the subject of ongoing investigation and debate. For a broad sampling of contemporary views, not all of which are compatible with that defended in this paper, see Farkas (1992); Stone (1999); Elliott (2000); Iatridou (2000); Ippolito (2003); Panzeri (2003); Schlenker (2005); Portner (2009); Quer (2009); Matthewson (2010); Starr (2012). Whatever the correct theoretical account of counterfactuality, here I follow many investigators in holding that the relatively narrow class of counterfactual possibility modals and conditionals can be reliably identified, if not clearly defined.
Such sentences are commonly thought to have two readings, loosely characterized as follows. On the first indicative (or “epistemic”) reading, (1) and (2) express the speaker’s ignorance about a past situation: she is saying that for all she knows it may have rained earlier today. On the second counterfactual (“metaphysical” or “subjunctive”) reading, (1) and (2) express the speaker’s belief that even though it did not rain today, there was a viable alternative situation in which it could have. There are various diagnostics for teasing apart the two readings. Perhaps the clearest is that the counterfactual reading is felicitously uttered in conjunction with the denial of the clause in its scope, shown below, while the indicative reading is not.2

(3) It could have rained today, but it didn’t.

(4) It might have rained today, but it didn’t.

My interest here is in the counterfactual readings of (1) and (2). I’ll call sentences of the form \(\Diamond \phi\), counterfactual possibility modals (for short, possibility modals). Note that natural languages countenance a variety of modal “flavors”, of which the epistemic and counterfactual readings described here are just two prominent examples. (Kratzer 1981b, 2012) Others include legal, doxastic, and ability modals. Here and throughout I will confine my attention to counterfactual possibility modals and counterfactual conditionals.

A widely accepted approach to the semantic analysis of possibility modals understands them to contribute a quantifier over worlds with existential force. (Kripke 1963; Kratzer 1977) The idea is that (1) and (2) are true if and only if there is some world among a contextually selected set of worlds in which it rains today. This is the set of counterfactually accessible worlds, roughly characterized as the set of worlds which are considered counterfactually possible at a given point in the discourse. Formally, the set of accessible worlds is a function of both the conversational context and the world of evaluation. (Kratzer 1977, 2012) For present purposes, let us dub the domain of accessible worlds over which counterfactual possibility modals range, relative to a world of evaluation and context, the modal domain.

To make this semantic proposal more exact, I introduce a simple formal language constituted by the standard language of propositional logic plus a one-place sentential modal operator \(\Diamond\). (For ease, I assume that the modal operator is not iterable.) And I adopt the following translation schema. The schema is not algorithmic; it does not define what it is for a sentence to be of a given form. Nevertheless it is clear enough to guide our discussion.3

**Translation for counterfactual possibility modals**

\(\Diamond \phi\) translates sentences of the form

\(\text{it could/might have been the case that } \phi\)

on their counterfactual readings.

Next, I assume that each sentence of the language is evaluated for truth relative to a world \(i\) and context \(c\) (but I suppress reference to a model). And I’ll model the truth-conditional content

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2 This diagnostic was brought to my attention by a participant at the 2009 Central European University Summer School on conditionals, whose name I have regrettably lost. Here is another diagnostic: on the indicative reading, synonymy is preserved if “could have”/“might have” is replaced by “may have”, but not so on the counterfactual reading.

3 Note that counterfactual possibility modals can also be expressed by sentences of the form \(\text{it could/might be the case that } \phi\). For example: “I could be at the beach, but instead I’m working on this paper.”
of a sentence $\phi$ as a set of worlds, expressed relative to a world of evaluation $i$ and a context $c$. Since, in the propositional language in question, the modal operators do not iterate, the set of worlds associated with non-modal formulae do not vary with world of evaluation or context. As a consequence, no ambiguity will be introduced by suppressing reference to these parameters when speaking of the content of non-modal formulae. I shall write $[\phi]$ to refer to the truth-conditional content of a non-modal formula $\phi$, modeled as a set of worlds, for any world of evaluation or context. When a world is in the set $[\phi]$, I will call it a “$\phi$-world.”

For our purposes the most important aspect of the context is the specification of a function $k$, which we define as follows:

**Modal accessibility function**
Relative to a context $c$, $k$ is a mapping from worlds to sets of worlds.

The accessibility function works to associate a world of evaluation with a modal domain— that is, the set of worlds accessible from the world of evaluation, given the conversational context. With this tool, we can express the standard, existential semantics of possibility modals, for any world $i$ and context $c$:

**Semantics for counterfactual possibility modals**

\[
\langle \Box \phi \rangle \text{ is } \text{true}_{i,c} \text{ iff } \exists w \in k(i) : w \in [\phi]
\]

There is a world $w$ among the worlds accessible from $i$, $k(i)$, such that $w$ is a $\phi$-world.

We now turn to the case of counterfactual conditionals.

### 1.2 Counterfactual conditionals

**Counterfactual conditionals**, in English, are conditionals of the approximate form “if it had been the case that $\phi$, it would/might/could have been the case that $\psi$”. Not only can the consequents of such conditionals involve a variety of different modals, the conditional itself can be realized by a diversity of syntactic forms. Here my focus is on counterfactual “would” conditionals, which I’ll often refer to simply as conditionals.

Today, two semantic theories of counterfactual conditionals have distinguished themselves. The dominant view is the **variably strict analysis** (for short, the **variable analysis**), introduced by Robert Stalnaker (1968; 1970; 1984) and David Lewis (1973, 1979a), elaborated by Angelika Kratzer (1981a, 1989, 1991), and expounded by innumerable others.\(^4\) The main alternative is the **strict conditional analysis** (for short, the **strict analysis**). It appears to originate with the Stoic philosopher Chrysippus in the third century B.C.E. (Sanford 2003); it was first defended in the 20th century by C.I. Lewis (1914) and C.S. Pierce (1933). Contemporary, context-sensitive versions of the theory have been developed by Ken Warmbröd (1981a, 1981b), William Lycan (1984, 2001), E.J. Lowe (1983, 1995), Kai von Fintel (2001), and Thony Gillies (2007).\(^5\)

\(^4\)The term “variably strict” was coined by Lewis 1973.

\(^5\)Besides the strict and variable analyses of counterfactual conditionals, there are a variety of other competing accounts, including probabilistic analyses (e.g. Edgington 2003, Kvart 1986, Loewer 2007), and cotenablity analyses (e.g. Goodman 1947, Daniels and Freeman 1980). In my opinion, the first family of theories has been shown to contain fundamental
defended here.

The rival views can be thought of as divergent implementations of the same basic idea. The strict and variable analyses hold in common that a conditional is true at a world and in a context if and only if for every world from a relevant set, when the antecedent is true at that world, the consequent is also true at that world. Let us call this relevant set of worlds the evaluation domain of a given conditional, evaluated at a world in a given context. In the contemporary debate, all parties agree that, the evaluation domain is a restricted set of worlds, where the restriction is determined in part by the world of evaluation, and in part by the context of expression.

Nevertheless, the strict and variable analyses propose crucially different accounts of how, as a rule, the evaluation domain should be calculated. According to the variable analysis, once we have fixed the context and world of evaluation, the evaluation domain is a function of the antecedent of the conditional, and varies from one antecedent to another. According to the strict analysis, once we have fixed the context and world of evaluation, the evaluation domain is also fixed, independent of the antecedent of the conditional under consideration. Thus the analyses diverge about how to define the set of worlds relevant to the the determination of a conditional’s truth value, and in particular about whether this set should depend on the syntax of the conditional itself.

To precisify these ideas, I add to our working formal language a two-place sentential modal operator $\triangleright$, which cannot be iterated. Then we can represent any English counterfactual conditional by the following translation schema.

**Translation for counterfactual conditionals**

$\left\langle \phi \triangleright \psi \right\rangle$ translates sentences of the form:

*if it had been/were the case that $\phi$, it would have been/would be the case that $\psi$."

Again, the schema is not algorithmic; it does not define what it is for a sentence to be of a given form. Here I cast my lot with most parties to the debate in assuming that there is some relatively systematic way of determining what counts as a counterfactual conditional, and how they should be decomposed.

The strict analysis relies on the now familiar notion of a set of accessible worlds. For this purpose, I introduce a second accessibility function $s$; it has the same formal properties as the modal accessibility relation $k$, and like $k$, it is determined by context.

**Conditional accessibility function (Strict Analysis)**

Relative to a context $c$, $s$ is a mapping from worlds to sets of worlds.

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6. To be exact, each theory is compatible indefinitely many distinct sets playing the role the evaluation domain. While some formulations explicitly define the set that plays this role, others do not. In the latter case, I will continue to refer to “the” evaluation domain, by which I mean, an arbitrarily selected set that fills the specified role.

7. Thanks to Matthew Stone (p.c.) for helping to clarify the distinction in this way.

8. I make this stipulation for the sake of expository simplicity; an adequate theory of embedding, along the lines of Gillies (2009) and Gillies (2010, §7), requires more sophisticated semantic mechanisms than those presented here.

9. Accepting the schema further presupposes that counterfactual conditionals can be legitimately translated by a sentence containing two other sentences and single logical connective. I shall persist in this assumption, but I flag it as a site of potential disagreement. (See Kratzer 1986, Lycan 2001, ch. 1).
The variably strict analysis relies on a somewhat different set of formal tools. The goal here is to define a contextually determined selection function which takes as arguments an evaluation world and a sentence, and returns the set of worlds “closest” to the evaluation world in which the sentence is true. Such a function can only be defined relative to a “closeness” ordering (a partial ordering) over worlds, with the world of evaluation as a maximal element. Officially, context determines the ordering over worlds, and this, together with the distribution of sentential semantic values over worlds, fixes the selection function.

Comparative closeness ordering (Variable Analysis)
Relative to a context $c$, $\geq$ is a function from worlds to partial orders over sets of worlds, such that, for any world $i$, $\geq_i$ is a comparative closeness ordering over a set of worlds.

Conditional selection function (Variable Analysis)
Relative to a context $c$, $f$ is a mapping from a world $i$ and sentence $\phi$, to the set of closest $\phi$-worlds to $i$ according to $\geq_i$, and to the empty set if there are no such $\phi$-worlds.

Finally, using the accessibility function $s$ and selection function $f$, we are in a position to define the strict and variable analyses, for any world $i$ and context $c$:

The Strict Analysis

\[ \langle \phi > \psi \rangle \text{ is true}_{i,c} \iff \forall w : w \in s(i) \cap \llbracket \phi \rrbracket \to w \in \llbracket \psi \rrbracket \]

For every world $w$: if $w$ is in the accessible worlds from $i$, $s(i)$, and a $\phi$-world, then $w$ is a $\psi$-world.

The Variable Analysis

\[ \langle \phi > \psi \rangle \text{ is true}_{i,c} \iff \forall w : w \in f(\phi, i) \to w \in \llbracket \psi \rrbracket \]

For every world $w$: if $w$ is among the closest $\phi$-worlds relative to $i$, then $w$ is a $\psi$-world.

The strict analysis states that the conditional $\langle \phi > \psi \rangle$ is true at a world $i$ and context $c$ iff every $\phi$-world in the set of worlds accessible from $i$ is a $\psi$-world. The variable analysis states that the conditional $\langle \phi > \psi \rangle$ is true at a world $i$ and context $c$ iff every $\phi$-world among the set of closest $\phi$-worlds to $i$ is also a $\psi$-world. The key terms, in each case, are assumed to be context-sensitive.

The variable analysis holds that there are many possible measures of comparative closeness among worlds, operative in different conversational contexts, while the strict analysis allows that the contents of the set of accessible worlds is similarly context dependent.

The essential difference between these two views is that, fixing for world of evaluation and context, according to the strict analysis, the evaluation domain remains the same, for any an-

\[ ^{11} \text{Though I count both Stalnaker (1968) and Lewis (1973) as archetypical defenders of the variable analysis, neither would agree to my formulation of it, but for different reasons. Stalnaker assumes Uniqueness, according to which the selection function always returns only a single world, which the above analysis rejects. Lewis denies the Limit Assumption, according to which there is always a set of closest $\phi$-worlds for any $\phi$, which the above analysis accepts. Furthermore, Uniqueness entails the Limit Assumption, so Stalnaker accepts each, while Lewis rejects both. Thus the version of the variable analysis presented here is a hybrid of both views. But the hybrid is both clearer and more intuitive than either of its progenitors, so for the purposes of this paper it will be a useful stand-in for any particular variable analysis. None of the force the overall argument would be weakened by adopting one of these variants in its stead.} \]

\[ ^{12} \text{For the purposes of meta-logical proof, a purely set-theoretic formulation of each analysis will be useful. The strict truth conditions may be stated } s(i) \cap \llbracket \phi \rrbracket \subseteq \llbracket \psi \rrbracket, \text{ while the variable truth conditions may be stated } f(\phi, i) \subseteq \llbracket \psi \rrbracket. \]
tedent; while according the variable analysis, the evaluation domain varies from conditional to conditional, as a function of the antecedent. More explicitly: according to the strict analysis, for any given world $i$ and context $c$, there is a set $S$ such that, for any conditional $⌜\phi > \psi⌝$, it is true$_{i,c}$ iff $S \cap [\phi] \subseteq [\psi]$. The variable analysis rejects this claim: for any given world $i$ and context $c$, there is no single set $S$ such for any conditional $⌜\phi > \psi⌝$, it is true$_{i,c}$ iff $S \cap [\phi] \subseteq [\psi]$. Instead, there are different such sets for different antecedents. Thus the two analyses divide over the the dependence of the evaluation domain on the syntactic structure of the conditional, in particular, its antecedent.$^{13}$

We may further illustrate the difference between the two theories with respect to an arbitrary pair of conditionals “$A > C''$” and “$B > C''$", evaluated relative to a single context and world of evaluation. According to the strict analysis, the truth conditions are much the same; each conditional is true just in case all the accessible antecedent worlds are C-worlds. In each case, the total set of accessible worlds $s(i)$ remains the same. The diagrams below display these truth-conditions by shading out the logical space which must remain unpopulated in order for each conditional to be true.

By contrast, for the variable analysis, the set of worlds relevant to the evaluation of a conditional varies with the conditional’s antecedent. In the diagrams below, the closest sphere of worlds containing at least one antecedent-world is demarcated in red. As indicated, the closest $A$-worlds may be relatively close, while the closest $B$-worlds may be relatively more distant. The result is that the evaluation domain may vary from antecedent to antecedent.

$^{13}$A point of methodology. Given that all contemporary theorists recognize the substantial context-sensitivity of conditionals, the strict and variable analyses can not be usefully distinguished by the degree of variation they afford to the evaluation domain across contexts. The trick for properly detecting the distinction is to examine the behavior of each semantic clause as applied to arbitrary conditionals evaluated relative to a fixed context. Then we find that the strict and variable analyses differ essentially in the degree of variability they afford to the evaluation domain.
Thus, to reiterate, according to the strict analysis, antecedent-worlds are drawn from a constant stock of worlds; according the variable analysis, antecedent-worlds are drawn from a variable, antecedent-dependent stock of worlds.

This semantic distinction gains significance in view of the logics determined by each theory. Because the evaluation domain of the variable analysis is more variable, in the sense explained, than that of the strict analysis, the variable analysis determines a substantially weaker logic than the strict analysis. That is, the variable analysis fails to validate many inference patterns validated by the strict analysis, including Antecedent Strengthening, Hypothetical Syllogism, Contraposition, and Simplification of Disjunctive Antecedents. Whether or not this weakness is a virtue has been the subject of much debate.\textsuperscript{14}

The strict and variable analyses diverge over whether the evaluation domain depends semantically on the antecedent of the conditional. A more general question is whether the choice of antecedent can influence the selection of evaluation domain, by some mechanism or other. Call this general phenomena antecedent influence. A variety of arguments from Stalnaker (1968, 1984) and Lewis (1973) conclusively demonstrate that any plausible theory of conditionals must incorporate a mechanism by which antecedent influence may be achieved. Yet these authors suggest that only variable analyses, and not strict analyses, have the resources to meet this requirement. If this was true at the time, it is no longer. The most recent, sophisticated versions of the strict analysis join the variable analysis in endorsing the general phenomena of antecedent influence. But where variable theorists achieve antecedent influence by a semantic mechanism, the strict theorists achieve the same by a pragmatic one. In particular, they allow that certain choices of antecedent trigger pragmatic shifts in context, thereby indirectly affecting the evaluation domain. Such pragmatic mechanisms are not the sort which are vaguely confined to an atheoretical “wastebasket”; rather, they precisely define algorithmic transformations of the context.

A danger now arises that the distinct semantic theories, combined with distinct pragmatic mechanisms will ultimately yield the same predictions about natural language. Thus Stalnaker’s (1984, 126) expression of skepticism: “Despite the differences in logic, the difference between a strict conditional theory and a theory of the general kind I am defending might be more superficial than it seems.” Yet, while predictive differences may be difficult to detect, they can be found. The

\textsuperscript{14}For extensive discussion, see Stalnaker 1968; Lewis 1973; Lowe 1995; Loewer 1976; Nute 1980; Fine 1975; Creary and Hill 1975; Ellis, Jackson, and Parfet 1977; Warmbröd 1981b; Mckay and Van Inwagen 1977; Lycan 2001.
key here is that, according to the strict theories, not every choice of antecedent triggers a shift in context. By restricting our attention to those combinations of worlds, contexts, and antecedents which do not, according to the strict theorist, trigger a shift in context, we may recover predictive differences between the two theories. For in these cases, the context naturally stays fixed. And in these cases, the two theories appear make substantively different predictions. Von Fintel (2001) and Gillies (2007) have described specific linguistic evidence for this restricted divergence; I will discuss other, rather different sorts of cases in the next section of this paper.

Thus the distinction between the strict and variable analyses cannot be traced to whether one or the other substantiates antecedent influence. Both do. The difference lies in how each determines the evaluation domain of conditionals generally, when world of evaluation and context is held fixed.

Note, finally, that while the current definition of the strict and variable analyses constitutes the semantic core of each view, neither is exhausted by this characterization, and a variety of additional constraints are commonly imposed. For example, natural addenda to the semantics of each result in the validation of Modus Ponens.\(^{15}\) And standard versions of each analysis interpret their favored formal tools (accessibility functions and selection functions respectively) in terms of similarity orderings, or similarity-like orderings, over worlds.\(^{16}\) Further elaborations embed conditionals within sophisticated pragmatic machinery.\(^{17}\) I mention these embellishments only to set them aside. In the remainder, I’ll persist with these basic definitions, except where I explicitly extend them.

### 1.3 Semantics for conditionals with possibility modals

So far I have presented the semantics for possibility modals and conditionals independently. But how should analyses of these two phenomena interact? I address this question for both the strict and variable analyses of conditionals, in turn.

\(^{15}\)Most theorists of conditionals agree that counterfactual Modus Ponens must be counted among the logical validities. (For discussion, see Lewis (1973) and Lycan (2001).) Neither the coordinated nor the variable analysis validates it, as they are defined above. But simple adjustments can be made to each in order to correct this. The variable analysis may validate Modus Ponens with the following principle, defined relative to an arbitrary model:

\[\text{(Weak Centering)}\quad \text{For any } i \in W, \text{ } i \text{ is among the set of worlds closest to } i, \text{ according to } \geq_{i}.\]

The strict analysis requires a parallel constraint in order to validate Modus Ponens. (Lycan (2001) calls this constraint the Reality Requirement. I take the name below from characteristic frame condition of System T in modal logic.)

\[\text{(Reflexivity)}\quad \text{For any } i \in W, i \in k(i).\]

\(^{16}\)Similarity orderings have been central to the variable analysis since its inception. But any viable version of the strict analysis must make some allowance for such orderings as well. Lewis (1973, 9) in fact sketches such a construal of the strict analysis. The proposal has been developed in greater detail by Lowe (1995, 54-5), von Fintel (2001, 17-24) and Gillies (2007, 357-8).

\(^{17}\)Any linguistic description of conditionals must characterize the evolving behavior of conditionals within discourse. These discourse phenomena can be modeled within a pragmatic framework (e.g. Stalnaker 1975; Nute 1980) or a dynamic semantic one (von Fintel 2001; Veltman 2005; Gillies 2007). For a various reasons, recent strict analyses have tended to receive dynamic treatments, while recent variable analyses have tended to receive static treatments coupled with robust pragmatic machinery. (Examples of the former kind are von Fintel (2001) and Gillies (2007); examples of the latter kind are Stalnaker (1975), Moss (2012), and Williams (2008).) But ultimately, both views must countenance systematic changes of context through discourse, and both views face the same theoretical challenges about how to explain this context change. In my opinion, nothing about the character of either theory of conditionals predisposes it to dynamic or static analysis, beyond the relative inherent merits of those approaches. Although now is not the time for a detailed defense of this claim, I hope that my thoroughly static presentation of the strict analysis here will help disassociate the strict analysis from the project of dynamic semantics, whatever the virtues of each.
The semantic analysis of possibility modals relies on a modal domain, modeled by the accessibility function $k$, while that of the strict analysis of conditionals relies on an evaluation domain, modeled by the accessibility function $s$. What is the relation between $k$ and $s$? There are number of theoretical options here. In the second half of this paper I will defend a particular version of the strict analysis, which I dub the COORDINATED STRICT ANALYSIS (for short, the COORDINATED ANALYSIS), which holds simply that $k = s$. That is, possibility modals and conditionals share the same domain of quantification. In this sense, the two operators are coordinated. Thus conditionals express restricted universal quantifiers over the accessible worlds, while possibility modals express existential quantifiers over the accessible worlds. I implement this idea formally by simply employing the same accessibility function in the semantic clause for each operator, below.

Is there a similarly coordinated version of the variable analysis at hand? The variabilist wishing to extend her theory to possibility modals is presented with four prominent options. First, the modal domain may be identified with the set of all worlds in the model. Second, the modal domain may be identified with the set of worlds over which the closeness order is defined. Third, the modal domain might be identified with the set of worlds closest to the world of evaluation, or with a set that is sufficiently close according to some parameter. Finally, the null hypothesis: the modal domain need not bare any particular relation to the closeness ordering.

As we shall see in the second half the paper, each of these options has interestingly different consequences for the interaction of conditionals and possibility modals. I will ultimately argue that the variable analysis should impose at least the second constraint—the closeness ordering should range only over worlds within the modal domain. But without further argumentation, I do not wish to saddle the variable analysis with commitments alien to its original spirit. So in what follows, I will define the canonical version of the variable analysis using the null hypothesis above—the modal domain is the set of accessible worlds with no particular relation to the closeness ordering. For any world $i$ and context $c$:

**The Coordinated Strict Analysis**

\[ \lbrack \lbrack \phi \triangleright \psi \rbrack \rbrack \text{ is } \text{true}_{i,c} \text{ iff } \forall w \in k(i) : w \in [\phi] \rightarrow w \in [\psi] \]

\[ \lbrack \lbrack \Diamond \phi \rbrack \rbrack \text{ is } \text{true}_{i,c} \text{ iff } \exists w \in k(i) : w \in [\phi] \]

**The Variable Analysis**

\[ \lbrack \lbrack \phi \triangleright \psi \rbrack \rbrack \text{ is } \text{true}_{i,c} \text{ iff } \forall w : w \in f(\phi, i) \rightarrow w \in [\psi] \]

\[ \lbrack \lbrack \Diamond \phi \rbrack \rbrack \text{ is } \text{true}_{i,c} \text{ iff } \exists w \in k(i) : w \in [\phi] \]

As before, the two proposals diverge in the semantics they assign to the conditional. But following the discussion above, we now observe an additional and important divergence pertaining to the interaction between possibility modals and conditionals. On the strict analysis, the domain of quantification for conditionals and possibility modals is the same. No such demand is imposed by the variable analysis. The tight coordination between conditionals and modals reflected in this

\[ ^{18}\text{As far as I know, this version of the strict analysis has not been explicitly articulated in print; but it can hardly be considered novel either, as it has been tacit in much of the recent discussion of the strict analysis of conditionals. (von Fintel (2001) briefly consider the view in footnote 15.) I owe special thanks to Jason Stanley (p.c.) for helping me see clearly the characteristic coordinative features of this theory.} \]

\[ ^{19}\text{In the definition below, I have very slightly reformulated the strict analysis truth conditions for } \triangleright, \text{ so as to preserve parallelism with the standard formulation of truth conditions for } \Diamond. \]
version of the strict analysis is central to the argument of the paper, to which we now turn.

2 The Coordination Argument

I now introduce to the central contribution of this paper: a deductive argument for the coordinated strict analysis of counterfactual conditionals. For reasons that will become clear shortly, I dub this the Coordination Argument. The argument relies on two key premises, mirror images of one another. The first premise holds that the pattern of inference I term Impossibility Above is logically valid; the other holds that the pattern I term Impossibility Below is logically valid.

\[
\begin{align*}
\text{(Impossibility Above)} & \quad \neg \diamond (\phi \land \neg \psi) \\
\phi & \Rightarrow \psi
\end{align*}
\]

\[
\begin{align*}
\text{(Impossibility Below)} & \quad \phi > \psi \\
\neg \diamond (\phi \land \neg \psi)
\end{align*}
\]

In the first two subsections below, I’ll provide linguistic evidence for each. Then I’ll give the Coordination Argument itself: a simple proof that the two key premises jointly entail the coordinated strict analysis. It shows that if each premise correct—that is, if each inference above is a logical validity—then \( \neg \diamond (\phi \land \neg \psi) \) is logically equivalent to \( \neg \diamond (\phi \land \neg \psi) \). And if this is so, by a straightforward deduction, then the coordinated strict analysis is correct. In the following section, I’ll take up the stickier matter of defending the key premises against possible objections.

Here and throughout, I’ll employ a classical definition of entailment: a set of premises \( \phi_1, \ldots, \phi_n \) entails a conclusion \( \psi \) if and only if, for any world and context (or model) where all the premises are true, the conclusion is also true. An argument is logically valid, in the sense intended here, if and only if its premises entail its conclusion.

2.1 Premise 1: Impossibility Above

The first key premise is the claim that arguments conforming to the following inference pattern are logically valid.

\[
\begin{align*}
\text{(Impossibility Above)} & \quad \neg \diamond (\phi \land \neg \psi) \\
\phi & \Rightarrow \psi
\end{align*}
\]

The argument for this claim is abductive: it provides an elegant explanation of at least two general phenomena in natural language discourse, where no other principle obviously presents itself to do the same work. In each case, the reader should assume that all sentences are spoken by the same individual, and that this individual is speaking in some kind of deductive context—either reasoning to herself or trying convince an interlocutor of her conclusions.

In the first type of case, the felicity of an inference is explained by direct appeal to Impossibility Above.

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\(^{20}\)The definition is “classical” in the sense that, after fixing for the world of evaluation and the interpretation of the atomic formulae, all other features of the model are also held fixed across the sequence of sentences under consideration. This is opposed with recent dynamic treatments of entailment which allow contextual parameters to evolve over the course of evaluation. (e.g. von Fintel 2001, 18) In addition, the definition is both “formal” and “modal”, in the sense that it requires that the truth of the premises guarantee the truth of the conclusion as we vary both the interpretation of the atomic sentences in each and the world at which they are evaluated. (Etchemendy 1990) I do not take any stand on the best definition of classical entailment. I elect for a definition that combines the formal and modal constraints, because the combination is more stringent than either of the constraints taken alone. Thus whatever inference patterns are classically valid here will still be valid if the reader elects for a merely formal or merely modal definition.
(5)  a. Though she stayed home, Tendayi could have gone sailing Tuesday afternoon.
    b. But she couldn’t have gone sailing and bowling.
    c. So, if she had gone sailing, she wouldn’t have gone bowling.

(5b) has the form “¬◊(sail \& skate)”. By Impossibility Above this entails that “sail > ¬skate” is true, as expressed by (5c). The speaker’s felicitous use of the inferential marker “So” at the beginning of (5c) indicates that it genuinely follows from the previous discourse, instead of being merely consistent with it. Impossibility Above provides a straightforward account of this inferential force. Here (5a) is included in order to force the counterfactual reading of could and to explicitly satisfy a hypothesized presupposition of the conditional in (5c) that its antecedent be considered possible in context.21

The second type of case involves a stark infelicity which is explained as a violation of Impossibility Above. The case can be stated most forcefully once we note that, for both the similarity and coordinated analyses,  \( \Gamma \phi > \neg \psi \Gamma \) entails  \( \neg(\phi > \psi) \Gamma \) so long as the antecedent is compatible with the evaluation domain, so that the conditional as a whole is not trivially true. Since this is the norm, and may even be presupposed by conditionals generally, I will assume it holds in the following.

(6)  a. Norbert could have gone home over the holidays.
    b. But he couldn’t have gone home and met the deadline.
    c. Yet if he had gone home, he would have met the deadline.

Here (6b) has the form “¬◊(go.home \& meet.deadline)”. By Impossibility Above this entails “go.home > ¬meet.deadline”, which normally entails “¬(go.home > meet.deadline)”. Yet (6c) asserts the negation of this, “go.home > meet.deadline”. So Impossibility Above predicts that (6c) is unacceptable because logically incompatible with the previous discourse.

Together, these linguistic observations constitute a powerful case for Impossibility Above.

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21A qualification. Recent advocates of the strict analysis have proposed, as a general linguistic principle, that conditionals presuppose the compatibility of their antecedents with the possibilities made available by the context of evaluation. In the framework of this paper, this means that conditionals presuppose that their antecedents are compatible with the set of accessible worlds. Call this claim Possibility Presupposition: for any conditional “\( \phi > \psi \)”, world of evaluation \( i \), and context \( c \) it is presupposed that \( k(i) \cap [\phi] \neq \emptyset \). (Von Fintel (1998, 2; 2001, 15-20) calls this the “Compatibility Presupposition”; Gillies (2007, 333-4) calls it the “entertainability presupposition.”) This requirement has the desirable consequence that conditionals whose presuppositions are satisfied are never trivially true, because there must always be some antecedent-worlds in their evaluation domain. The doctrine is independent of the question of whether presupposition failure is merely pragmatic infelicity, or also results in loss of truth-value. See Gillies (2009, 344-348) for a discussion of the options.

Advocates of Possibility Presupposition may object that Impossibility Above is too strong. For suppose Possibility Presupposition is correct, suppose that presupposition failure results in loss of truth-value, and consider a model in which the premise “¬◊(\( \phi \land \neg \psi \))” is true because it is impossible that \( \phi \); in that case it is neither true nor false that “\( \phi > \psi \)”; due to presupposition violation, so Impossibility Above fails. But a weaker version of the rule, which guarantees the presupposition of the conclusion by adding “\( \Diamond \phi \)” as an additional premise, is valid:

\[
\begin{align*}
\neg\Box(\phi \land \neg \psi) & \quad \Diamond \phi \\
\hline
\phi & > \psi
\end{align*}
\]

(Weak Impossibility Above)

As we will see, substituting Weak Impossibility Above for Impossibility Above because of Possibility Presupposition has a very limited effect on the final conclusion of the Coordination Argument.
2.2 Premise 2: *Impossibility Below*

The second key premise is that arguments conforming to the following inference schema are logically valid:\(^{22}\)

\[
\frac{\phi \triangleright \psi}{\neg \diamond (\phi \land \neg \psi)}
\]

(Axiom \textit{Impossibility Below})

Again, the evidence for this claim is that it elegantly explains phenomena in natural language discourse, where no other explanation is readily available. As before, the first type of case seems to appeal to this inference rule directly:

(7) a. Tendayi didn’t show up to the match yesterday.
   b. But if she had showed up, she would have defeated Talia.
   c. So it couldn’t have been that Tendayi showed up and lost to Talia.

Since (7b) has the form “\textit{show.up} \triangleright \textit{defeat}”, it follows by \textit{Impossibility Below} that “\(\neg \diamond (\textit{show.up} \land \neg \textit{defeat})\)”. This is exactly what is expressed by (7c), once again prefaced by a felicitous use of the inferential marker “So”.

A second class of example explains the following \textit{infelicity} as a violation of the rule:

(8) a. Talia is an excellent athlete, though she missed the ping-pong match last Tuesday.
   b. However, if Talia had played, she would have won.
   c. * But she might have played and lost.

(8b) has the form “\textit{played} \triangleright \textit{won}”. By \textit{Impossibility Below} it follows that “\(\neg \diamond (\textit{played} \land \neg \textit{won})\)”.

But (8c) expresses the contradiction of this, “\(\diamond (\textit{played} \land \neg \textit{won})\)”. Thus (8c) is predicted to be infelicitous because it is logically incompatible with the preceding discourse. The same infelicity arises even when the order is inverted; this is explained as violating \textit{Impossibility Below} by denying its conclusion while affirming its premise:

(9) a. Talia is an excellent athlete, though she missed the ping-pong match last Tuesday.
   b. Of course, Talia might have played and lost.
   c. * But if she had played, she would have won

The next and last type of case relies on the inversion of \textit{Impossibility Below} derived by reasoning from the denial of its conclusion to the denial of its premise:

\[
\diamond (\phi \land \neg \psi) \models \neg (\phi \triangleright \psi)
\]

This inference is exhibited directly, though somewhat awkwardly, in the following script:

(10) a. John wanted to enroll in Organic Chemistry. But in all fairness, it’s a very difficult class.
   b. He could have enrolled and failed.
   c. So its false that if he had enrolled, he would have passed.

---

\(^{22}\)This inference pattern came to me via John Hawthorne, who discussed it in his 2008 metaphysics seminar at Rutgers University; he presented the inference in its inverted form, reasoning from the negation of the conclusion to the negation of the premise.
Here (10b) has the form “\(\Diamond (\text{enroll} \land \neg \text{fail})\)”. By Impossibility Below it follows that “\(\neg (\text{enroll} \rightarrow \text{fail})\)”, the same proposition felicitously expressed by (10c).

Thus, counting Impossibility Below as logically valid vividly explains a variety of inferential patterns in natural language. In a later subsection, I will discuss in detail potential alternate strategies for explaining the same discourse phenomena described here; I’ll argue that all such attempts fail.

2.3 The argument

Besides its two key premises, the Coordination Argument relies on a standard modal semantics for each of \(\neg\), \(\land\), \(\lor\), \(\supset\), as well that of \(\Diamond\), introduced in Section 1. I will not assume any particular semantic analysis for \(\supset\), since that is the matter at issue. I’ll define \(\Diamond \phi^n\) as an abbreviation of \(\neg \Diamond (\neg \phi)\). The following semantic definition can then be derived:

\[
\Diamond \phi^n \text{ is true}_i \text{ iff } \forall w \in k(i) : w \in [\phi]
\]

The argument proceeds by showing that if both of the inferential rules discussed above are understood as logically valid, the correct analysis of conditionals must be equivalent to the coordinated strict analysis.

**Step 1:** Show that \(\Diamond \supset (\phi \supset \psi)\) entails \(\phi > \psi\).

Assume, as a premise, the logical validity of Impossibility Above:

\[\neg \Diamond (\phi \land \neg \psi) \models \phi > \psi\]

Then we can reason as follows, by propositional modal logic:

\[\neg \Diamond (\phi \land \neg \psi) \iff \neg \Diamond \neg (\neg \phi \lor \psi) \text{ [DeMorgan’s Law]} \]
\[\iff \neg \Diamond \neg (\phi \supset \psi) \text{ [Definition of \(\supset\)]} \]
\[\iff \Diamond (\phi \supset \psi) \text{ [Definition of \(\Diamond\)]} \]

It follows that:

\[\Diamond (\phi \supset \psi) \models \phi > \psi\]

Thus the strict conditional entails the conditional.

**Step 2:** Show that \(\phi > \psi^n\) entails \(\Diamond (\phi \supset \psi)\).

Assume, as a premise, the logical validity of Impossibility Below:

\[\phi > \psi \models \neg \Diamond (\phi \land \neg \psi)\]

Now reasoning as before:

\[\neg \Diamond (\phi \land \neg \psi) \iff \Diamond (\phi \supset \psi) \]

It follows that:

\[\phi > \psi \models \Diamond (\phi \supset \psi)\]

Thus conditional entails the strict conditional.

**Step 3:** Derive the strict analysis.
By Step 1, \( \phi \Rightarrow \psi \) entails \( \square (\phi \Rightarrow \psi) \). By Step 2, \( \square (\phi \Rightarrow \psi) \) entails \( \phi \Rightarrow \psi \). So \( \phi \Rightarrow \psi \) and \( \square (\phi \Rightarrow \psi) \) are equivalent. Given the semantics for \( \square \) derived above, it follows that \( \phi \Rightarrow \psi \) is true at any world \( i \) and context \( c \) iff:
\[
\forall w \in k(i) : w \in [\phi \Rightarrow \psi]
\]
Which is equivalent to:
\[
\forall w \in k(i) : w \in [\phi] \rightarrow w \in [\psi]
\]
And these are the truth-conditions given by the coordinated strict analysis.

I conclude that if Impossibility Above and Impossibility Below are logical validities, as I have argued they are, then the coordinated strict analysis gives the correct truth-conditions for the conditional.\(^{23}\)

Of course, for richly compositional semantic analyses, truth-conditional equivalence for a single class of sentences (e.g. modals and conditionals) does not entail theoretical or predictive equivalence across the board. This is because two theories may diverge in the meanings they assign to individual words, and these assignments may result in predictive differences. But in the present case, the competing theories are not richly compositional. In fact, they agree on the meanings of both antecedents and consequents, but diverge only in their interpretation of the conditional connective.\(^{24}\) At this level of semantic abstraction, truth-conditional equivalence really is theoretical equivalence. If the correct analysis of conditionals is truth-conditionally equivalent to the strict analysis, then the strict analysis is the correct analysis of conditionals.

But we cannot yet declare the strict analysis the final victor, for there remains the crucial question of whether the premises of the Coordination Argument are actually true. That is, are Impossibility Above and Impossibility Below both valid inference rules? I have already provided positive linguistic evidence to this effect. But I have not yet considered whether there are alternative explanations of the linguistic evidence which are also compatible with variable analysis. In Section 3, I argue at length that no such alternative explanation is viable. The upshot is that both rules must be valid to explain the linguistic evidence, thus the coordination strict analysis must be correct.

Before turning to this negative line of argument, it will prove useful to clarify the relationship between the two key premises, on one hand, and the variable analysis, on the other. To this end, I’ll now show that the variable analysis can be straightforwardly extended to validate Impossibility Above, but not Impossibility Below. Thus the latter marks the real point of divergence between the Coordination Argument and the variable analysis. Attempts to defend the variable analysis against the Coordination Argument are attempts to explain away Impossibility Below.

\(^{23}\)Here we return to a complication introduced earlier. If Possibility Presupposition is true, then we must abandon Impossibility Above in favor of Weak Impossibility Above. Substituting the weaker rule for the stronger while maintaining Possibility Presupposition has a constrained effect on the conclusion of the Coordination Argument. Instead of showing that the unadorned coordinated analysis is correct, the weakened Coordination Argument now shows that the coordinated analysis with Possibility Presupposition is correct.

\(^{24}\)Remember that the connective “\( \Rightarrow \)” is not a simple translation of the word “if”; rather, sentences of the form “\( \phi \Rightarrow \psi \)” translate a complex and highly variable set of conditional sentences, some of which may not even include the word “if”.

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14
2.4 The variable analysis and the Coordination Argument

The Coordination Argument shows that *Impossibility Above* and *Impossibility Below* jointly entail the strict analysis. And as we saw in the first part of this paper, the strict analysis and the variable analysis have distinct truth-conditions, and determine different logics. Thus the two premises jointly entail a theory of conditionals which is incompatible with the variable analysis. The advocate of the variable analysis must therefore reject at least one of these premises. In this section I will argue that (i) according to the variable analysis, as presented, neither rule is validated; but (ii) a sympathetic revision of the variable analysis validates *Impossibility Above*; yet (iii) no such easy revision allows the variable analysis to validate *Impossibility Below*. So if the variable analyst wishes to resist the Coordination Argument, she should direct her objections at *Impossibility Below*. In the section, we will consider such objections.

As I have presented the variable analysis, there is no coordination between the semantics for possibility modals and the semantics for conditionals. In particular, there are no constraints relating the values of the set selection function $f$ and the accessibility function $k$, save that the values of each must lie within $W$. Thus the values of $f$ and the values of $k$ may be entirely disjoint. The absence of constraint here gives rise to cases which straightforwardly violate each of the inference patterns at issue.

That said, there is a sympathetic modification one can make to the variable analysis which results in the validation of *Impossibility Above*, as follows. It is natural to think that all the worlds relevant to the evaluation of a conditional must be considered possible in the context in which it is expressed; a world which is not considered possible in that context should not interfere with evaluation. We can implement the proposal by stipulating simply that every world in the domain of the closeness ordering must also be among the set of accessible worlds. I call this constraint *Accessibility*, defined below. It puts strict limits on the relationship between the modal accessibility function and the closeness ordering exploited by the variable analysis.

**Accessibility**

For any world $i$, comparative closeness function $\geq$, and modal accessibility function $k$:

The set of worlds ordered by $\geq_i$ is a subset of $k(i)$.

Diagrammatically, the effect of assuming *Accessibility* is that the system of spheres imposed by a closeness ordering is enclosed by the set of accessible worlds:

![Diagram](image)

*Impossibility Above* is thereby validated. For according to the premise of *Impossibility Above*, there are no $\phi \land \neg \psi$-worlds in $k(i)$, for an arbitrary $i$. Thus every $\phi$-world in $k(i)$ is a $\psi$-world (if
there are no \( \phi \)-worlds in \( k(i) \), the generalization is trivially true). By \textit{Accessibility}, the closest \( \phi \)-worlds to \( i \) must be in \( k(i) \). So they must be \( \psi \)-worlds. So \( \lozenge \phi \succ \psi \) is true, on the variable analysis. This reasoning is illustrated below.

If \textit{Accessibility} holds, then according to the variable analysis, \( \lozenge \neg \Box (\phi \land \neg \psi) \) entails \( \lozenge \phi \succ \psi \).

\[
\begin{array}{c|c|c}
\phi & \neg \phi & \psi \\
\hline
\psi & \neg \psi & \\
\phi & \neg \phi & \\
\end{array}
\]

Accessible worlds: \( k(i) \)

Closeness ordering \( \geq i \)

Suppose \( \neg \Box (\phi \land \neg \psi) \) is \textbf{true} at \( i \): then there are no \( \phi \land \neg \psi \)-worlds in \( k(i) \)... so all \( \phi \)-worlds in \( k(i) \) are \( \psi \)-worlds...

By \textit{Accessibility}, the closest \( \phi \)-worlds are in \( k(i) \)... so the closest \( \phi \)-worlds are all \( \psi \)-worlds...

so according the variable analysis, \( \lozenge \phi \succ \psi \) is \textbf{true} at \( i \).

Since this way of validating \textit{Impossibility Above} is so readily available to variable theorists, I’ll assume in what follows that they will take it on board; there is good reason to accept it and no reason to reject it. Instead, what is more profoundly incompatible with the variable analysis is \textit{Impossibility Below}, as I shall now show.

I noted above that \textit{Impossibility Below} is not valid on the variabilist semantics as I initially presented them. But perhaps surprisingly, it is not valid even if we impose the natural constraint expressed by \textit{Accessibility}. Consider a counterexample, illustrated below: suppose that the world of evaluation \( i \) is a \( \neg \phi \)-world, but all the \( \phi \)-worlds closest to \( i \) are \( \psi \)-worlds. And suppose also that there are some \( \phi \land \neg \psi \)-worlds in \( k(i) \), but these are all more distant from \( i \) than the closest \( \phi \land \psi \)-worlds. Since all the closest \( \phi \)-worlds are \( \psi \)-worlds, then according the the variable analysis, \( \lozenge \phi \succ \psi \) is true. Thus the premise of \textit{Impossibility Below} is true. But since there are also some accessible \( \phi \land \neg \psi \)-worlds, \( \lozenge (\phi \land \neg \psi) \) is true and \( \neg \Box (\phi \land \neg \psi) \) is false. Thus the conclusion of \textit{Impossibility Below} is false, and the inference rule is invalidated.\footnote{This fact was pointed out by John Hawthorne in his 2008 metaphysics seminar at Rutgers University, though he did not flag the crucial assumption expressed by \textit{Accessibility}; without this assumption, counterexamples are (even more) trivial.}

\[
\begin{array}{c|c|c}
\phi & \neg \phi & \psi \\
\hline
\psi & \neg \psi & \\
\phi & \neg \phi & \\
\end{array}
\]

Accessible worlds: \( k(i) \)

Closeness ordering \( \geq i \)
There may be further constraints one can put on the variable analysis that will validate Impossibility Below. I shall discuss some such suggestions in the next section. Thus far I take myself to have shown that, on a natural way of extending the variable analysis, the logical validity of Impossibility Above is compatible with that analysis, but that of Impossibility Below is not. Defenders of the variable analysis who want to resist the Coordination Argument should therefore take aim at Impossibility Below. In the section I’ll argue that there is no plausible strategy for explaining away or undermining this inference rule: it must be counted as logically valid.

3 Objections and replies

Objections to the Coordination Argument are chiefly objections to Impossibility Below. These critical responses fall into three natural groups. The first group, Objections 1-3 below, are direct attacks on the alleged logical validity of Impossibility Below itself. Objections 1 and 2 claim that there are straightforward counterexamples to the rule; Objection 3 urges that there is other, less direct counter-evidence. In both cases, I show that the actual linguistic evidence does not support the objector’s interpretation of it.

The second group, Objection 4 and 5, aim to undermine the abductive argument for Impossibility Below. In that argument, I provided evidence from natural language discourse that, I claimed, is best explained by the logical validity of the inference rule. The objections here hold that there are alternative viable explanations of the evidence provided. But I argue that, in fact, neither of the proposed explanations are plausible.

The third group, Objections 6 and 7, hold that, with minor changes, the variable analysis actually implies the logical validity of Impossibility Below. According to this type of response, the Coordination Argument only proves that certain versions of the variable analysis fail—but others are compatible with both of the argument’s major premises. In each case, I show that the “minor” revisions to the variable analysis actually result in a complete logical shift to the strict analysis, albeit one formulated in terms which are superficially like those of the variable analysis.

In addition to these challenges to the Coordination Argument, there are well-known objections to the strict analysis itself, having to do with contraposition, antecedent strengthening, and transitivity. (Lewis 1973; Stalnaker 1968, 1984) I do not reply to such objections here, but they have been addressed in detail by others, in a manner which I find convincing. (von Fintel 2001; Gillies 2007) Whether or not these replies are successful lies outside the scope of this paper. My goal here
is only to present the Coordination Argument for the strict analysis, and to defend its soundness and validity. A full defense of the implications of the strict analysis is an important but distinct task.

**Objection 1: remote possibilities**

According to the variable analysis, a conditional is true if the closest antecedent worlds are consequent worlds—no matter if there are more remote antecedent-worlds which are not consequent-worlds. This suggests counterexamples to *Impossibility Below* with the following structure: the modal sentence $\Gamma (\phi \land \neg \psi)$ is true because there are very remote $\phi \land \neg \psi$-worlds; at the same time, the conditional $\Gamma \phi \succ \psi$ is true, because the closest $\phi$-worlds are all $\psi$-worlds. Yet according to *Impossibility Below*, both sentences cannot be true. Here is an example suggested by Lewis’ original discussion:

(11) a. Though kangaroos in fact use their tails to stay upright, in principle, they could have used crutches to stay upright instead of tails.
   b. So kangaroos could have lacked tails and stayed upright.
   c. ? But if kangaroos had lacked tails, they would not have stayed upright.

A more colloquial case might be rendered as follows:

(12) a. Though the library is in fact free of wildlife, in principle someone could have brought a bear from the local zoo, and released it into the library.
   b. So Phillip could have gone to the library and seen a bear.
   c. ? But if he had gone to the library, he wouldn’t have seen a bear.

(11b) is translated as $\Gamma (\phi \land \neg \psi)$, while (11c) is translated as $\Gamma \phi \succ \psi$. By *Impossibility Below*, these express logically incompatible propositions. But according to the objector, the entire discourse is felicitous. The same goes for (12). Thus, the objector claims, (11) and (12) are straightforward counterexamples to *Impossibility Below*.

I must confess that, to my ears, neither of these cases are truly felicitous, hence the “?” marks. But I am willing to grant their felicity for the sake of argument. Still, it is essential that the cases in question are understood so as not to involve covert use of focal stress, verbally encoded in English with emphasis on particular morphemes. In particular, it is crucial to control for focal stress on modal expressions such “could”, “if”, and “would”. Introducing such focal stress makes these example straightforwardly acceptable. This in itself is a source of alleged counterexamples, which I address (and reject) in the next section. For now, I only wish to distinguish the two styles of objection—those that exploit remote possibilities, and those that exploit focal stress. Unless the cases here are rendered without focal stress, they do not represent an independent objection from the one discussed later.

The variable theorist straightforwardly predicts the felicity of (11) and (12), and they in turn claim that such cases constitute natural counterexamples to *Impossibility Below*. My contention is

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26 The diagram at the end of §2.4 illustrates such a model. Thanks to Adam Sennet and an anonymous reviewer for pressing this objection, and to the same reviewer for suggesting the adaption of Lewis’ case.
that, in so far as these cases are felicitous, they involve a certain kind of shift in context from the (b) sentence to the (c) sentence. In particular, they involve a contraction of the modal domain. For quite independent reasons, it is widely recognized that the modal domain is highly context-sensitive, and liable to shift in response to a range of linguistic and extra-linguistic factors. (Kratzer 1977; Lewis 1979b, Ex. 6) And contraction of the modal domain is one acknowledged type of permutation. (von Fintel 2001, §8; Gillies 2007, §9) If am right that such a shift is at work here, then the cases in question are not in fact counterexamples to Impossibility Below.

If there is such contraction of the modal domain, then the coordinated strict analysis predicts that there are natural models in which, for example, both (12b) and (12c) may be true, hence felicitous. This would undermine the objection. Such a model is illustrated in the diagram below.

In this situation, the modal domain (relative to a world of evaluation) is wide enough to include worlds which are both library-worlds and bear-worlds. Thus (12b) is true:

(12b) Phillip could have gone to the library and seen a bear.

Note that this is an unusual context; we don’t normally countenance live possibilities in which bears roam libraries, even counterfactually. Now, by hypothesis, the modal domain contracts in the transition from (12b) to (12c), so as to rule out these outlandish possibilities. Then there would be no worlds which were both library-worlds and bear-worlds. In fact, all the library-worlds would be ¬bear-worlds. Then, by the lights of the strict-analysis, (12c) would be true:

(12c) But if he had gone to the library, he wouldn’t have seen a bear.

Thus, if the transition from the (b) sentences to the (c) sentences involves a kind a contraction of the modal domain— from outlandishly wide to mundanely narrow— then the cases in question pose no threat to the strict analysis. Therefore they pose no threat to Impossibility Below.

In general, classically valid inferences relate premises to conclusions under conditions where the world of evaluation and salient aspects of context are held fixed. When these contextual parameters vary across a discourse, the same logical relations may no longer obtain. The Coordination Argument requires only that Impossibility Below be classically valid. This means that if \( \phi > \psi \) is true at a world and context, then \( \neg \Box (\phi \land \neg \psi) \) must be true at the same world in the same context. Classical validity makes no provision for context shift. Natural language examples which have merely the following form are not necessarily counterexamples.

(13) a. \( \Box (\phi \land \neg \psi) \)
b. \( \phi > \psi \)

For in such cases, the modal domain may shift. Any true counterexample to *Impossibility Below* must ensure that modal domain remains stable—no small feat given its naturally shifty disposition.

Where do these observations leave us? It is granted that the proposed counterexamples are felicitous. I hold, on behalf of the strict analysis, that the examples involve a shift in context, resulting in the contraction of the modal domain. The objector holds, on behalf of the variable analysis, that these examples do not involve a contextual shift in modal domain. How can we adjudicate this standoff? Here I wish to introduce two kinds of considerations which, I think, support my position.

First: some readers may feel that each of the examples above have both a consistent reading and contradictory reading. This response weighs heavily in my favor. The existence of both a consistent reading and contradictory reading is itself entirely consistent with the strict analysis. On one hand, if the modal domain is held fixed from (b) to (c), a contradictory reading is predicted straightway. On the other hand, if the modal domain is allowed to shift freely between (b) and (c), then mechanisms of accommodation will ensure their mutual consistency. No such explanation of the two kinds of reading is available to the variable theorist, however. For if the ordering source is held fixed from (b) and (c), then, according to the variable analysis, the two sentences must be mutually consistent, on any plausible such ordering. And if the contextually selected ordering is allowed to shift freely between (b) and (c), then mechanisms of accommodation will still guarantee their consistency. It seems the variable analysis cannot account for this linguistic data.

A second consideration is subtle, but, I believe, even more decisive. The two examples presented above both make use of the contrastive discourse particle “but” at the head of the (c) sentence. The word “but” belongs to a broader class of contrastive discourse particles including “yet”, “however”, and “by contrast”. These particles are thought to signal a contrast between a preceding segment of discourse and the clause to follow. (Hobbs 1985, 32; Knott 1996) Remarkably, altering the examples above by replacing the contrastive discourse particle with a non-contrastive discourse particle such as “and”, or removing the discourse particle altogether, results in a dramatic shift: the examples in question become vividly *infelicitous.*

(14)  

a. Though kangaroos in fact use their tails to stay upright, in principle, they could have used crutches to stay upright instead of tails.

b. So kangaroos could have had no tails and stayed upright.

c. *And if kangaroos had no tails, they would not have stayed upright.

(15)  

a. Though the library is in fact free of wildlife, in principle, someone could have brought a bear from the local zoo, and released it into the library.

b. So Phillip could have gone to the library and seen a bear.

c. *And if he had gone to the library, he wouldn’t have seen a bear.

What explains the felicity of the “but” cases and the *infelicity* of the “and” cases? It might be thought that there is something inherently infelicitous about the use of the non-contrastive
particle “and” to conjoin modal sentences. But this is plainly not the case, as the felicity of the following example shows.

(16)  a. Talia might have played and won.
     b. And she might have played and lost.

Nor is there any problem, in general, with using “and” to conjoin a modal sentence with a conditional:

(17)  a. Talia might have played and won.
     b. And if she had played, she would have won.

So the puzzle remains: what explains the felicity difference between the “but” cases and the “and” cases?

I argue that the strict analysis has a plausible explanation of this phenomenon ready to hand, while the variable analysis has none. To begin, the strict analyst may explain the infelicity of the “and” cases straightforwardly as a contradiction; the assumption here is that, in these cases, the modal domain does not shift between (b) and (c). What of the felicitous “but” cases?

“But” is characterized as signaling a contrast, or violated expectation in discourse. Yet the notion of contrast at work here is quite open-ended; the relevant contrast may be an inconsistency or difference in embedded clauses, predicates, presuppositions, implicatures, or merely associated expectations. (Hobbs 1985, 21-23; Asher and Lascarides 2003, §1.1, §4.8.4) Plausibly, a contrastive particle could be used to signal a shift to a new context which differs from the previous context in a manner relevant for the discourse. In the alleged counterexamples, I contend, “but” is used to signal a possible shift from a wide modal domain that satisfies the possibility modal to a narrow modal domain that satisfies the conditional.

According to this hypothesis, each (b) sentence describes an outlandish possibility, forcing the modal domain to an unusually permissive state, via mechanisms of accommodation. (Lewis 1979b) The use of “but” at the head of the (c) sentence signals that the speaker may be introducing a different modal domain from that currently in use. This, together with the force of accommodation, guides the hearer to assume a more restricted modal domain in the interpretation of (c). The use of “and”, on the other hand, signals to the hearer that there will be no substantive change. This accounts for both the felicity of the “but” cases and infelicity of the “and”.

Though this proposal is speculative, it is nevertheless a plausible explanation of the data before us. By contrast, the variable analysis has no such plausible explanation at their disposal. They predict felicity when context is held fixed, and felicity when context is allowed to vary. Thus they have the resources to explain the felicity of the “but” cases, but nothing comparable to account for the infelicity of the “and” cases.

To be clear, I do not claim that “but” must serve the function of signaling a shift in modal domain. In fact, I assume it can signal a variety of relevant contrasts, of which contextual contrast is only one. It seems likely that there is, in nearly all discourses, a standing pragmatic pressure to shift from outlandishly wide modal domains to mundanely narrow ones. The combination of the force of accommodation and the use of the contrastive particle makes this transition inevitable. But
when the initial modal domain is already suitably mundane, these same factors may be insufficient to force such a shift. Indeed, in what follows, I will continue to use examples featuring “but” in which it appears that modal domain is held fixed. While this introduces a potential confound, a flexible selection of discourse particles—including both “and” and “but”—greatly improves the naturalness of the discourses under discussion.

**Objection 2: focal stress and intensifiers**

A second line of response urges that counterexamples to *Impossibility Below* can be trivially achieved through the introduction of logically neutral modifications of my own motivating examples. Here I focus on two such modifiers: focal stress, and the addition of intensifiers such as “really” or “of course.” In both cases, I reply, the modifiers in question are not logically innocent. In fact, they are context shift triggers; they are strong indications that the speaker intends to shift the context. Once this is appreciated, I argue, the cases in question pose no threat to *Impossibility Below*. But first I rehearse the objection.

One kind of case exploits focal stress. In the examples below, the words written in small caps are pronounced with extra emphasis:

(18) a. If Talia had played, she would have won.
    b. But she **might** have played and lost.

(19) a. Talia **might** have played and lost.
    b. But if she had played, she **would** have won.

Both discourses are felicitous. According to the objector, (18a) is translated as $\langle \phi > \psi \rangle$ while (18b) is translated as $\langle \diamond (\phi \land \neg \psi) \rangle$. By *Impossibility Below*, these express logically incompatible propositions. But with the addition of the focal stress above, they are felicitously uttered in conjunction. The same goes for (19). Thus, the objector claims, (18) and (19) are straightforward counterexamples to *Impossibility Below*.

A second class of case involve expressions like “in fact,” “of course,” “actually”, and “really” whose function, to a first and rough approximation, is to shift or raise the standards of assertability in a discourse. For lack of a better term, I shall call these “sentential intensifiers.” According to the objector, sentential intensifiers can be used much the way focal stress was used above, to render acceptable otherwise infelicitous discourses, including those deemed logically inconsistent by *Impossibility Below*.

(20) a. If Talia had played, she would have won.
    b. But of course, she **might** have played and lost.

(21) a. Talia **might** have played and lost.
    b. But of course, if she had played, she **would** have won.

Here again, according to the objector, (20) is a counterexample to *Impossibility Below* because (20a) and (20b) can be uttered felicitiously in conjunction, but one is translated as $\langle \phi > \psi \rangle$ and the other as $\langle \diamond (\phi \land \neg \psi) \rangle$. The same goes for (21).
All of the examples considered thus far are felicitous. But I do not agree that they are counterexamples to *Impossibility Below*. This because, I contend, both focal stress and intensifiers are linguistic devices which reliably trigger a shift in context, specifically modal domain. In each case, the sentence translated as \(\Gamma(\phi \land \neg \psi)\) is evaluated relative to a wide modal domain, while that translated as \(\phi > \psi\) is evaluated relative to a narrow modal domain. When the conditional precedes the possibility sentence, the modal domain expands; when the possibility sentences precedes the conditional, the modal domain contracts. If this is so, then the coordinated strict analysis predicts that there are cases of each type where both sentences are true. Thus it can explain the felicity of all the cases presented so far.

The danger for the objector is that, as with Objection 1, unless the possibility of such shifts can be ruled out, the alleged counterexamples may just as well be confirmations of the coordinated strict analysis. I suggest that not only can such shifts not be ruled out, there is independent reason to believe that they are at work in the examples in question.

To begin, the view I have outlined is capable of explaining patterns of felicity which the skeptic about *Impossibility Below* cannot. Combined with the strict analysis, the proposal that focal stress and intensifiers trigger a shift in modal domain correctly predicts the felicity of the examples offered thus far. The same combination predicts that when the context shifting markers are removed, context will thereby tend to stay fixed, and the examples will become infelicitous. (Cases involving remote possibilities, like those discussed in Objection 1, may be an exception to this generalization.) This is in fact what we find: with the felicitous but modified cases reproduced as (22) and (23) below, and the infelicitous and unmodified case (24).

(22) a. If Talia had played, she would have won.
   b. But she might have played and lost.

(23) a. If Talia had played, she would have won.
   b. But of course, she might have played and lost.

(24) a. If Talia had played, she would have won.
   b. * But she might have played and lost.

For the objector, who doubts the validity of *Impossibility Below*, there is no explanation for why eliminating focal stress should reintroduce infelicity. Indeed, under the variable analyst, (24) is predicted to be logically consistent; and there is little else to explain its infelicity. Thus the strict analysis has a clear explanatory advantage over the variable analysis.

There are independent reasons to believe that both focal stress and intensifiers can be used to trigger shifts in context. (King and Stanley 2005, §5) In particular, there is independent evidence that they can be used specifically to widen or narrow a contextually determined domain of quantification. Consider the following discourse involving not modals, but nominal quantifiers. The standard analysis of “all” as a universal quantifier predicts this discourse to be infelicitous. Yet the combined use of focal stress (and a contrastive particle) in (25c) render it reasonably acceptable.

(25) a. Last weekend I went to a party in New York.
b. All of my friends were there.
c. But not all of my friends were there.
d. Some live in Chicago, so naturally they couldn’t make it.

The same goes for the intensifier “of course” in (26c):

(26)  a. Last weekend I went to a party in New York.
    b. All of my friends were there.
    c. But of course, not all of my friends were there.
    d. Some live in Chicago, so naturally they couldn’t make it.

When focal stress is eliminated, the discourse becomes infelicitous, as the standard quantificational analysis would predict:

(27)  a. Last weekend I went to a party in New York.
    b. All of my friends were there.
    c. * But not all of my friends were there.
    d. Some live in Chicago, so naturally they couldn’t make it.

The context shifting mechanisms at work here appears to be precisely the nominal counterpart of that proposed for the modal case. For example, the focal stress in (25c) seems to have the effect of widening the domain of quantification. Thus (25b) and (25c) can be uttered felicitously in conjunction, despite the standard universal quantification analysis of “all”. Such observations constitute independent reason to recognize the context-shifting mechanisms that I have claimed are at work in the objector’s original examples to Impossibility Below.

I conclude that that the proposed counterexamples to Impossibility Below fail. All make illegitimate use of context shifting devices, including focal stress and sentential intensifiers. When the examples in question are stripped of these confounds, the appearance that they are counterexamples fades away.

Objection 3: interaction with “suspect”

The next response seeks again to undermine the claim of logical validity for Impossibility Below, this time with less direct counter-evidence. Normally, it is infelicitous to assert a sentence of the form \( \langle \phi \text{ but I suspect that } \psi \rangle \) where \( \phi \) and \( \psi \) are logically incompatible. Thus, I cannot felicitously assert:

(28) * Josh was at the party, but I suspect that he wasn’t.

Nonetheless, it is perfectly permissible to make the following sequence of assertions:

(29) a. Susan could have played and won.
    b. But I suspect that if she had played, she would have lost.

\(^{27}\)The objection is derived from Stalnaker (1981).
By *Impossibility Below*, (29a) entails the negation of the conditional clause embedded in (29b). Thus, according to the principle just described, (29) should be infelicitous. But it is not. So, the objection goes, (29a) and the conditional embedded in (29b) are in fact compatible. And so the claim of logical validity for *Impossibility Below* is false.

I reply that there are clear counterexamples to the objector’s proposed principle: pairs of sentences which are logically incompatible but acceptable to assert in conjunction when one is subordinated by the phrase “I suspect that”. To begin, many (but not all) theorists of conditionals have concluded that any two sentences of the following form are incompatible:28

\[(30)\]
\[
\begin{align*}
\text{a.} & \quad \text{If it had been the case that } \phi, \text{ it might have been the case that } \psi. \\
\text{b.} & \quad \text{If it had been the case that } \phi, \text{ it would have been the case that } \neg \psi.
\end{align*}
\]

For example, the following monologue is badly infelicitous, a fact explained by its alleged inconsistency:

\[(31)\]
\[
\begin{align*}
\text{a.} & \quad \text{If Rasha had played she might have lost.} \\
\text{b.} & \quad \text{But if Rasha had played, she would have won.}
\end{align*}
\]

Yet the addition of “I suspect that” to the second line renders the monologue acceptable:

\[(32)\]
\[
\begin{align*}
\text{a.} & \quad \text{If Rasha had played she might have lost.} \\
\text{b.} & \quad \text{But I suspect that if Rasha had played, she would have won.}
\end{align*}
\]

While I take this example to be a reductio of the responder’s main argument, she may take it as a reductio of my main premise, that the pair of sentence types in (30) are duals.29 Therefore I turn to other, hopefully more compelling examples to bolster my point.

It appears that, understood relative to a supposition, any pair of sentences of the following form are incompatible:

\[(33)\]
\[
\begin{align*}
\text{a.} & \quad \text{It might have been the case that } \phi. \\
\text{b.} & \quad \text{It would have been the case that } \neg \phi.
\end{align*}
\]

For example, the following monologue is infelicitous:

\[(34)\]
\[
\begin{align*}
\text{a.} & \quad \text{Suppose Tess had found a well-paying job.} \\
\text{b.} & \quad \text{She might have bought a new car.} \\
\text{c.} & \quad \text{But she wouldn’t have bought a new car.}
\end{align*}
\]

But note again the acceptability of the following, minimally altered monologue:

\[(35)\]
\[
\begin{align*}
\text{a.} & \quad \text{Suppose Tess had found a well-paying job.} \\
\text{b.} & \quad \text{She might have bought a new car} \\
\text{c.} & \quad \text{But I suspect she wouldn’t have bought a new car.}
\end{align*}
\]

---

28 For discussion, see Lewis (1973), Stalnaker (1981, 98-102), Bennett (2003, §73), and Williams (2010).

29 Indeed, this was the conclusion of Stalnaker (1981) when he introduced the very argument in question.
Yet another set of examples trades on the widely recognized duality between indicative “might” and “must” sentences. Thus the following assertion is infelicitous in any context:

(36) John might be outside, but he must be inside.

But the following is more acceptable:

(37) John might be outside, but I suspect he must be inside.

The original objection was based on the principle that when two sentences \( \phi \) and \( \psi \) are incompatible, it is invariably infelicitous to assert \( \uparrow \phi \) but I suspect that \( \psi \). I take myself to have given clear counterexamples to this principle. Not only do these examples undermine the objector’s argument, they suggest why it fails. The principle the objector relies on appears to be a good rule of thumb for sentences that do not include modal expressions. All of my counterexamples involve modals, and of course, the key cases which support Impossibility Below also involve modals. It appears that some aspect of the interaction between attitude ascriptions and modality (and perhaps also and the discourse marker “but”) undermines an otherwise reliable generalization. What causes the phenomenon? The interlocking mechanics of modals and attitude ascriptions are complex and poorly understood. Suffice to say, the answer lies beyond the scope of this paper.

Objection 4: salient possibilities

A fourth objection argues that some of the discourse phenomena used as evidence for Impossibility Below can be explained away pragmatically.\(^{30}\) Capitalizing on the context-sensitivity of the closeness ordering, the objector suggests that the utterance of possibility modals has the effect of making certain possibilities salient, with effects for subsequent invocations of the closeness ordering. In particular, the objector takes aim at the infelicity of discourses of the following form, which were used to motivate Impossibility Below:

(38) a. \( \diamond (\phi \land \neg \psi) \)

b. * \( \phi > \psi \)

The envisioned strategy proceeds as follows: when the possibility that \( \chi \) is made salient, the contextually selected closeness ordering changes in such way that there are \( \chi \)-worlds among the closest worlds to \( i \). Thus when \( \uparrow \diamond (\phi \land \neg \psi) \) is asserted, as in (38a), the context is shifted so that the subsequently selected closeness ordering ranks some \( \phi \land \neg \psi \)-worlds among the closest worlds to \( i \). It follows directly that \( \uparrow \phi > \psi \) is false on the variable semantics, because among the closest \( \phi \)-worlds there will be at least one \( \neg \phi \)-world. The infelicity of (38b) is thus explained as pragmatic inconsistency with previous discourse.\(^{31}\) (An importantly different, but related tactic is to allow that that \( \diamond \) puts constraints on the closeness ordering at a semantic level. I’ll discuss this approach in Response 5 below.)

It should first be noted that, even if this explanation were successful, it would only account for the cases of infelicity used to support Impossibility Below. It leaves unscathed the examples of

\(^{30}\)This objection is inspired by the discussion in Moss (2012).

\(^{31}\)The notion of pragmatic inference (and by extension, pragmatic inconsistency) originates with Stalnaker (1975), under the label “reasonable inference.”
felicitous inference which constitute an intuitively powerful part of the overall evidence for the key entailment. But even for cases of infelicity, the salience-based explanation fails. Note that the proposed account is crucially sensitive to the order in which the elements of the discourse are presented. It depends on the fact that the assertion of the conditional follows the assertion of the salience-altering possibility modal. Among discourses in which the positions of the assertions are reversed, as in (39) below, the account generates no prediction of infelicity. For here, the utterance that allegedly affects the selection of closeness ordering is introduced only after the assertion of the conditional.

(39) a. \( \phi > \psi \)
    b. * \( \Diamond (\phi \land \neg \psi) \)

Unfortunately for the proposal, such reversed cases are just as problematic as those in the original order:

(40) a. If Talia had played, she would have won.
    b. * But she could have played and lost.

(41) a. Talia could have played and lost.
    b. * But if she had played, she would have won.

Whatever underlies the infelicity of these discourses, it’s apparent that the same explanation must be given for both cases. Yet the account that exploits the shifting salience of worlds only covers the second case. To account for both kinds of data, there must be constant coordination of the modal and evaluation domains, even when order-dependent pragmatic mechanisms like that sketched above are not available. This is precisely what the coordinated analysis delivers.

**Objection 5: epistemic modality**

This objection again argues that the discourse phenomena used as evidence for Impossibility Below can be explained away pragmatically, this time without adverting to order-dependent effects.\(^{32}\) The objector begins by disputing my representation of that data. She claims that the “might have” and “could have” sentences in the relevant examples should not be translated with \( \Diamond \), as expressing counterfactual possibility, but instead with an operator that expresses epistemic possibility. To regiment this idea, let us introduces a sentential operator \( e \) for epistemic possibility, whose semantics are the same as our \( \Diamond \), save that it quantifies not over \( k(i) \), but rather over a distinct domain of epistemically open worlds.

The objector then claims that while \( \neg e (\phi \land \neg \psi) \land \phi > \psi \) are logically unrelated, a speaker who commits himself to one thereby commits himself to the other. It is proposed that this fact can explain both the cases of felicitous and infelicitous inference that were originally introduced as evidence for Impossibility Below, such as the following:

\(^{32}\)The response was first suggested to me by Jason Stanley (p.c.) and later clarified by Robert Stalnaker (p.c.). It gets its inspiration from the debate between Lewis and Stalnaker regarding the duality of “would” and “might” conditionals (Lewis 1973; Stalnaker 1981, 98-102), though the strategy it pursues is markedly different.
a. If Talia had played, she would have won.
   b. So she couldn’t have played and lost.

33Parties to the debate about counterfactual “might” conditionals would do well to attend to the dialectical situation described here. (e.g. Stalnaker 1981, 98-102; DeRose 1999) While the two debates may be independent, they appear linked by the following, rather compelling inference pattern. (See Gillies (2010, 12) for discussion.)

\[ \phi \rightarrow \psi \]
\[ \Diamond (\phi \land \neg \psi) \]

(For ease, let \( \Diamond \) and \( \rightarrow \) be used here to translate sentences of the appropriate surface form, independent of epistemic v. counterfactual reading.) But if \( \phi \rightarrow \neg \psi \) \models \Diamond (\phi \land \neg \psi) \), and \( \Diamond (\phi \land \neg \psi) \) \models \neg (\phi > \psi) \), then it is a moot question whether there is some more “direct” relation between \( \phi \rightarrow \neg \psi \) and \( \neg (\phi > \psi) \). Even if it is denied that \( \Diamond (\phi \land \neg \psi) \models \neg (\phi > \psi) \), the appearance that \( \phi \rightarrow \neg \psi \) \models \Diamond (\phi \land \neg \psi) \) together with the observation that an assertion of \( \Diamond (\phi > \psi) \) displays the same kind of infelicitous conjunction with assertions of \( \Diamond (\phi \land \neg \psi) \) as with those of \( \phi \rightarrow \neg \psi \) suggests that there should be a single diagnosis of the infelicity in both cases. If I am right that interpreting \( \Diamond \) as epistemic is implausible in the former case, doubt is cast on attempts to pursue a parallel strategy in the latter.

According to the envisioned explanation, when a speaker asserts \( \chi \), he indicates that he knows that \( \chi \), and thus \( \chi \) holds at all of his epistemically open worlds. When a speaker asserts the conditional \( \phi > \psi \), he indicates that he knows that \( \phi > \psi \), and thus that \( \phi > \psi \) is true at all of his epistemically open worlds. If some of those worlds are \( \phi \)-worlds, the speaker is also committed, by Modus Ponens, to those being \( \psi \)-worlds. Thus, by asserting \( \phi > \psi \), the speaker indicates that for him, there are no epistemically open \( \phi \land \neg \psi \)-worlds, hence to the truth of \( \neg e(\phi \land \neg \psi) \). On this account, when the speaker of (42) asserts “\( play > win \)”, he commits himself to the truth of “\( play > win \)”, and is therefore licensed to infer it. While in (43), by asserting both “\( play > win \)” and “\( e(\phi \land \neg \psi) \)” the speaker makes incompatible commitments about his epistemic state, though again, his assertions are not logically inconsistent.

The problem with this proposal is that its foundational assumption, that the “might have” and “could have” sentences in the relevant examples should be interpreted epistemically, is not plausible. Recall one of our original cases:

(9) a. Talia is an excellent athlete, but she missed the ping-pong match last Tuesday.
   b. Of course, Talia might have played and lost.
   c. * But if she had played, she would have won.

In (9a), the speaker asserts that Talia missed the match, and thus did not play. The speaker thereby indicates that she knows Talia did not play. But if the “might have” of (9b) were epistemic, (9b) would indicate that the speaker does not know that Talia did not play—the objector’s strategy assumes as much. So (9a) and (9b) would be infelicitous when asserted in conjunction. But as a matter of fact, they are mutually compatible; therefore the “might have” of (9b) is not epistemic. Despite this, (9c) is still infelicitous. So whatever explains its unacceptability cannot be the sort of explanation that goes by way of an epistemic reading of (9b). The alleged undermining explanation simply doesn’t work.
Objection 6: permissive ordering sources

The final two objections attempt to capture Impossibility Below as a logical validity by making suitable alterations to the variable semantics. The first proposes an additional constraint on the definition of the closeness ordering; the objection taken up in the next section proposes a revision of the semantics for possibility modals. In each case I’ll show that the resulting semantics turns out to be logically equivalent to the coordinated analysis— they are variable in superficial form alone.

The first strategy holds fixed the variable analysis’ semantic clauses for possibility modals and conditionals, but puts a substantive additional constraint on the closeness ordering. It stipulates that the set of worlds which are ranked as closest in any context are exactly the set of accessible worlds. I call this constraint Interior Limit.

Interior Limit

For any world $i$, comparative closeness function $\geq$, and modal accessibility function $k$:

$$k(i) = \text{the set of worlds closest to } i \text{ according to } \geq_i.$$  

*Interior Limit* states that the set of accessible worlds is the interior perimeter of the closeness ordering; all worlds within $k(i)$ are maximally close.\(^{34}\) It has the desired effect of validating Impossibility Below. For suppose the premise $\Box \phi > \psi$ is true. Then, by the variable semantics, every closest $\phi$-world is a $\psi$-world. Now suppose $k(i)$ contains some $\phi$-worlds; it follows by *Interior Limit* that every $\phi$-world in $k(i)$ is a $\psi$-world. Hence there are no $\phi \land \neg \psi$-worlds in $k(i)$. On the other hand, suppose $k(i)$ contains no $\phi$-worlds; it follows trivially that $k(i)$ contains no $\phi \land \neg \psi$-worlds. Either way, there are no $\phi \land \neg \psi$-worlds in $k(i)$, so the conclusion of Impossibility Below, $\Box \neg \Diamond (\phi \land \neg \psi)$, is true and the inference is valid.

Here’s the catch: assuming the variabilist also wishes to validate Impossibility Above, the resulting analysis is equivalent to the coordinated strict analysis.\(^{35}\) This equivalence follows directly from the Coordination Argument. As the argument shows, any analysis which validates both Impossibility Below and Impossibility Above is logically equivalent to the coordinated strict analysis. If the defender of the variable analysis now wishes to do both, I welcome her on board— for the theory she promotes is equivalent to the coordinate strict analysis. It may seem surprising that merely validating these two inference rules renders a theory which was originally formulated as a variable analysis equivalent to the coordinated analysis. Yet as a matter of fact, certain closeness orderings are such that, when they are combined with the variable-style truth-conditions, they make that theory equivalent to the coordinated analysis. And this is exactly the effect of imposing the two principles adopted to validate Impossibility Below and Impossibility Above— *Interior Limit* and *Accessibility* respectively.\(^{36}\) Together they define a closeness ordering which results in

\(^{34}\)Note that such an ordering is not compatible with Strong Centering, since according to that principle, only $i$ is ranked maximally close by $\geq_i$. But in the defined ordering, every world in $k(i)$ is ranked maximally close by $\geq_i$. Assuming there is more than one world in $k(i)$, the two constraints conflict.

\(^{35}\)In theory it is possible for the variabilist to choose to validate Impossibility Below but to reject Impossibility Above. But this choice has nothing to recommend it. Adopting Impossibility Above alone yields a standard version of the variable analysis, with its distinctive vices and virtues. Taking on both principles yields the coordinated analysis— this, I think, is the best solution. Admitting Impossibility Below without Impossibility Above brings the worst of both worlds.

\(^{36}\)In principle, there are other ways for the variable theorist to validate both Impossibility Below and Impossibility Above.
equivalence, proven below.

Let us say that a strict and variable theory are logically equivalent under certain assumptions iff for any model, world, and sentence, they determine the same truth-value for that sentence. To see how such logical equivalence can come about, recall that we can express the truth-conditions determined by the coordinated and variable analyses respectively for a conditional \( \phi > \psi \) at a world \( i \) and context \( c \), as follows:

\[
(44) \quad k(i) \cap [\phi] \subseteq [\psi]
\]

\[
(45) \quad f(\phi, i) \subseteq [\psi]
\]

By simple substitution, any closeness ordering which implies that the following equation holds is one which makes the two accounts equivalent:

\[
(46) \quad k(i) \cap [\phi] = f(\phi, i)
\]

Now consider an ordering which implements our two constraints:

- **(Interior Limit)** \( k(i) = \) the set of worlds closest to \( i \) according to \( \geq_i \)
- **(Accessibility)** \( k(i) \supseteq \) the set of worlds ordered by \( \geq_i \)

It follows first from **Interior Limit** that for any model, world \( i \), and sentence \( \phi \):

\[
(47) \quad k(i) \cap [\phi] \subseteq f(\phi, i)
\]

By **Interior Limit**, \( k(i) \) is the set closest worlds. If \( k(i) \) is \( \phi \)-permitting, then \( k(i) \cap [\phi] \) is the set of closest \( \phi \)-worlds, so \( k(i) \cap [\phi] = f(\phi, i) \). On the other hand if \( k(i) \) is not \( \phi \)-permitting, then \( k(i) \cap [\phi] = \emptyset \), so trivially \( k(i) \cap [\phi] \subseteq f(\phi, i) \). Next, it follows from **Accessibility** that, for any model, world \( i \), and sentence \( \phi \):

\[
(48) \quad f(\phi, i) \subseteq k(i)
\]

For suppose there is at least one closest \( \phi \)-world. By **Accessibility**, every ordered world is in \( k(i) \); so every closest \( \phi \)-world is in \( k(i) \); so \( f(\phi, i) \subseteq k(i) \). On the other hand, if there is no closest \( \phi \)-world, then \( f(\phi, i) = \emptyset \), so trivially \( f(\phi, i) \subseteq k(i) \). Then from (47) and (48) together, it follows that, for any model, world \( i \), and sentence \( \phi \):

\[
(49) \quad k(i) \cap [\phi] = f(\phi, i)
\]

But as discussed, this is the equation which guarantees the equivalence of the variable and coordinated theories.

Why conclude that the proposed variable analysis is in fact strict? Why not conclude instead that the proven equivalence shows that some strict analyses are in fact variable? The final equation (49) shows that the antecedent worlds in the evaluation domain of the proposed “variable” analysis can be derived from the antecedent and the accessibility function independently. Thus it gives rise to the semantic constancy characteristic of strict analysis, and as a consequence, exhibits the logical behavior characteristic of the strict analysis. This is enough, I believe, to count such
proposals as versions of the strict analysis. One moral, therefore, is that whether an apparently
variable proposal is in fact variable cannot be read off from its semantic clauses in isolation. The
constraints imposed on the closeness ordering by other components of the semantic framework
are crucial to its proper categorization. As we have seen, certain constraints can result in an anal-
ysis which is variable in superficial form, but strict in its semantic and logical behavior.

Objection 7: closeness semantics for possibility modals

The final objection alleges that, when the semantics for possibility modals are suitably modi-
fied, the variable analysis renders Impossibility Below logically valid, without direct constraints on
the closeness ordering. I will consider two strategies for achieving this effect; each introduces de-
pendence on the closeness ordering into the semantics for possibility modals. I’ll show that the
first straightforwardly fails, while the second results in a semantics that is once again equivalent
to that of the coordinated analysis— it is variable in superficial form alone.

According to the original semantics for possibility modals, $\Box \phi$ is true just in case at least
one accessible world is a $\phi$-world:

$$\Box \phi \text{ is true}_i \iff \exists w \in k(i) : w \in [\phi]$$

A first attempt at revision suggests instead that the modal sentence is true just in case at least one
accessible world is a closest $\phi$-world. That is:

$$\Box \phi \text{ is true}_i \iff \exists w \in k(i) : w \in f(\phi, i)$$

But this suggestion straightforwardly fails to have the desired effect of validating Impossibility
Below. For suppose the premise $\Box \phi > \psi$ is true. Then, by the variable semantics, every closest
$\phi$-world is a $\psi$-world. The conclusion is then supposed to be $\neg \Box (\phi \land \neg \psi)$. On the revised
semantics for $\Box$ this requires that there be no closest $\phi \land \neg \psi$-world. But unfortunately, there will
be many models where it is trivial to secure a closest $\phi \land \neg \psi$-world. To maintain consistency with
the premise, it is merely required that the closest $\phi \land \neg \psi$-world be less close than the closest $\phi$
world. This requirement is easily satisfied. Thus, even on the revised semantics, the premise does
not entail the conclusion.

A more promising approach holds that $\Box \phi \gamma$ is true just in case some some world which
is closest simplicter is a $\phi$-world. Whereas the first proposal required merely that there be some
closest $\phi$-world, the new proposal makes the much stronger claim that among all the world ranked
closest by the ordering $\geq_i$, there is at least one $\phi$-world. To formalize this analysis, let us define
$[\geq_i]$ as the set of worlds closest to $i$ according to $\geq_i$. Then the new semantics for $\Box$ can be stated
as follows:

$$\Box \phi \gamma \text{ is true}_i \iff \exists w \in [\geq_i] : w \in [\phi]$$

This analysis has the desired effect of validating Impossibility Below. For suppose the premise
$\Box \phi > \psi$ is true. Then, by the variable semantics, every closest $\phi$-world is a $\psi$-world. Now suppose
that among the closest worlds to $i$, $[\geq_i]$, there are some $\phi$-worlds. It follows from the premise that
they must all be $\psi$-worlds. So, on the new semantics the conclusion $\neg \Box (\phi \land \neg \psi) \gamma$ is true, for there
are no $\phi \land \neg \psi$-worlds among the closest worlds, because all closest $\phi$-worlds are $\psi$-worlds. On the other hand, suppose there are no $\phi$-worlds among the closest worlds. Then $\Diamond (\phi \land \neg \psi)$ is again true, in virtue of the supposition.

Once again, this is a victory for the variable analysis in name only. Any theory which validates both *Impossibility Above* and *Impossibility Below* is committed to an account logically equivalent to the coordinated analysis. The reasons are essentially the same as before. Briefly, whereas the original Coordination Argument, based on the original semantic for $\Diamond$, showed that (53) below must be the truth-conditions for the conditional, the Coordination Argument now shows that (54) below must be the truth-conditions for the conditional.

\begin{align*}
(53) & \quad k(i) \cap [\phi] \subseteq [\psi] \\
(54) & \quad \geq i \cap [\phi] \subseteq [\psi]
\end{align*}

Clearly, the difference between these formulations is only skin deep. As the reader may verify, even with the new semantics for possibility modals, the constraints on the closeness ordering required to validate both inference patterns results, as before, in an analysis which may be variable in appearance but is ultimately strict in logical character.

4 Conclusion

In the first part of this paper I defined the Coordinated Strict Analysis, a context-sensitive version of the strict analysis according to which the quantified domain of possibility modals is identical to that of conditionals. This view implies a tight logical connection between conditionals and modals. In the second part of the paper, I presented two compelling inference rules which reflected different aspects of this connection. I showed that these inference rules, taken as logically valid, jointly imply the Coordinated Analysis. And I argued they must be taken as logically valid. Thus the dominant view of conditionals due to Stalnaker and Lewis must be rejected, in favor of the view defended here. According to the resulting picture of modal language and reasoning, conditionals and possibility modals are not linguistic devices which express merely loosely related modal facts. Instead, they are part of a unified suite of descriptive tools, like the nominal quantifiers of natural languages, whose specialized task is the navigation of a common modal space.

On this view, the semantic structure of both conditionals and possibility modals is extremely simple. The rich interaction between context and conversation exhibited by conditionals is not a property of their quantificational structure, as the variable analysis would have it, but rather of a common domain of quantification. This conclusion suggests a shift in the study of modality, away from the logic and semantics of modal operators, and towards the structure and content of the modal spaces over which the modal operators quantify. The challenging theoretical questions which animate linguistic research should be directed to the pragmatics of this modal space. What social and psychological factors cause it to expand, contract, and shift? Are there multiple, distinct modal spaces, corresponding, for example, to indicative and counterfactual modalities? What makes a counterfactual possibility “live” for an individual or conversation? I hope that rec-
ognizing the coordinated behavior of possibility modals and conditionals will help to illuminate the path towards the resolution of these puzzles.

References


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