

On indicative and subjunctive conditionals

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September 27, 2012

Abstract

At the center of the literature on conditionals lies the division between indicative and subjunctive conditionals, and Ernest Adams' famous minimal pair:

- (1) If Oswald didn't shoot Kennedy, someone else did.
- (2) If Oswald hadn't shot Kennedy, someone else would have.

A lot of attention is paid to figuring out what these different kinds of conditionals mean, but significantly less attention is paid to the question of why their grammatical differences give rise to their semantic differences. In this paper, I articulate and defend an answer to this question that illuminates and unifies the meanings of both kinds of conditionals. The basic idea is that epistemic and metaphysical possibilities differ with respect to their interaction with time, such that there can be present epistemic possibilities with different pasts, while present metaphysical possibilities share the same past. Our interpretation of conditionals is subject to a pragmatic constraint that rules out interpretations in which their consequents are true at all or none of the possibilities they quantify over. The past + future morphology on subjunctives, but not indicatives, is what allows them to receive a metaphysical interpretation in light of this pragmatic constraint. The resulting theory predicts several surprising features of indicatives and subjunctives, which I argue are correct.

It's common practice in the literature to divide the landscape of conditionals into two camps—the indicatives and subjunctives—and theorize about each camp separately. Unfortunately, it's often unclear exactly what this distinction amounts to. Usually, we're handed minimal pairs to exemplify the distinction, such as the following:

- | | |
|---|-------------|
| (1) If Oswald didn't shoot Kennedy, someone else did. | Indicative |
| (2) If Oswald hadn't shot Kennedy, someone else would have. | Subjunctive |

Without trying to guess what others may have had in mind, let's draw some distinctions and make some stipulations. First, (1) and (2) are distinguished both grammatically and semantically. Grammatically, subjunctives are distinguished from indicatives by the fact that they carry an extra layer of past tense (marked morphologically in English with the past perfect “had”) and the modal auxiliary verb “would” in their consequents.¹ The semantic difference is shown by the fact that, since we know that Kennedy was shot and that (since we're Warrenites) there was no backup killer, (1) is true while (2) is false—so, (1) and (2) have different truth conditions. Here's a way to gloss the difference in what they mean: (1) is about how the world was given what we *now* know plus the supposition of the antecedent, while (2) is about how history would have progressed had things been as the antecedent describes them. In slogan form: since it's about what we know, the indicative conditional (1) is epistemic, while the subjunctive conditional (2) is metaphysical, since it's about the world.² Let's stipulate that the indicative/subjunctive distinction is the grammatical one, and let “epistemic” and “metaphysical” label the different meanings of the two conditionals.

With this terminology in hand, we can ask two different questions:

- (i) What do indicative and subjunctive conditionals mean?

¹Notice, though, that the extra layer of past tense in (2) doesn't shift the event time of the if-clause to past. To see this clearly, notice that “tomorrow” is felicitous in the if-clause of the following subjunctive, which is not the case when the same sentence occurs outside of the if-clause:

- (i) a. The contest was held today. If you had entered tomorrow, you would have missed it.
 b. Luckily, Sue had entered the contest yesterday.
 c. #Unfortunately, John had entered the contest tomorrow.

This feature of subjunctive conditionals has been called “forward time shift” in the conditionals literature (cf. Gibbard 1981, Dudman 1983, 1984, Edgington 1995, Bennett 2003).

²However we characterize it, this semantic distinction between epistemic and metaphysical modality is both intuitive and philosophically important. It's why, for instance, subjunctives, but not indicatives, figure into talk about causality (see Lewis 1986, 2000, Woodward 2003) and bear an intimate connection to laws of nature (see Goodman 1947, Chisholm 1955, Maudlin 2007, Lange 2009) and chance (Lewis 1979, 1980, Albert 2000), and what drives causal decision theorists to insist that it's the probability of subjunctives (rather than indicatives) that ought to guide rational deliberation (see Gibbard & Harper 1981, Lewis 1981a,b, Williamson 2007).

- (ii) Why does the indicative/subjunctive distinction give rise to the corresponding epistemic/metaphysical distinction—in other words, what role does grammar play in bringing about a difference in what indicatives and subjunctives like (1) and (2) mean?³

Philosophers thinking about conditionals have typically focused on the former question to the neglect of the latter (though a notable exception is [Stalnaker 1975](#)),⁴ and as a result have overlooked a useful theoretical constraint in answering (i)—after all, our answer to (i) ought to be compatible with our answer to (ii). Furthermore, thinking about (ii) is interesting in its own right, for at least three reasons. First, the extra morphology carried by subjunctives but not indicatives (past tense + “would”) leads to similar differences in meaning in modals, and this holds generally across a variety of unrelated languages—suggesting a non-contingent, perhaps conceptual, link between the grammatical and semantic differences.⁵ Second, exploring the relation between the grammatical and semantic distinctions in indicatives and subjunctives promises insight into how the interaction between time and modality is related to the kind of modality expressed by a particular modal or conditional expression. And finally, it turns out that the relationship between the indicative/subjunctive and epistemic/metaphysical distinctions is subtle, revealing readings of indicative and subjunctive conditionals not predicted by the standard theories.

³The latter question cross-cuts another issue surrounding indicatives and subjunctives, namely, whether the two kinds of conditionals are semantically unified. The unifiers include [Stalnaker 1975](#), [Edgington 1995](#), [Lycan 2001](#), while non-unifiers include [Lewis 1973](#), [Gibbard 1981](#), [Bennett 2003](#). The question may seem more pressing for a unifier since answering it will presumably be part of her answer as to how indicatives and subjunctives can mean different things despite sharing some common semantic core. However, it is also a pressing question for non-unifiers, for even if indicatives and subjunctives involve distinct conditional operators, it’s an open question how grammar mediates the selection of operator.

⁴For instance, two philosophical treatises on conditionals, [Lewis 1973](#) and [Bennett 2003](#), are entirely devoted to characterizing a semantics for a formal operator that is intended to gloss a certain class of English sentences, but spend little time worrying about the relation between that operator and the English sentences it is intended to gloss. [Gibbard 1981](#) devotes time to the discussion of the grammatical differences and their corresponding semantic differences (pp. 222–226), but offers no account of the relation between them. Even [Lycan 2001](#), who is admirably sensitive to syntactic data (see especially pp. 1–15), says nothing illuminating about (ii) (pp. 143–148).

⁵See for instance [Iatridou 2000](#), pp. 245, 263–266, [von Stechow & Iatridou 2008](#), pp. 120–126, and [Steele 1975](#). The observation is that counterfactuality is implicated with certain combinations of future + past tense morphology in the right contexts (for instance, in English: “would”, which is often considered the past tense of “will”). In addition to Romance and Germanic languages, Iatridou cites evidence from Modern Greek, Papago, Proto-Uto-Aztecan, Japanese, Korean, Hebrew, Turkish, and Basque.

In this paper, I articulate and defend a proposal about why the grammatical differences between indicative and subjunctive conditionals give rise to their differences in meaning. The basic idea is that epistemic and metaphysical possibilities differ with respect to their interaction with time, such that there can be present epistemic possibilities with different pasts, while present metaphysical possibilities share the same past. Our interpretation of conditionals is subject to a pragmatic constraint that rules out interpretations in which their consequents are true at all or none of the possibilities they quantify over. The past + future morphology on subjunctives, but not indicatives, is what allows them to receive a metaphysical interpretation in light of this pragmatic constraint. The rest of the paper is structured as follows. In Part 1, I begin with an observation about the grammatical/semantic differences between the Oswald minimal pair, and motivate a general semantic theory and explanation why (1) and (2) differ in meaning. Then, in Part 2, I explore some predictions of the theory for other indicative and subjunctive conditionals, and argue that several surprising predictions generated by the theory are true. I conclude with some brief remarks about further applications of the theory and open issues.

I Why indicatives and subjunctives differ in meaning

In this section, we'll focus on the Oswald minimal pairs, with the aim of explaining why their grammatical differences give rise to their semantic differences.

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|-----|---|-------------|
| (1) | If Oswald didn't shoot Kennedy, someone else did. | Indicative |
| (2) | If Oswald hadn't shot Kennedy, someone else would have. | Subjunctive |

Looked at in the abstract, it's mysterious why the grammatical differences (an extra layer of past tense and the tense auxiliary “would” on the subjunctive but not indicative) would give rise to such a semantic difference between (1) and (2). Normally, past tense shifts to the past the time at which the described event is said to take place, and “would”, like its present counterpart “will”,⁶ shifts to the future the time at which the described event is said to take place:⁷

⁶That “would” is the past tense of “will” is argued for in [Palmer 1986](#), [Abusch 1997, 1998](#), [Ogihara 1996](#).

⁷This future-shifting effect of “will”/“would” is optional when combined with stative verbs, as in:

- a. Yesterday, someone shot Kennedy.
- b. Yesterday, someone would shoot Kennedy.

So, why should their combination (past + “would”) yield the kind of semantic difference we find with indicative and subjunctive conditionals? By way of illustrating a hypothesis about the semantic contribution of past tense and “would” in (2), let’s consider a similar grammatical/semantic difference exhibited by modal adjectives:

- (3) It is possible that John won the election. Epistemic
- (4) It was possible that John would win the election. Metaphysical

The grammatical distinction between (3)/(4) is analogous to that between (1)/(2)—the second, but not the first, of each pair has an extra layer of past tense and the tense auxiliary “would”. And corresponding to this analogous grammatical difference is an analogous semantic difference. Suppose the election results are in but we haven’t heard them yet, so we don’t yet know whether John won—then we might say (3) to express that it’s compatible with our knowledge or evidence that John won. Suppose later we find out that John didn’t win the election—now we might say (4) to express that the election wasn’t rigged (that perhaps it was unsettled at some past time whether John would win). This difference in what (3) and (4) mean is very similar to the difference in what (1) and (2) mean.⁸

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- (i) John will be in his room.

I discuss the extra complexity introduced by stative verbs further in my dissertation.

⁸We find the same grammatical/semantic difference in modal auxiliaries:

- (i) John might have won the election.

(i) is ambiguous: on one reading, it means something akin to (3) and on the other, something akin to (4). There’s also a less prominent reading of (i) in which it reports a past time at which it was epistemically possible that John won the election. I’ll discuss this reading further in §2.1. This ambiguity is an instance of the pattern above if (i) is structurally ambiguous between a reading in which “might” falls in the scope of past tense or not:

- (ii) John might have won the election.
 - a. Might[Past[John won the election]] Epistemic
 - b. Past[Might[John won the election]] Metaphysical

But now notice that, unlike (2), we have a better grasp of what the past tense and “would” are doing in (4). Since modal adjectives inflect for tense in English, we see that the untensed modal adjective “be possible” falls in the scope of the past tense in (4), but not in (3) (it is past-inflected in the former but not the latter). Thus, the past tense on the modal in (4) shifts to the past the time at which the modal “be possible” is evaluated, while “would” locates the time of the event described by the clause to the future of that past time. Whereas in (3), the modal is present-tensed (hence, evaluated at the present time), while only the that-clause is past-inflected, and hence, the time of John’s winning the election is to the past of the present (utterance) time. In (4), the modal “be possible” is interpreted metaphysically—roughly, there are possible futures from some past time at which John would win—while in (3) the modal “be possible” is interpreted epistemically—roughly, that it is now epistemically possible that John won.

The grammatical/semantic differences between (3)/(4) are clearer than those between (1)/(2), but my conjecture is that they are the same. Thus, even though there is no overt modal that inflects for tense in (1) or (2), both contain a modal in their logical forms (perhaps a conditional operator), which is in the scope of a past tense in (2) but not (1). As with (4), “would” shifts the event time of the main verb of the consequent of (2) to the future of the past time picked out by the past tense on the conditional. Given this conjecture, the semantic differences between these two conditionals arise for the same reason as the semantic differences between (3) and (4). This is an important first step in our explanation—we now have a hypothesis about the semantic contribution of the grammatical features distinguishing subjunctives from indicatives. Furthermore, we have a way of stating the observed connection between the grammatical and semantic differences in (1) and (2), which I summarize roughly as follows: present modal/conditional claims about the past (e.g., (1)/(3)) have epistemic readings, while past modal/conditional claims about the future (from that past, e.g., (2)/(4)) have metaphysical readings.⁹

This is our starting observation, but it remains to be seen *why* it holds. In the next section, I’ll sketch a baseline semantics which will allow us to state the interaction between

⁹It’s not part of the observation here, but I will go on to argue that (1)/(3) have only epistemic readings, while (2)/(4) have, in addition to their (default) metaphysical reading, an epistemic reading as well. More on this in §2.1.

tense and modality that we'll eventually make use of in our explanation of why indicative and subjunctive conditionals differ in meaning.

1.1 A baseline semantics

Let's begin with three technical terms: we'll say that a modal is "present" iff it is **evaluated** at a time identical with utterance time, it is "about the past" iff its **prejacent** is about a time to the past of speech time, and it "has an epistemic reading" iff its **domain** is comprised of all and only the epistemically accessible worlds (at the context of utterance). I'll sketch our background semantics by explaining what is meant by each of these boldfaced words.

Prejacent. I assume that modals are propositional operators—hence, they take as their complements propositions and return propositions. Call the proposition that is the input to the modal operator its prejacent. Thus, the modal sentence

- (3) It is possible that John won the election.

has "is possible" as its modal operator, and its prejacent is the proposition expressed by:

- (5) John won the election.

For notational convenience, I'll use quotation to refer to expressions (or patterns of substitution instances thereof), and *italics* to denote propositions—thus, where the variable 'p' denotes a sentence, the corresponding italicized variable '*p*' denotes the proposition expressed by that sentence (at the relevant context). I'll assume that propositions are sets of possible worlds—since we're only concerned with the modal profile of sentences, this assumption is harmless for our purposes.

Domain. I assume that modal operators are interpreted as quantifiers over a contextually determined domain of possible worlds. Different readings of a modal are thus due to differences in the domain of worlds it quantifies over—so, since domains are determined by context, our theory predicts that a modal's reading depends (in part) on the context in which it is uttered. In principle, we can think of how context determines modal domains

in several different, though inter-definable, ways. However, for reasons that will become clear later, I will assume a two-tiered theory of how context fixes modal domains. On this approach, context determines two functions—a modal base f , which is a function from worlds w and times t to sets of worlds $f(w, t)$, and a domain-fixing function D , which is a function from modal bases, worlds, and times to sets of worlds $D(f, w, t)$.¹⁰ We require that $D(f, w, t) \subseteq f(w, t)$ —basically, that D deliver a refinement on the set of worlds delivered by f .¹¹ Different choices of f and D will result in different readings of modals, via their quantifying over different possible worlds. Notice also that, since f is sensitive to time, tense, whose semantic function is to shift evaluation times, may play a role in the determination of modal domains (figuring out just what role it plays is the topic for §1.2). For now, we can state a general semantics for modals in terms of the relationship between the modal’s prejacent and its domain as follows:¹²

- (6) a. $\ulcorner \text{must: } p \urcorner$ is true at w, t given f and D iff every world in $D(f, w, t)$ is one in which p is true (is a p -world).
b. $\ulcorner \text{might: } p \urcorner$ is true at w, t given f and D iff some world in $D(f, w, t)$ is one in which p is true (is a p -world).

Evaluated. The time at which the modal is evaluated is the time that is the input to the modal base (and domain-fixing function). Having distinguished prejacent from modals, we thus distinguish three times: utterance time (t_u), prejacent time (the time in which the clause expressing the modal’s prejacent is about, t_q), and modal time (the time at which

¹⁰Note that by “time” here, I mean “interval of time” and not “moment of time” (we can think of an interval as a continuous set of moments).

¹¹This is not an ad hoc division of labor. We are treating modals and conditionals in a unified semantic framework. Those familiar with ordering (cf. Stalnaker 1968, Lewis 1973) or premise (cf. Kratzer 1977, 1981, 1991, 2012) semantics for counterfactuals can think of D as inducing an order and selecting only the “closest” worlds given that order in $f(w, t)$. Another motivation for such a two-factor semantics is Kratzer’s treatment of comparative possibility claims (cf. Kratzer 1991, 2012).

¹²Notationally, I’m trading perspicuity for precision. Strictly speaking, the substitution instances of $\ulcorner \text{must: } p \urcorner$ will not be sentences of English, but I’m going to treat them as proxies for corresponding sentences of English. For instance, we might substitute “John is at home” for ‘ p ’ in $\ulcorner \text{must: } p \urcorner$ to get: “must: John is at home”. I intend this to be proxy for the English sentence “John must be at home”. Also, I’m not treating tense compositionally, so the contribution of tense will be kept track of separately, again, to simplify the presentation of the theory.

the modal is evaluated, t_m). Thus, for present tensed modals $t_m = t_u$, and for past tensed modals $t_m < t_u$.¹³ We may understand the time a clause is about as the interval of time throughout which the state or event described is said to take place. For instance:

- (7) a. John is upstairs.
- b. John was upstairs.

(7-a) is about an interval that overlaps the present, while (7-b) is about a past interval. Sometimes, past-tensed clauses are about a specific past time, as in Partee 1973's famous example (8), as uttered by me on my way to work:

- (8) I left the stove on!

Other past-tensed clauses are about no particular past time, as in:

- (9) John was happy at some time or other.

In these cases, we'll say that the clause is about the interval stretching from the present moment throughout all of history.¹⁴ I sketch a referentialist semantics of tense in the Appendix that illustrates how we might integrate this tense information compositionally into the determination of the proposition expressed by tensed clauses, but in stating the theory we'll rely on these aboutness intuitions and keep track of this information separately. Finally, it will sometimes be easier to talk as if propositions are about times—when I say this, understand me as meaning that the relevant clause expressing that proposition is about that time.

We can now restate our observation using this semantic framework as follows:

Observation

¹³If there is more than one modal in the sentence there will be more than one modal and prejacent time. I won't be considering such sentences so we can set aside this complication for now.

¹⁴There might be some concern here, if we think instead that sentences like (9) are about the past but no particular past interval. I don't think this is a problem for my view, though I must bracket this issue for the time being.

- (a) A present tensed modal \mathcal{M} whose preajacent time is either identical or to the past of modal time ($t_q \leq t_u, t_m$), is epistemic.
- (b) A past tensed modal \mathcal{M} whose preajacent time is to the future of modal time ($t_m < t_u$ and $t_m < t_q$), is metaphysical.

This observation extends immediately to conditionals, given the assumption that conditionals are just modals whose domains are restricted by their if-clauses. This is just to say that a conditional is a modal whose preajacent is q and whose modal base is restricted to p -worlds (by intersection) as follows:

$$(10) \quad f^{+p}(w, t) = f(w, t) \cap p$$

I'll assume for now that conditionals are restricted necessity modals, and state the truth conditions for $\ulcorner \text{if } p, q \urcorner$ as follows:^{15,16}

¹⁵By making this assumption, we remain neutral about a lot of details. For instance, we haven't said whether if-clauses denote such restricted modals (the view of "operator theories" of conditionals—cf. [Stalnaker 1968](#), [Lewis 1973](#), [Bennett 2003](#), [Gillies 2010](#)), or whether if-clauses merely restrict the modal bases of other modals (the view of "restrictor theories" of conditionals—cf. [Kratzer 1986, 1991, 2012](#)). Also, since we haven't said how $D(f, w, t)$ selects the relevant subset of $f(w, t)$, our semantics is neutral about whether conditionals are strict (cf. [Lewis 1918](#), [Lowe 1995](#), [von Fintel 2001](#), [Gillies 2007](#)) or variably strict (c.f. [Stalnaker 1968](#), [Lewis 1973](#), [Moss 2010](#)). Finally, we ultimately remain neutral about the Limit, Uniqueness, and Homogeneity Assumptions (see [Lewis 1973](#), [Stalnaker 1980](#), [von Fintel 1997](#) for discussion):

- (i) a. Limit Assumption: $\forall w, t, f, D, p : \neg \forall w' \in D(f^{+p}, w, t) : \exists w'' \in D(f^{+p}, w, t) : w' \neq w''$.
- b. Uniqueness Assumption: $\forall w, t, f, D, p : \exists w' \in D(f^{+p}, w, t) : \forall w'' \in D(f^{+p}, w, t) : w' = w''$.
- c. Homogeneity Assumption: $\forall w, t, f, D, p, q : \forall w' \in D(f^{+p}, w, t) : w' \in q \vee \forall w' \in D(f^{+p}, w, t) : w' \in \neg q$.

¹⁶A brief word about $\ulcorner \text{if } p, q \urcorner$. I intend $\ulcorner \text{if } p, q \urcorner$ to denote an arbitrary (indicative or subjunctive) conditional sentence with p as the proposition denoted by its antecedent and q the proposition denoted by its consequent. Since we are handling tense information separately, we must distinguish the antecedent of a conditional from the proposition expressed by the sentence we substitute in $\ulcorner \text{if } p, q \urcorner$ to yield that conditional. For instance, the antecedent of

- (i) If Oswald hadn't killed Kennedy, someone else would have.

is not the proposition expressed by the sentence we substitute for 'p' in $\ulcorner \text{if } p, q \urcorner$ to yield (i), that is,

- (ii) Oswald hadn't killed Kennedy.

- (ii) $\lceil \text{if } p, q \rceil$ is true at w, t , given f and D iff every world in $D(f^{+p}, w, t)$ is a world in which q is true (is a q -world).

Recall that with modals we distinguished three times: utterance time t_u , prejacent time t_q , and modal time t_m . Since conditionals are just restricted modals, we distinguish those three times for conditionals as well—with prejacent time being consequent time—though we distinguish the antecedent time t_p as well (though we’ll set it aside since it won’t matter for our purposes here). With this baseline semantic framework for conditionals in place, we see that **Observation** extends to conditionals as well. Recall our Oswald minimal pair:

- (1) If Oswald didn’t shoot Kennedy, someone else did. Indicative
 (2) If Oswald hadn’t shot Kennedy, someone else would have. Subjunctive

The indicative (1) is present tensed and hence its modal time is identical to utterance time, while its prejacent time (the time its consequent is about) is to the past of both, and the conditional is epistemic; the subjunctive (2) is past tensed and hence its modal time is to the past of utterance time, while its prejacent time is to the future of that past modal time (this is the contribution of “would”), and the conditional is metaphysical.

With our baseline semantics in hand, we now turn to an explanation of our observation. First, I’ll motivate a pragmatic constraint on the assignment of domain-fixing functions in context, and then I’ll show how we can use this pragmatic constraint to explain our observation.

1.2 A pragmatic constraint

Given our semantic framework, our observation suggests that the assignment of modal bases and domain-fixing functions to modals and conditionals in context is constrained in a way that explains why (1) gets an epistemic reading while (2) gets a metaphysical reading.

but rather the proposition expressed by

- (iii) Oswald didn’t kill Kennedy.

We could avoid this complication by treating tense compositionally in our semantics, at the cost of extra complexity in stating the theory.

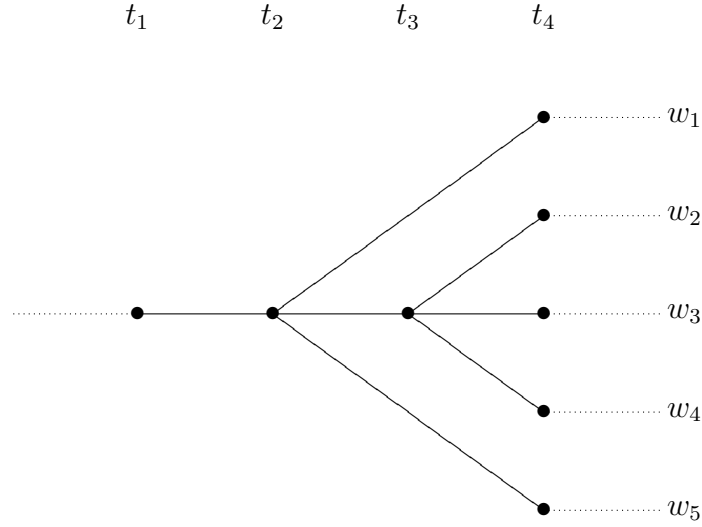
In what follows, I'll only discuss a constraint on the modal base assigned by context, and set aside the domain-fixing function for now.¹⁷ I propose that there are two distinct modal bases—informational and historical—and that a modal or conditional has an epistemic reading when it is assigned an informational modal base and a metaphysical reading when it is assigned a historical modal base.¹⁸ An informational modal base f_I takes a world and time into a set of worlds that are compatible with someone's knowledge or evidence at that world and time. A historical modal base f_H takes a world and time into a set of worlds that agree with that world on the truth value of every proposition about times no later than t and possibly disagree about the truth values of propositions about later times. Alternatively, we can think of the worlds in $f_H(w, t)$ as being exactly like w up until t and then diverging thereafter, as in the following diagram:

¹⁷By setting aside D , we set aside a critical feature of the theory that we'll need to predict adequate truth conditions for the various readings of modals. For instance, on this kind of theory it is differences in the domain-fixing function D that distinguishes deontic readings of modals and conditionals from what I've been calling their metaphysical readings, while differences in the modal base (while holding fixed the domain-fixing function) that distinguishes what I'll call "counterfactual deontic" readings from "epistemic deontic" readings:

- | | | | |
|-----|----|--|------------------------|
| (i) | a. | If Oswald hadn't killed Kennedy, someone else would have. | Metaphysical |
| | b. | If Oswald hadn't killed Kennedy, someone else should have. | Counterfactual Deontic |
| | c. | If Oswald didn't kill Kennedy, someone else should. | Epistemic Deontic |

The kinds of domain-fixing functions that natural language modals seem to involve are deontic (rules or norms), stereotypical (expected patterns), or lawful (laws of nature)—this list is not meant to be exhaustive. See [Kratzer 2012](#), pp. 32–37 for more discussion relating to her version of D (ordering sources).

¹⁸In fact, the epistemic/metaphysical readings will be the result of the modal or conditional having an informational/metaphysical modal base *and the right domain fixing function*.



Here, $w_1, w_2, w_3, w_4, w_5 \in f_H(w_2, t_1)$ but only $w_2, w_3, w_4 \in f_H(w_2, t_3)$. Hence, historical possibilities decrease as time goes on—thus, what was once historically possible may not now be historically possible, and what is now historically possible was always historically possible. I'll leave the formal definitions of historical modal bases to the Appendix. Given this informal characterization, it should be clear that historical modal bases have the following feature:

Necessity of the past

For all worlds w, w' and propositions p expressed by clauses about some time $t' \leq t$:

If $w' \in f_H(w, t)$ then p is true at w iff p is true at w' .

Since the past is historically necessary but the future historically contingent, we can use historical possibilities to model the intuition that the past is fixed but the future open. **Necessity of the past** does not hold of informational modal bases, and this difference between them will be crucial for our theory.¹⁹

¹⁹To forestall a possible objection, notice that it's compatible with our theory that the laws of nature are historically contingent (from some past time), and hence that the following sentence has a true metaphysical reading:

But now notice that although clauses about past times express propositions that are *now* historically necessary, it is not necessarily the case that they express propositions that *were* historically necessary, for there may be a clause about some past time that expresses the proposition p such that there is a past time t' such that p is false at some historically possible world at t' . This gives us a clue to explaining **Observation**. If context is barred from assigning a modal base f to some modal if its prejacent is true at all or none of the worlds in $f(w, t)$, where w is the world of evaluation and t the time at which the modal is evaluated, this constraint would prevent present modal claims about the past from receiving historical modal bases, but allow past modal claims about the future (from that past time) to receive historical modal bases. Here is the version of the pragmatic constraint that I propose:²⁰

Prejacent Diversity

For any modal \mathcal{M} with modal time t and prejacent q , context can assign \mathcal{M} a modal base f at w only if:

There are two worlds $w', w'' \in f(w, t) : q$ is true at w' and q is false at w''

One way to understand **Prejacent Diversity** is as disallowing homogenous domains without the input of the domain-fixing function. Since the domain-fixing function can only deliver a subset of the modal base, this leaves the domain-fixing function with an important role to play for necessity modals.²¹ Before seeing how we'll use **Prejacent Diversity** to

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- (i) Law L could have failed to be a law of nature.

The reason we can allow that laws are historically contingent (from some past time) is that the theory allows there to be historically accessible worlds from that past time that progress differently from the actual world and are hence governed by different laws (this last step is obvious if we adopt a regularity theory of laws of nature—cf. [Lewis 1994](#), [Loewer 1997](#)—but also compatible with a universalist theory of laws of nature—cf. [Armstrong 1983](#), [Tooley 1987](#)).

²⁰[Condoravdi 2002](#) uses a similar strategy to explain the ambiguity in “might have” sentences.

²¹Although I want to remain neutral on this point for now, I think the most plausible understanding of **Prejacent Diversity** is as a semantic presupposition of modal sentences. Notice also that **Prejacent Diversity** is an intensional constraint, and thus it will run into classic problems of hyper-intensionality—for instance, if the prejacent of a modal is a necessary truth, then, assuming that there are no impossible worlds, no modal base will satisfy **Prejacent Diversity** for that modal. We might appeal to one of the standard attempts to handle hyper-intensionality to avoid this problem. One way rejects the auxiliary assumption (allowing impossible worlds), and another holds that **Prejacent Diversity** applies to the diagonal proposition determined by the clause expressing the modal's prejacent. I want to remain neutral on these complications here.

explain our observation about modals and conditionals, I want to offer some independent motivation for it by showing that it is involved in predicting some other facts about modals. First, notice that without it we could assign a historical modal base to (I2-a), which, given **Necessity of the Past**, would make it equivalent to (I2-b); but there's no reading of (I2-a) in which it is equivalent to (I2-b):²²

- (I2) a. John may be next door.
- b. John is next door.

Second, if we suppose that informational modal bases take a world and time into a set of propositions of which each member is *directly known* (that is, not inferred on the basis of some other known fact), **Prejacent Diversity** predicts that present-tensed modal claims about the present/past made on the basis of directly known information will be infelicitous (since in such a case neither a historical nor informational modal base will satisfy **Prejacent Diversity**). And, in fact, this seems to be exactly what we find:²³

- (I3) [Said while watching it rain]:
 - a. It's raining.
 - b. #It must be raining.
- (I4) [Said while watching people come inside with wet umbrellas]:
 - a. It's raining.
 - b. It must be raining.

Therefore, I think it's safe to assume that **Prejacent Diversity** is not an ad hoc stipulation of our theory but rather a principled constraint that is independently plausible. Now, let's turn to see how we can use **Prejacent Diversity**, along with our other assumptions, to predict our observation.²⁴

²²This first motivation for **Prejacent Diversity** comes from Condoravdi 2002, p. 79.

²³See Karttunen 1972, Kratzer 1991, von Stechow & Gillies 2010 for further discussion of the “indirectness requirement” of epistemic modals.

²⁴Notice that it's crucial that **Prejacent Diversity** only constrain modal bases and not entire modal domains, for if it did the latter, no true necessity claim would satisfy it! This is why this explanation requires the division of labor between modal bases and domain fixing functions.

1.3 Predicting the observation

Recall our two minimal pairs and our observation:

- | | | |
|-----|---|--------------|
| (1) | If Oswald didn't shoot Kennedy, someone else did. | Indicative |
| (2) | If Oswald hadn't shot Kennedy, someone else would have. | Subjunctive |
| (3) | It is possible that John won the election. | Epistemic |
| (4) | It was possible that John would win the election. | Metaphysical |

Observation

- (a) A present tensed modal \mathcal{M} whose prejacent time is either identical or to the past of modal time ($t_q \leq t_u, t_m$), is epistemic.
- (b) A past tensed modal \mathcal{M} whose prejacent time is to the future of modal time ($t_m < t_u$ and $t_m < t_q$), is metaphysical.

Throughout we'll talk about an arbitrary modal \mathcal{M} with prejacent q . The explanation is intended to cover both modals and conditionals, although with conditionals the domain of \mathcal{M} will be restricted by the conditional's antecedent (this won't affect the theory's predictions).

Explaining (a). Suppose \mathcal{M} is a present tensed modal such that $t_q \leq t_m$ (prejacent time is non-future with respect to modal time, as in (1) and (3)). We have two options for the modal base of \mathcal{M} —it's either informational or historical. Since $t_q \leq t_m$, by **Necessity of the past**, for any w, w' : if $w' \in f_H(w, t_m)$ then q is true at w iff q is true at w' . Therefore, it will not be the case that there are two worlds in $f_H(w, t_m)$ such that q is true at one and false at the other. Thus, f_H will not satisfy **Prejacent Diversity**, and therefore we predict that in such a case \mathcal{M} will not receive a metaphysical reading. But now notice that there can be an informational modal base f_I that satisfies **Prejacent Diversity**—since informational modal bases are not constrained by **Necessity of the past**, it's possible that there be two worlds in $f_I(w, t_m)$ such that q is true at one and false at the other. Therefore, we predict

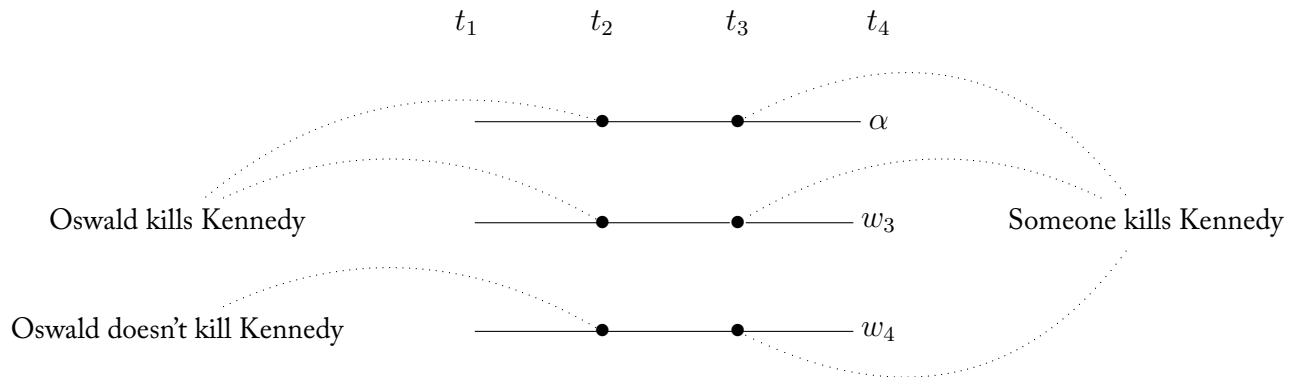
that in such a case (where $t_q \leq t_m$), \mathcal{M} will receive an epistemic reading only. This is exactly what we find—both (1) and (3) are epistemic. We judge (1) true because the set of epistemically accessible worlds in which Oswald didn't kill Kennedy are all worlds in which someone else did.

Explaining (b). Suppose that \mathcal{M} is a past tensed modal such that $t_m < t_q$ (prejacent time is future with respect to modal time, which is past with respect to utterance time, as in (2) and (4)). As before, the modal base of \mathcal{M} may be either informational or historical. In this case, *both* historical and informational modal bases can in principle satisfy **Prejacent Diversity**. An informational modal base can satisfy **Prejacent Diversity** for the same reasons as above. But a historical modal base can satisfy **Prejacent Diversity** as well, for it's compatible with **Necessity of the past** that, where q is about a time to the future of t_m , there are two worlds in $f_H(w, t_m)$ such that q is true at one and false at the other. Therefore, we predict that \mathcal{M} can receive a historical modal base when $t_m < t_u$ and $t_m < t_q$, and hence can receive a metaphysical reading. But since an informational modal base may be assigned to \mathcal{M} in such a context, we predict that such modals can in principle receive epistemic readings. Thus, we predict that **Observation-(b)** holds only generally, not absolutely. I think this prediction is correct—in certain contexts, subjunctive conditionals like (2) have epistemic readings—and I'll argue for this claim in the next section. There, I'll also argue that the default reading of subjunctive conditionals like (2) is metaphysical.

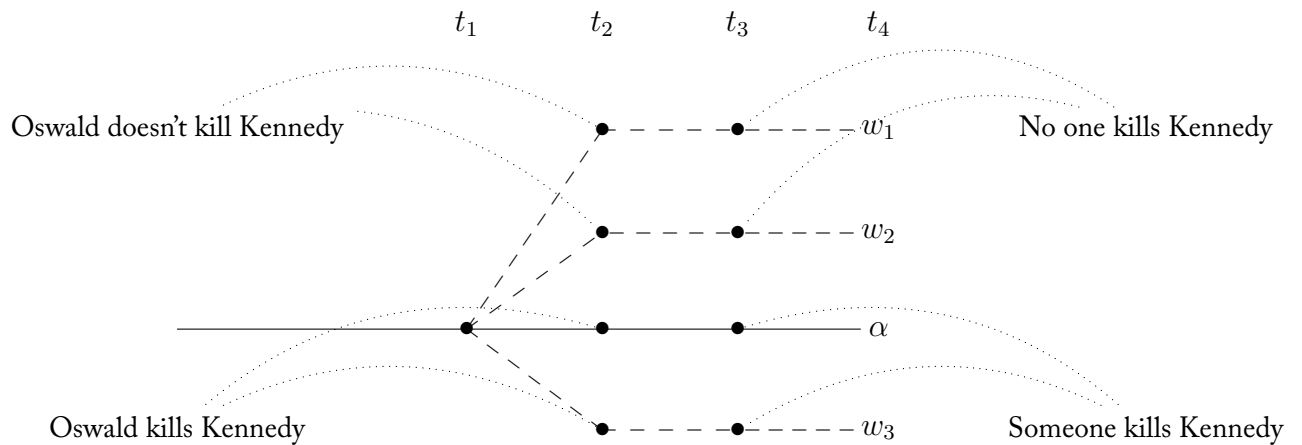
For now, notice that we predict that (1) can be true while (2) is false (on its metaphysical reading). We predict that (1) is true iff all the presently epistemically accessible worlds in which Oswald didn't kill Kennedy are worlds in which someone else did. We predict that (2) is true iff (where t' is the relevant past time) all the (relevant) historically accessible worlds from t' in which Oswald doesn't kill Kennedy are worlds in which someone else kills Kennedy.²⁵ And the former can be true while the latter false in a scenario in which we are certain, given Oswald didn't shoot Kennedy, that someone else did, and (as the Warren report confirms) in which there were no reliable backup plans in place prior to the killing

²⁵See also Jackson 1977, Thomason & Gupta 1980, Bennett 2003, Placek & Müller 2007, who arrive at a similar meaning for subjunctive conditionals.

of Kennedy to ensure someone else would step in were Oswald to fail. Schematically, this would be a scenario in which all epistemically possible p -worlds are q -worlds, but some historically accessible p -worlds from t' are $\neg q$ -worlds. Here's a scenario in which (1) is true:



In this scenario, the epistemically possible worlds are the solid lines. All the epistemically possible worlds are ones in which someone kills Kennedy, and hence at all those in which Oswald doesn't (w_4), someone else does. Now, “zoom in” on the actual world α and “project out” the historically accessible worlds from α, t_1 . On this same scenario, (2) is false:



Here, t_4 is utterance time, t_3 is the time the consequent is about, t_2 is the time the antecedent is about, and t_1 is modal time. The hashed lines branching off of α represent

the historically possible worlds (from α, t_1). Since not every historically possible world at which Oswald doesn't kill Kennedy is one at which someone else kills Kennedy, we judge (2) to be false, even though in the world of evaluation α Oswald in fact kills Kennedy.²⁶

This concludes the proposal about question (ii), that is, the account of *why* paradigm indicatives and subjunctives like (1) and (2) mean different things. On this account, the indicative (1) is present tensed—so, its modal base is evaluated at utterance time—and thus, since its consequent is about a past time, all the historically accessible worlds are either worlds in which its consequent is true or worlds in which its consequent is false (by **Necessity of the Past**). So, by **Prejacent Diversity**, it cannot receive a historical modal base, but can receive an informational one—thus, we predict that (1) is invariably epistemic. The subjunctive conditional (2), on the other hand, is past tensed—its modal base is evaluated at a time to the past of utterance time—and its consequent is about a time to the future of that past time. Thus, the constraints of **Necessity of the Past** and **Prejacent Diversity** allow such a subjunctive to receive a historical modal base in context, and hence carry a metaphysical reading. Thus, (1) says of some set of present epistemic possibilities that all of

²⁶What should we say about subjunctive conditionals the antecedent and consequent of which are not about any particular time? [Lewis 1973](#) gives the following famous example:

- (i) If kangaroos had no tails, they would topple over.

and [Bennett 2003](#) p. 284 adds:

- (ii) If Pluto had been a planet, it would have moved on the plane of the ecliptic.

Recall that I stipulated that “time” does not refer to moments but rather intervals (continuous sets of moments of time). Now, notice that “Kangaroos have no tails” and “kangaroos fall over (when trying to stand)” are generic claims about some (past, possibly extending into the future) interval of time. But that interval is unspecified without further context. Interestingly, the choice of interval has a crucial effect on whether (i) is true. Suppose it is about some relatively recent interval beginning in the near past and extending through the present—then it may be true, since kangaroos use their tails to balance, so if they were to lose them (some time in the near past), they would topple over. Suppose instead that it is about some more remote interval beginning before kangaroos evolved and extending through the present. Then it seems false—if kangaroos evolved not to have tails then presumably they would have evolved some other mechanism for not toppling over. Our theory predicts these two interpretations by the fact that they involve different conditional times—the former involves a time just before the kangaroos lose their tails and the latter before kangaroos evolve. We see, then, that besides being constrained to be before the consequent time in subjunctive conditionals, the choice of modal time is somewhat flexible, and different choices may lead to truth-conditionally different interpretations of the conditional. I discuss this issue and the relationship between modal time and antecedent time in my dissertation.

the ones in which Oswald didn't kill Kennedy someone else did, while (2) (on its default, metaphysical, reading) says of some set of past historical possibilities that all of the ones in which Oswald doesn't kill Kennedy someone else will. For the sake of space, I must leave aside addressing how this answer to question (ii) is related to question (i). Instead, next, I'll argue for the generality of this explanation by defending two additional predictions it makes—one being that subjunctives can have epistemic readings, and the other being that indicatives about the future can have metaphysical readings.

2 Two additional predictions

Whenever a modal's preajacent time is to the future of modal time ($t_q > t_m$), as with subjunctive conditionals (and indicative conditionals with future-directed antecedents), **Necessity of the Past** and **Preajacent Diversity** allow that such a modal receive an informational modal base or a historical modal base. Hence, our theory predicts that, in principle, such modals and conditionals have both epistemic and metaphysical readings. In the next two sections, I discuss and motivate this prediction.

2.1 Subjunctive ambiguity

We predict that subjunctive conditionals like (2) are in principle ambiguous between (the default) metaphysical reading, and an epistemic reading. In this section, I'll argue that this is the right prediction and defend the claim that the metaphysical reading of subjunctives is only the default.

In fact, epistemic subjunctives have already been noticed, though dismissed as an oddity. Edgington 2007 gives the following example (borrowed from Grice 1989):

Treasure hunt. “There is a treasure hunt. The organizer tells me:

(15) I'll give you a hint: it's either in the attic or the garden.

Trusting the speaker, I think

(16) If it's not in the attic, it's in the garden.

We are competing in pairs: I go to the attic and tip off my partner to search the garden. I discover the treasure. ‘Why did you tell me to go to the garden?’ she asks.

- (17) Because if it hadn’t been in the attic it would have been in the garden: that’s what I was told. (or more pedantically: ‘that’s what I inferred from what I was told’)

That doesn’t sound wrong in the context.” [Edgington 2007](#), p. 212.

Notice that, in this context, (17) has an epistemic reading: the speaker infers it from (16)—thus, it’s an instance of the direct argument (p or q , therefore, *if not- p , q*).²⁷ The truth of (17) has nothing to do with the world—the intentions of the treasure-hider for instance—and is due entirely to the fact that the disjunction (16) was known at the relevant past time. So, interestingly, the epistemic reading here may be paraphrased along the following lines: given what I knew *then*, had it not been in the attic, it must have been in the garden. This is no mere quirk, either. Edgington gives another example: “‘Why did you hold Smith for questioning?’ ‘Because we knew the crime was committed by either Jones or Smith—if it hadn’t been Jones, it would have been Smith’.” ([Edgington 2007](#), p. 213). As with (17), here, we have a claim about past epistemic possibilities—at that time, all of the not-Jones possibilities were Smith-possibilities.

Perhaps I’ve convinced you that there are subjunctive conditionals that have epistemic readings in certain contexts; you may still be wondering: is there a context in which even (2), the paradigm subjunctive conditional, receives an epistemic reading?

- (2) If Oswald hadn’t killed Kennedy, someone else would have.

I think there is such a context: Kennedy has been shot, but we don’t know whether he was shot on Monday or Tuesday. However, we are certain that if Kennedy was shot on Monday, Oswald did it, but if he was shot on Tuesday, Oswald couldn’t have done it. I send you to investigate some of the possible Tuesday-shooters, and arrest myself Oswald.

²⁷The direct argument appears valid for indicative conditionals but not for subjunctives (with these “epistemic subjunctives” as exceptions). See [Stalnaker 1975](#), [Jackson 1979](#) for further discussion.

Later, we discover that Oswald in fact killed Kennedy, so you ask, “why did you send me to investigate those other suspects?” and I reply,

(18) Because if Oswald hadn’t killed Kennedy, someone else would have (on Tuesday).

In this context, just as in **Treasure Hunt**, by uttering (2) I seem to express about my (our) past epistemic possibilities—thus, even (2) seems to have an epistemic reading in the right context, and our theory predicts this.

So far, so good. Past epistemic readings of subjunctive conditionals are possible, in the right contexts, and our theory predicts that they are possible. But these readings of subjunctives are not the default ones, and they seem to require a special context to bring them out. What features of the context are necessary to bring out such a reading, and why is the default interpretation of subjunctives metaphysical? First, notice that past possibility modals like (19) admit of past epistemic readings:

(19) The keys might have been in the car

von Fintel & Gillies 2008 point out the past epistemic reading of (19) arises in the following kind of context:

(20) A: Where are the keys?

B: They might be in the car.

A: (after checking) They’re not, why’d you say that?

B: I didn’t say they were in the car, just that they might be—and they might have been!

This gives us our clue as to what kinds of contexts seem to permit epistemic readings of past modals and conditionals. The readings seem to only arise in contexts in which the speaker is explaining (or evaluating, see footnote 28) some past event—in **Treasure Hunt**, the speaker told her confidant to check the garden *because* given what she knew then, if it hadn’t been in the attic it would have been in the garden; in the questioning case the speaker held Smith for questioning *because* given what she knew then, if the crime hadn’t been committed by Jones it would have been committed by Smith; in the keys case, the speaker said they might be in the car *because* given what she knew then they might have been in the car; and in the

modified Oswald case, the speaker said what she did *because* given what she knew then, if Oswald hadn't killed Kennedy, someone else would have (been the killer).²⁸

So, why is the metaphysical interpretation of a subjunctive conditional the default? We've seen that we get epistemic readings of subjunctives (or past modals) only in behavior-explaining/evaluating contexts. A possible explanation why we only get them in such contexts is that we typically don't care about past epistemic possibilities except in those contexts, whereas we typically care about past historical possibilities.²⁹ The historical possibilities at some time represent the "objective options" open given various features of the world in place at that time (for instance, the capabilities of individuals, given how they are constituted). Thinking about such possibilities is thus useful in planning, comparing courses of action, and so on. For instance, if we think that if we had played zone defense, we would have won last night's basketball game, then we have a reason to play zone defense in today's rematch. It's harder to think of why we might care about past epistemic possibilities which are no longer open possibilities (having learned something new which rules them out). Since we know now that it didn't rain yesterday, what's the point of bringing up the fact that yesterday we thought it might have been raining? One reason to talk about such possibilities might be to explain our actions at that time—for instance, why we brought our umbrella with us to work. But it doesn't make sense to use such possibilities to plan for the future or compare possible courses of action—these were epistemic possibilities at the time only because of our ignorance, but past ignorance won't (in general) be the basis for future plans or useful in comparing courses of action. In other words, the information we have now (though didn't then), which rules out those past epistemic possibilities, is the information relevant to most ordinary activities (e.g., deciding where to go for dinner).

²⁸Such readings also arise in contexts in which we are evaluating some past behavior, as in the following example:

- (i) You close the door behind me, which automatically locks it. I ruffle through my pocket for my keys, finding them there luckily, and say:
 - a. Still, that was stupid of you—the keys might have been inside!

²⁹For a small sampling consider: in decision contexts we care about what would happen were we to do something (cf. [Lewis 1981a,b](#), [Stalnaker 1996](#), in assessing whether someone was morally responsible we care about whether the person could have done otherwise (cf. [Frankfurt 1969](#)), and in assessing whether X harmed Y we care about how Y would have been had X not acted as they did (cf. [Feinberg 1992](#), [Perry 2003](#)).

Thus, a possible non-linguistic explanation why we don't usually get epistemic readings of subjunctive conditionals (or modals in the preajacent of past tense) is that there are only a few contexts (such as behavior-explaining/evaluating contexts) in which we care about past epistemic possibilities.³⁰

Our theory predicts, correctly I have argued, that subjunctive conditionals can in principle receive epistemic interpretations. This is a further mark in its favor—indeed, no other theory of subjunctive conditionals that I know of accounts for these readings of subjunctives. In the next section, I turn to the second controversial prediction of our theory—that future-directed indicative conditionals are similarly in principle ambiguous between an epistemic and metaphysical reading.

2.2 Future indicatives

In this section we'll discuss future-directed indicative conditionals—those whose consequents are about a time to the future of modal time (= utterance time), such as (21):

- (21) If Oswald doesn't kill Kennedy, someone else will.

Our theory predicts that such conditionals are ambiguous between an epistemic and a metaphysical reading. The reason is that if $t_q > t_m$ then either an informational or histor-

³⁰An alternative explanation is that there are two kinds of modals, ones which select for informational modal bases and others which select for historical modal bases (this division is intended to map on to the observed difference between so-called “epistemic” and “root” modals; see Coates 1983, Palmer 1986, Brennan 1993), and these modals differ in their syntactic projection properties: epistemics tend to outscope quantifiers and tenses, while roots do not (c.f. Cinque 1999, Drubig 2001, Hacquard 2006). Then, we might account for the cases of epistemics in the preajacent of a tense as being in the preajacent of a deleted past-inflected attitude verb, as in:

- (i) ~~I thought that~~ if it hadn't been Jones, it would have been Smith.

See Stephenson 2007 for a proposal of this kind for epistemic modals.

ical modal base will satisfy **Prejacent Diversity**.³¹ Is this prediction plausible?³²

Let's begin by motivating the fact that some future indicatives clearly carry (at least) an epistemic reading. [Bennett 2003](#) pp. 345-346 and [Edgington 1995](#) pp. 317-318 offer examples where we can accept a future-directed indicative on grounds that would not support accepting its past subjunctive counterpart at a later time in support of this claim:

Meeting. Someone is scheduled to meet with the boss Monday morning, but now, on Sunday, we're not sure whether it will be Sue or Ben who she meets. We know, however, that the boss only schedules one meeting per day, and never has a backup meeting in place in case the person scheduled fails to show up. Thus, on Sunday we can express something true by uttering the following future indicative:

(22) If Sue doesn't meet with the boss tomorrow, Ben will.

On Monday afternoon we learn that Sue met with the boss. Uttering the following subjunctive now would seem to express something false:

(23) If Sue hadn't met with the boss today, Ben would have.

By uttering (22) on Sunday, we express something epistemic, which we might paraphrase by: given the available evidence, if Sue is not the person meeting with the boss tomorrow, Ben will be. Since this seems to be true of the available information, (22), as uttered on Sunday, is true. But uttering (23) on Monday after Sue's meeting seems to express something metaphysical, which we might paraphrase by: features of the world in place before

³¹I won't discuss future-directed subjunctive conditionals here:

- (i) If Oswald were not to kill Kennedy, someone else would.

Our theory predicts that these only have metaphysical readings, while ones with stative consequents are predicted to also have an epistemic reading (in the kind of contexts discussed in §2.1):

- (ii) If Oswald weren't Kennedy's killer, someone else would be.

³²Note that [Gibbard 1981](#), pp. 226-229 argues that future indicatives have both epistemic and metaphysical readings. I won't review Gibbard's argument here, since it involves subtle judgments about such conditionals. Consider the argument in this section an additional argument in favor of ambiguity, on top of arguments involving differences in truth conditional judgments.

Sue's meeting with the boss would have led, given her not meeting with the boss, to Ben meeting with the boss. But since no such arrangements were in place at the relevant past time, the utterance of (23) on Monday seems false. If (22), as uttered on Sunday, meant something that is true just in case (23), as uttered on Monday, were true, the fact that there was no backup meeting scheduled should condemn (22) to falsity just as it does (23), yet it does not—in Bennett's terminology, future indicatives do not always stand or fall with their corresponding past subjunctives. Hence, it's plausible that (22) means something epistemic, along the lines of the paraphrase above.³³

Nonetheless, future indicative conditionals seem to also carry a reading in which they *do* stand or fall with their corresponding past subjunctives. Consider the following example (borrowed from Stalnaker 1984 p. 113):

Election. It's the '60s, and A and B are discussing the approaching British national election. Both A and B think Wilson's a plausible contender, but disagree over which of the other two has a shot at winning. A thinks:

(A) If Wilson doesn't win, Thorpe will.

while B thinks

(B) If Wilson doesn't win, Heath will.

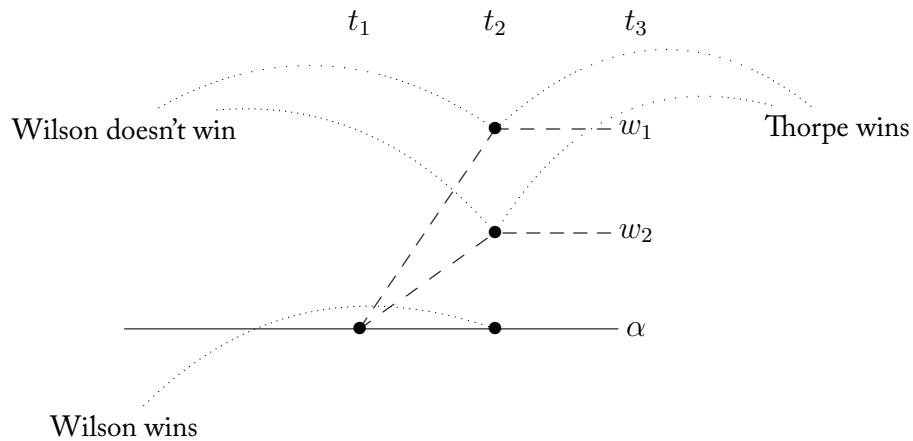
Suppose that, as it turns out, Wilson wins. Even after this becomes common knowledge between A and B, either may continue to insist he was right, and their disagreement over (A) and (B) turns naturally into a disagreement over (A') and (B'):

(A') If Wilson hadn't won, Thorpe would have.

(B') If Wilson hadn't won, Heath would have.

³³Bennett describes the situation this way: there are grounds on which we can accept a future indicative but not its corresponding subjunctive (see Bennett 2003 pp. 344-355). In the case above, knowing that either Sue or Ben will meet with the boss are sufficient grounds to support belief in the future indicative (22), but these grounds (which you continue to know after you learn that Sue met with the boss) are not sufficient to support belief in the past subjunctive (23).

In **Election**, unlike with **Meeting**, the future indicatives (A) and (B) seem to express at their utterance times something equivalent to what their past subjunctive counterparts (A') and (B') express at a relevant later time. [Edgington 2004](#) mentions a similar case: “I say ‘Don’t go in there; if you go in you will be hurt.’ You look skeptical but stay outside, and there is a loud bang as the ceiling collapses. ‘You see,’ I say, ‘I was right: if you had gone in, you would have been hurt. I told you so’. Or, if there is no loud bang and the ceiling doesn’t collapse, “I was wrong; I thought the ceiling was about to collapse; I thought you would have been hurt if you had gone in”. Contrast these examples with (22) as uttered in the context **Meeting**. There, as I pointed out, we think that what (22) expresses (as uttered on Sunday) is true even though we don’t think that what (23) expresses (as uttered on Monday after the meeting) is true. Thus, there seem to be future indicatives that stand-or-fall with their subjunctive counterparts, and some that do not, and it appears that context is largely what affects which reading is in play. Our theory predicts this in virtue of predicting that in the right context, an utterance of a future indicative expresses a proposition that is (in principle) equivalent to the proposition expressed by a past subjunctive (as uttered at a later time). The following graphic illustrates a scenario in which the historical readings of (A) and (A') (as uttered at t_1 and t_3 respectively) are both true, and the historical readings of (B) and (B') (as uttered at t_1 and t_3 respectively) are both false:



This isn't a decisive argument that future indicatives are ambiguous. After all, it's compatible with the foregoing observations that (A) and (B) carry only epistemic readings and it

just happens to be the case that, in **Election** A and B care about (A') and (B') since they care about the objective chances of candidates taking office, and these chances are relevant to the truth conditions of the subjunctive conditionals (cf. [Bennett 2003](#), pp. 350–355). Unfortunately, dispelling all doubt about this ambiguity is a task that goes beyond the scope of this paper. I hope to have at least provided some grounds for thinking that this consequence of my theory is not implausible, and has some intuitive motivation.

3 Conclusion

We began with the famous indicative/subjunctive minimal pair:

- (1) If Oswald didn't shoot Kennedy, someone else did.
- (2) If Oswald hadn't shot Kennedy, someone else would have.

Recognizing that the indicative/subjunctive distinction is one both of grammar and meaning, we distinguished two questions at the outset:

- (i) What do indicative and subjunctive conditionals mean?
- (ii) Why does the indicative/subjunctive distinction give rise to the corresponding epistemic/metaphysical distinction—in other words, what role does grammar play in bringing about a difference in what indicatives and subjunctives mean?

This paper has aimed to present and defend a proposal about (ii). The proposal begins with the assumption that the metaphysical reading of subjunctive conditionals involves historical modality—the key feature of which is that what was once historically possible may not now be historically possible (**Necessity of the past**). We added to this a pragmatic constraint requiring modal prejacents to be diverse with respect to their modal base (**Prejacent Diversity**). Together, these two principles allowed us to predict that past subjunctives like (2) are metaphysical, while past indicatives like (1) are epistemic (since epistemic modality is not constrained by **Necessity of the past**). We defended this proposal on the following grounds:

- (I) The two principles needed for the theory were both natural and independently plausible (§1.2).
- (II) The two principles together predicted the same grammatical/semantic connection in modals (§1.3).
- (III) The resulting theory predicts that some subjunctive conditionals can have epistemic readings, and also predicts just which subjunctives can get them (§2.1).
- (IV) The resulting theory also predicts that future indicative conditionals can have metaphysical readings as well as epistemic ones (§2.2).

We’ve covered a lot of ground. But more work remains, for we have said very little about question (i) and how our proposal bears on it. One way to begin filling in an answer to (i) that builds on the proposal here is to explore how to integrate the contribution of the domain-fixing function to the truth conditions of indicative and subjunctive conditionals. Thinking about the contribution of the domain-fixing function to a historical modal base promises a framework for exploring what gets held fixed in the evaluation of a subjunctive conditional—for instance, facts about times to the past of the antecedent are held fixed, but so are certain facts about times to its future (cf. Edgington 2004 on hindsight considerations)—and the relationship between subjunctive conditionals and laws of nature. Related to this is the relationship between antecedent time and conditional time—something Bennett 2003, pp. 202–221 discusses at length—and what the resulting theory can tell us about backtracking subjunctives. In addition, our theory does not immediately explain the fact that subjunctive conditionals implicate the falsity of their antecedents (cf. Stalnaker 1975, Karttunen & Peters 1979, von Stechow 1997, Iatridou 2000, Ippolito 2003, Arregui 2007) while indicatives do not. Finally, it remains to be seen how the notion of historical modality defined here relates to the philosopher’s notion of metaphysical modality present in discussions (for instance) of the metaphysical necessity that water is H_2O . Each of these projects are interesting in their own right, and I discuss each in more detail in my dissertation.

Appendix

Historical modal bases

We define historical modal bases formally as follows.³⁴ First, define the following three-place relation in $T \times W \times W$, \simeq , such that:

- (i) $\forall t \in T$: \simeq_t is an equivalence relation (reflexive, transitive, symmetric) over pairs of worlds in W , and
- (ii) $\forall w, w' \in W$ and $\forall t, t' \in T$: $(w \simeq_t w' \wedge t' < t) \rightarrow w \simeq_{t'} w'$

Basically, what \simeq does is group worlds into equivalence classes at a particular time such that each world is \simeq_t -accessible to every other in that class, and ensures that if two worlds are in some class at some time, then they are in that class for all earlier times, but not necessarily for later times. We add to this branching structure the following semantic constraint:

(24) **Semantic Constraint**

For all worlds w, w' , and propositions p about some time $t' \leq t$:
 $w \simeq_t w' \rightarrow p$ is true at w iff p is true at w'

This constraint ensures that the set of \simeq_t -accessible worlds agree in truth value on all those propositions about any time to the past or present of t (I'll continue to leave the notion of a proposition being about a time as undefined). We can now define a historical modal base f_H as follows:

$$(25) \quad \forall w, t : f_H(w, t) =_{\text{def}} \{w' : w \simeq_t w'\}$$

Substituting into **Semantic Constraint** yields the formal analysis of **Necessity of the past**:

(26) **Necessity of the past**

For all worlds w, w' and propositions p about some time $t' \leq t$:
 $w' \in f_H(w, t) \rightarrow p$ is true at w iff p is true at w'

³⁴This definition borrows from [Thomason 2002](#).

A simple interval semantics

- Begin with a set of times T , ordered by precedence by $<$.
- From this we build a set of intervals I , defined as the set $\{i : \wp(T) : \forall t, t', t'' \in T : (t < t' < t'' \wedge t, t'' \in i) \rightarrow t' \in i\}$
- An interval i is included within another i' iff $i \subseteq i'$
- An interval i overlaps another i' iff $i \circ i'$ iff $i \cap i' \neq \emptyset$
- We define a partial order on intervals as follows:
 - $i \leq i'$ iff either $\exists t \in i : \forall t' \in i' : t < t'$ or $i = i'$

Interpretation is done in two steps. First, we translate expressions of English into expressions of an intermediate language \mathcal{L} which represents the logical form of that expression (I'll use sans serif font to mark expressions of \mathcal{L}). Then $\llbracket \cdot \rrbracket$ is an interpretation function that maps expressions of \mathcal{L} to extensions relative to a context c , assignment function g , and world w (cf. [Kaplan 1989](#)). Where 'p' is an expression of \mathcal{L} , let $\llbracket p \rrbracket^{c,g}$ be its intension—a function from worlds to extensions. Throughout I assume that the extensions of logical forms of sentences are truth values ($\mathbf{1}, \mathbf{0}$) and that their intensions are propositions, and thus that propositions are just functions from worlds to truth values (or equivalently, the set of worlds the proposition maps to truth). Thus $p = \{w : \llbracket p \rrbracket^{c,g,w} = \mathbf{1}\}$, or alternatively the set of worlds in which p is true, or alternatively the set of p -worlds.

Compositionally, we distinguish tenses and untensed sentences. The intension of the logical form of an untensed sentence is a function from an interval to a proposition (call this a property of eventualities). In general, I'll write p for the logical form of an arbitrary untensed sentence, and let its intension be:

$$(27) \quad \llbracket p \rrbracket^{c,g} = \lambda w \lambda i. \exists e P(e, w, i)$$

Read $P(e, w, i)$ as: e is an eventuality of P that holds at world w throughout interval i . Tenses are treated as variables distinguished by their semantic presuppositions (cf. [Partee 1973](#)). The intension of a tense is the interval context assigns it. The logical form of present tense is pres_x and past tense past_x . Let i_c be the time of the context of utterance.

$$(28) \quad \llbracket \text{pres}_x \rrbracket^{c,g} = g(x), \text{ where } g(x) \circ i_c$$

$$(29) \quad \llbracket \text{past}_x \rrbracket^{c,g} = g(x), \text{ where } g(x) < i_c$$

Modals are treated as propositional operators—the intension of the logical form of a modal is a function from propositions to a function from intervals to propositions. I’ll assume that the logical forms of modal expressions carry a free variable over modal bases and domain-fixing functions the values of which are assigned by context. Let $\Diamond_{f,D}$ be the logical form of an untensed possibility modal and $\Box_{f,D}$ be the logical form of an untensed necessity modal. Thus, where \mathcal{P} is a variable over propositions:

$$(30) \quad \llbracket \Diamond_{f,D} \rrbracket^{c,g} = \lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w \in \mathcal{P}$$

$$(31) \quad \llbracket \Box_{f,D} \rrbracket^{c,g} = \lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w \in \mathcal{P}$$

Putting things together, we can now translate and interpret tensed modal sentences, for instance:

- (32) a. It’s possible that John is outside.
b. It’s possible that John was outside.

These are interpreted as having the following truth conditions, respectively:

$$(33) \quad \llbracket \text{pres}_x(\Diamond_{f,D}(\text{pres}_x(p))) \rrbracket^{c,g,w} = \text{I} \text{ iff } \exists w' \in D_c(f_c, w, g(x)) : \exists e P(e, w', g(x))$$

Where $g(x) \circ i_c$

$$(34) \quad \llbracket \text{pres}_x(\Diamond_{f,D}(\text{past}_y(p))) \rrbracket^{c,g,w} = \text{I} \text{ iff } \exists w' \in D_c(f_c, w, g(x)) : \exists e P(e, w', g(y))$$

Where $g(x) \circ i_c$ and $g(y) < i_c$

Notice in (33), the second present tense is interpreted with respect to the same variable as the first. This is because that present tense is anaphoric to the previous one. See [Partee 1973](#) for evidence that tenses can have anaphoric readings. I won’t say more about the conditions under which such readings arise, since that goes far beyond the scope of this paper. To see how the compositional system is working, here’s a derivation of the truth conditions of (34):

$$(35) \quad \text{a. } \llbracket \text{pres}_x(\Diamond_{f,D}(\text{past}_y(p))) \rrbracket^{c,g,w^*} = \text{I} \text{ iff}$$

- b. $\llbracket \text{pres}_x(\Diamond_{f,D}(\text{past}_y(p))) \rrbracket^{c,g}(w^*) \text{ iff}$
- c. $\llbracket \Diamond_{f,D}(\text{past}_y(p)) \rrbracket^{c,g}(\llbracket \text{pres}_x \rrbracket^{c,g}(w^*)) \text{ iff}$
- d. $\llbracket \Diamond_{f,D}(\text{past}_y(p)) \rrbracket^{c,g}(g(x))(w^*) \text{ iff}$ Where $g(x) \circ i_c$
- e. $(\llbracket \text{past}_y(p) \rrbracket^{c,g}(\llbracket \Diamond_{f,D} \rrbracket^{c,g}))(g(x))(w^*) \text{ iff}$
- f. $(\llbracket \text{past}_y(p) \rrbracket^{c,g}(\lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w' \in \mathcal{P}))(g(x))(w^*) \text{ iff}$
- g. $((\llbracket p \rrbracket^{c,g}(\llbracket \text{past}_y \rrbracket^{c,g}))(\lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w' \in \mathcal{P}))(g(x))(w^*) \text{ iff}$
- h. $((\llbracket p \rrbracket^{c,g}(g(y))) (\lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w' \in \mathcal{P}))(g(x))(w^*) \text{ iff}$
Where $g(y) < i_c$
- i. $((\lambda i \lambda w. \exists e P(e, w, i)(g(y))) (\lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w' \in \mathcal{P}))(g(x))(w^*) \text{ iff}$
- j. $(\lambda w. \exists e P(e, w, g(y))) (\lambda \mathcal{P} \lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : w' \in \mathcal{P}))(g(x))(w^*) \text{ iff}$
- k. $(\lambda i \lambda w. \exists w' \in D_c(f_c, w, i) : \exists e P(e, w', g(y)))(g(x))(w^*) \text{ iff}$
- l. $(\lambda w. \exists w' \in D_c(f_c, w, g(x)) : \exists e P(e, w', g(y)))(w^*) \text{ iff}$
- m. $\exists w' \in D_c(f_c, w^*, g(x)) : \exists e P(e, w', g(y))$ Where $g(x) \circ i_c$ and $g(y) < i_c$

Next, I propose that “will” is decomposed in logical form into woll and pres, and that “would” is woll plus past. Usually, this proposal is accompanied by the view that woll is a modal, however instead I want to treat its intension as a function from intervals to intervals as follows, where i^∞ is an interval whose earliest time is the earliest time of i and extends to the end of time:

$$(36) \quad \llbracket \text{woll} \rrbracket^{c,g} = \lambda i. i^\infty$$

Now we can interpret:

$$(37) \quad \text{It was possible that John would win.}$$

$$(38) \quad \llbracket \text{past}_x(\Diamond_f(\llbracket \text{past}_x[\text{woll}] \rrbracket(p))) \rrbracket^{c,g,w} = \text{I iff } \exists w' \in D_c(f_c, w, g(x)) : \exists e P(e, w'', g(x)^\infty)$$

where $g(x) < i_c$

Finally, we will treat the logical form of an untensed conditional sentence via the two-place conditional operator \rightarrow_f which is interpreted as a necessity modal on its consequent with its antecedent restricting its modal base:

$$(39) \quad \llbracket \rightarrow_f \rrbracket^{c,g} = \lambda \mathcal{P} \lambda \mathcal{Q} \lambda i. \lambda w. \forall w' \in D_c(f_c, w, i) \cap \mathcal{P} : w' \in \mathcal{Q}$$

Now, we can interpret indicative conditionals like:

(I) If Oswald didn't kill Kennedy, someone else did.

$$(40) \quad \llbracket \text{pres}_x(\rightarrow_f(\text{past}_y(p))(\text{past}_y(q))) \rrbracket^{c,g,w} = 1 \text{ iff} \\ \forall w' \in (D_c(f_c, w, g(x)) \cap \lambda w''. \exists e P(e, w'', g(y))) : \exists e Q(e, w', g(y)) \\ \text{where } g(x) \circ i_c \text{ and } g(y) < i_c$$

and subjunctive conditionals like:

(2) If Oswald hadn't killed Kennedy, someone else would have.

$$(41) \quad \llbracket \text{past}_x(\rightarrow_f(\text{past}_y(p))([\text{past}_y[\text{woll}]](q))) \rrbracket^{c,g,w} = 1 \\ \forall w' \in (D_c(f_c, w, g(x)) \cap \lambda w''. \exists e P(e, w'', g(y))) : \exists e Q(e, w', g(y)^\infty) \\ \text{where } g(x) < i_c \text{ and } g(y) < i_c$$

Now, what's left is to integrate this semantics with **Necessity of the Past** and **Prejacent Diversity** to predict our **Observation**. First, we'll restate our observation using the machinery from our interval semantics:

- In this simple interval semantics, an expression denoting an interval always c-commands an untensed expression at logical form. So we can explain talk of “the time of the prejacent” or “modal” in terms of the value of its c-commanding tense.
- Thus, where p is an untensed sentence and tense be its c-commanding tense, let $\pi(\llbracket p \rrbracket^{c,g}) = \llbracket \text{tense} \rrbracket^{c,g}$. And where modal is an untensed modal and tense its c-commanding tense, let $\pi(\llbracket \text{modal} \rrbracket^{c,g}) = \llbracket \text{tense} \rrbracket^{c,g}$.
- Thus, where $\text{tense}_x(\text{modal}_f(\text{tense}_y(p)))$ is the logical form of an arbitrary modal sentence, the time of the prejacent (t_q) is $\pi(\llbracket p \rrbracket^{c,g})$, that is $g(y)$, and the time of the modal (t_m) is $\pi(\llbracket \text{modal}_f \rrbracket^{c,g})$, that is $g(x)$.
- Now, we restate **Observation** as follows:

Observation*: where $\text{tense}_x(\text{modal}_f(\text{tense}_y(q)))$ is the logical form of an arbitrary

modal sentence, and $\text{tense}_x(\rightarrow_f(\text{tense}_y(p))(\text{tense}_y(q)))$ is the logical form of an arbitrary conditional sentence,

- (a) If $\pi(\llbracket q \rrbracket^{c,g}) < i_c$, $\pi(\llbracket \text{modal}_f \rrbracket^{c,g})$, then $\llbracket f \rrbracket^{c,g}$ = the most salient informational modal base in c , f_I^c .
- (b) If $\pi(\llbracket \text{modal}_f \rrbracket^{c,g}) < i_c$ and $\pi(\llbracket \text{modal}_f \rrbracket^{c,g}) < \pi(\llbracket q \rrbracket^{c,g})$, then $\llbracket f \rrbracket^{c,g,w} = f_H$.

The original formulation of **Necessity of the Past** appeals to the time the prejacent is about:

Necessity of the past

For all worlds w, w' and propositions p about some time $t' \leq t$:
 If $w' \in f_H(w, t)$ then p is true at w iff p is true at w' .

We can now state this more precisely as:

Necessity of the past*

For all worlds w, w' , interval i , and logical form $\text{tense}(p)$ such that $\pi(\llbracket p \rrbracket^{c,g}) \leq i$:
 If $w' \in f_H(w, i)$ then $\llbracket \text{tense}(p) \rrbracket^{c,g,w} = \mathbf{1}$ iff $\llbracket \text{tense}(p) \rrbracket^{c,g,w'} = \mathbf{1}$.

Finally, take the original formulation of **Prejacent Diversity**:

Prejacent Diversity

For any modal \mathcal{M} with modal time t and prejacent q , context can assign \mathcal{M} a modal base f at w only if:
 There are two worlds $w', w'' \in f(w, t)$: q is true at w' and q is false at w''

This is now stated more precisely as:

Prejacent Diversity*: where $\text{tense}_x(\text{modal}_f(\text{tense}_y(q)))$ is the logical form of an arbitrary modal sentence, and $\text{tense}_x(\rightarrow_f(\text{tense}_y(p))(\text{tense}_y(q)))$ is the logical form of an arbitrary conditional sentence,

$\llbracket f \rrbracket^{c,g,w} = f$ only if:
 $\exists w', w'' \in f(w, \pi(\llbracket \text{modal}_f \rrbracket^{c,g}))$: $\llbracket \text{tense}_y(q) \rrbracket^{c,g,w'} = \mathbf{1}$ and $\llbracket \text{tense}_y(q) \rrbracket^{c,g,w''} = \mathbf{0}$

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