On the structures and meanings of *might*-counterfactuals

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University of Connecticut, Manuscript, August 3, 2020

Abstract

This paper investigates the natural language semantics of *might*-counterfactuals (CFs). While *might*-CFs have been reported to have vacillating interpretations, the exact linguistic mechanism behind them has been left unexplored. This study attempts to identify the possible linguistic structures and interpretations of *might*-CFs, making use of philosophers' previous analyses as an analytical toolkit. There are three major analyses for the logical form of *might*-CFs, which I call One-Modal, Wide-Scope and Narrow-Scope. I construct their fine-grained linguistic counterparts and examine each possibility with a variety of diagnostics. It is shown that, as far as the languages presented in this paper – English and Japanese – are concerned, Wide-Scope and Narrow-Scope must remain. Based on this result, I propose what I call the 'double-modal view' of *might*-CFs, and corroborate it with further evidence.

1 Introduction

Counterfactual conditionals, or simply *counterfactuals* (CFs), have raised a number of intriguing philosophical and linguistic puzzles.[1] Among those, the interpretation of '*might*-CFs' has been particularly elusive, and possibly more controversial than that of *would*-CFs. As (1) and (2) show, the two CFs differ only in the modal auxiliaries in the consequents.

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[1] I follow the classical view that CFs are conditional sentences whose antecedents are (known or believed to be) false. It is often argued that the term 'counterfactuals' is misleading because of the existence of the so-called Anderson conditionals (Anderson 1951), which look like CFs but are used to argue *for* the truth of the antecedent.

   (i) If Jones had taken arsenic, he would have shown just these symptoms which he in fact shows.

However, because this study will not deal with Anderson conditionals, the use of 'counterfactuals' should not give rise to any serious confusion.

   Notice incidentally that the '*might*'-variant of Anderson conditionals also seems to exist, committing the speaker to the possibility of the truth of the antecedent.

   (ii) If Jones had taken arsenic, he *might* have shown just these symptoms which he in fact shows.

While this will not be covered in this paper, I speculate that whatever is the right account of Anderson conditionals will extend to sentences like (ii) without special challenges.

(1)   If I had looked in my pockets, I *would* have found a penny.

(2)   If I had looked in my pockets, I *might* have found a penny.

The debate of *might*-CFs originates in Lewis's (1973) treatment of (2). Regarding its truth value, Lewis writes:

> Take ϕ as 'I looked in my pocket' and ψ as 'I found a penny'; suppose I did not look, suppose there was no penny to be found, and make commonplace assumptions about relevant matters of fact. Then 'If I had looked, I might have found a penny' is plainly false ... (*Ibid*. p.80)

Lewis's interpretation of (2) aroused reactions from other authors (Stalnaker 1981, DeRose 1994, 1999). The opponents argue that (2) cannot be *plainly* false, even if the consequent is in fact false. Rather, they claim that *might* in *might*-CFs can represent the speaker's current *epistemic uncertainty* about the veracity of the counterfactual dependence. DeRose (1994) writes:

> Suppose, that is, that in the example he still didn't know whether there had been a penny in his pocket, and was therefore ignorant of the truth-values of $(\phi\square\rightarrow\psi)$ and $(\phi\square\rightarrow\neg\psi)$. In this situation, ... (our (2)) certainly could be very natural and *appropriate* thing for him to say. (*Ibid*. p.414)

To illustrate this, DeRose provides the following scenario:

> A friend needed a penny some time ago and asked if you had one. You said you had none. And indeed you didn't, but you didn't know that you were pennyless; you denied having a penny because you were busy, your hands were full, and you didn't want to bother searching your pockets for change. (*Ibid*. p.414)

The story continues as follows. Later the friend came to suspect you and asked '*Would you have found a penny if you had looked in your pocket?*'. Because you have bought several things in the mean time and thrusted change into your pocket, it is no longer possible to tell whether there had been a penny in your pocket at the time of the friend's request. DeRose observes that (2) can be felicitously uttered as a response to the friend's question, despite the fact that you would have found none indeed.

It is also true, however, that *might*-CFs can represent uncertainty that is not epistemic, as Lewis would have had in mind. Suppose that there was a coin you knew to be fair, but you ended up not tossing it. Then (3) is obviously true and completely felicitous to utter.

(3)   If I had tossed this fair coin, it might have landed heads.

What *might* represents here is a *metaphysical uncertainty* that would have arisen if you had decided to toss the coin. Because a coin-toss is an indeterministic chance process, it would have been metaphysically uncertain on which side the coin would land. (3) does not involve the same speaker uncertainty that one finds in DeRose's scenario: it is unquestionably true that there would have existed a chance of the coin's landing heads if you had tossed it, since, as you knew, it was a fair one. There is no room for you to doubt the counterfactual link between the coin-toss and the chance of the coin's landing heads.[2]

How can we capture such vacillating meaning of *might*-CFs?[3] So far, *might*-CFs have been mostly discussed by philosophers, but they have been focusing on finding the logical form that fits into their logical theories, not necessarily interested in why and how *might*-CFs, *as a natural language expression*, give rise to diverse interpretations. And linguists, as far as I can see, have remained largely silent on this topic. However, the interpretive variation of *might*-CFs, I argue, is worth a serious pursuit from both linguistic and philosophical perspectives. As complex linguistic entities, the meaning of *might*-CFs builds up from the multi-layered interactions between tense/aspect, modal and *if*-clause. How they are compositionally derived and what constraints they are subject to through the composition deserve thorough linguistic investigation. Furthermore, given that logical theories exploit our language intuition as the primary source of inspiration, the possible range of meaning in their natural language counterpart must be properly reckoned with by those more interested in logical investigation.[4]

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[2]We can actually see this by a simple test: follow-ups like *'but I'm not certain about it'* or *'but it's uncertain'* can be felicitously used in (2) but not in (3).

  (i)   If I had looked in my pockets, I might have found a penny, but I'm not certain about it / but it's uncertain.

  (ii) If I had tossed this fair coin, it might have landed heads, ??but I'm not certain about it / ??but it's uncertain.

Due to the present indicative forms, the follow-ups signal that they are about the current (and actual) speaker uncertainty. (i) should be fine given DeRose's scenario: the pronoun *'it'* can refer to the counterfactual link between the antecedent and consequent, whose truthfulness the speaker is not sure of. However, the pronoun in (ii) finds no such referent, since the conditional as a whole bears no epistemic uncertainty.

[3]To the best of my knowledge, no author has ever observed or argued for the same sort of ambiguity in *would*-CFs. I leave open whether one can in fact find a similar vacillation in *would*-CFs and if not why that is so. But the fact that ambiguity has been noticed exclusively in *might*-CFs at least implies that there is something linguistically significant in *might*-CFs or the modal *might*, which is lacking or very weak in *would*-CFs or the modal *would*.

[4]The importance of being aware of the potential tension between formal and natural languages has been recently highlighted by Khoo and Mandelkern (2019). They have shown that the Import-Export principle, a logical schema which has long been debated by philosophers, is not necessarily translated into the English counterpart in the way that it is intended to be, and thus calls for a separate principle designed primarily for natural language sentences.

This paper thus pursues the underlying structures and interpretive limitations of natural language *might*-CFs. Importantly, our investigation will not draw solely on English. Indeed, English has been the main resource in previous works, and it serves as a starting point of our empirical pursuit too. But this language, as we will see, is not necessarily the best testing ground for a theory of *might*-CFs. This is mainly due to its opacity for modal-temporal interactions. While our analysis is built on the idea that the scope relation with respect to temporal elements non-trivially determines the interpretive variation of modal expressions, English exhibits such scopal differences only at a *covert* level (Condoravdi 2002). This property is particularly inconvenient for our purposes, because we intend to *explicitly* identify the correct structures for *might*-CFs: English *might*-CFs would elude diagnostics that single out one unique structure because of their putative structural ambiguity. This situation, I argue, can be resolved if we shift our perspective to other languages, especially those that exhibit the modal-temporal scope interactions *transparently*. As one such language, Japanese will offer a suitable empirical domain to detect the structural variety of *might*-CFs.[5]

I also argue that such an expansion of the sample is simultaneously beneficial in terms of empirical generality. Needless to say, a viable linguistic proposal must come with adequate cross-linguistic validity. This means that the predictions that it generates must be attested by, or at least be compatible with, as many languages as possible, as long as they qualify as testable subjects under the adopted framework.[6] This may be a somewhat weak sense of generalization, namely one that one language calls for and other languages offer no counter-evidence to. Still, if competing analyses have more or less the same extent of theoretical depth, the analysis that offers this kind of generalization should have more explanatory value than those only covering one single language. I will show that the proposal of this paper is consistent with the results obtained from both Japanese and English. While it is yet to be seen whether it also applies to other languages, I submit that it bears some extent of cross-linguistic generality, and therefore stands a better chance than an analysis fitted exclusively to either Japanese or English.

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[5]As a matter of fact, quite a few European languages seem to have overt scope relations between modals and tenses (e.g. French in Laca 2012). However, the particular advantage of using Japanese that I assume is that it does not have any counterfactual mood morphology such as we find in some European languages. For instance, as shown in Laca (2012), French has so-called conditional mood inflection on possibility modals or perfect morphology, which typically appears in CFs or future-less vivid conditionals (Iatridou 2000). The lack of such additional complexity in Japanese helps us capture the *direct* effect of the modal-tense scope interactions on the meanings of *might*-CFs.

[6]Concerning cross-linguistic generalizations, I adopt a somewhat cautious stance in not assuming at the outset that there is a single analysis that fits all languages, nor do I assume of a particular framework that it is applicable in the analysis of all languages. Finding such universality would be empirically significant. As it turns out, Japanese and English share some deep commonalities despite their superficial differences. But it is too early to speculate about the applicability of these findings to other languages.

Finally, as a qualification, I will confine my attention to Past Perfect subjunctives like in (2) and (3), and their Japanese equivalents. Specifically I will not deal with the following sentences.

(4)　　a.　If I looked in my pockets, I *might* find a penny.
　　　　b.　If I tossed this fair coin, it *might* land heads.

A comprehensive theory of natural language *might*-CFs also needs to cover these sentences too. I leave investigation of Simple Past subjunctives like in (4) for another occasion.

This paper is organized as follows. In Section 2, I briefly discuss what philosophers have so far argued about *might*-CFs. There I introduce three major analyses proposed in the literature, which this study will exploit as the baseline of its investigation. In Section 3, I construct linguistic structures for *might*-CFs, together with the introduction of the formal preliminaries of the framework that I assume throughout. I then discuss possible positions to be taken regarding the structural variety of *might*-CFs, and point out their limitations. In Section 4, I present my own analysis, and finally propose a novel view of *might*-CFs. In Section 5, I adduce further evidence for my proposal. In Section 6, I conclude.

2　Three baseline analyses

Traditionally, the controversies on *might*-CFs have often been associated with the so-called 'Duality vs. Conditional Excluded Middle (CEM)' debate. The former, famously endorsed by Lewis (1973), analyzes *would*-CFs and *might*-CFs as the duals of each other (i.e. '*if ϕ, might ψ*' $\Leftrightarrow$ '$\neg$(*if ϕ, would $\neg\psi$*)'). The latter, originating from Stalnaker (1968), says that the negation of *would-not*-CFs is rather the corresponding *would*-CFs (i.e. $\vdash$'*if ϕ, would ψ*' $\vee$ '*if ϕ, would $\neg\psi$*'). Holding both Duality and CEM is known to result in an implausible logical consequence.[7] For many decades, the defenders of either side have attempted to formalize a logical theory that fares better than the other.[8]

Various types of logical form have been accordingly proposed for *might*-CFs. Previous analyses can be divided as to how they define the relation between *might* and the conditional connective. One is to amalgamate them into one special two-place connector, just as Lewis (1973) did with his '$\diamondsuit\!\!\rightarrow$' operator. I call this line of analysis the **One-Modal** view. The other is to separate them as distinct entities. This allows *might*

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[7]Suppose that '*if ϕ, might ψ*' is true. Then it follows by Duality that '*if ϕ, would $\neg\psi$*' is false. It then follows by CEM that '*if ϕ, would ψ*' is true. Therefore, if one holds both Duality and CEM, '*if ϕ, might ψ*' entails '*if ϕ, would ψ*'. This consequence is of course contrary to our intuition.

[8]Detailed review of this debate is beyond the scope of this paper. I refer the reader to Mandelkern (2018) for recent work on this.

	Logical form	Salient construal of *might*
One-Modal	$\phi\diamond\!\!\rightarrow\psi$	Metaphysical
Wide-Scope	$\diamond(\phi\square\!\!\rightarrow\psi)$	Epistemic
Narrow-Scope	$\phi\square\!\!\rightarrow\diamond\psi$	Metaphysical

Table 1: The forms and the salient construals of *might* in the three views

to take variable scopes with respect to the conditional connective. Stalnaker (1981) and DeRose (1994, 1999) argued that *might* scopes over an entire conditional equivalent to a *would*-CF. Lewis (1979, 1986) and Bennett (2003) instead suggested the possibility of *might* scoping inside the consequent of a conditional. I call these two approaches **Wide-Scope** and **Narrow-Scope** views of *might*-CFs respectively.

These are the three major analyses proposed in the philosophical literature. For convenience, I notate the logical forms associated with them respectively as '$\phi\diamond\!\!\rightarrow\psi$', '$\diamond(\phi\square\!\!\rightarrow\psi)$', and '$\phi\square\!\!\rightarrow\diamond\psi$', by using Lewisan '$\square\!\!\rightarrow$' as the conditional connective. This is a slight abuse of notation, since for instance Stalnaker's conditional connective represents different semantics from Lewis's. But I assume that this choice will not seriously affect our argument.

The three logical forms map *might*-CFs to different denotations. Deferring the concrete definitions to later sections, they can be categorized in terms of what construal the *might* (i.e. $\diamond$ or $\diamond\!\!\rightarrow$) is supposed to represent. Stalnaker and DeRose argued that the *might* in Wide-Scope is standardly interpreted as epistemic possibility, representing the speaker's uncertainty about the counterfactual link. As for the *might* in One-Modal and Narrow-Scope, Lewis assumed that it represents metaphysical possibility, which is independent of anyone's epistemic state. Table 1 summarizes what philosophers have argued about the correspondence between the forms and the construals of *might*. Note that from the standard linguistic viewpoint (Kratzer 1977, 1981), the construals of *might* may not be semantically encoded, but rather leave room for contextual variation. Stalnaker (1981) stands with this view, assuming that *might* is open to both epistemic and non-epistemic construals, whereas it is not clear if Lewis would have tolerated it. While this is an open question, I assume that the construals in Table 1 represent the most *salient* interpretations that *might* in each logical form is to obtain.

We start with the discussion above as the baseline of our investigation. While the three logical forms do not necessarily exhaust all analytical options, they will constitute a well-suited possibility space to make the issue of *might*-CFs sufficiently concrete and manageable. The next task is to construct linguistic structures which reflect the denotation of each logical form in a more fine-grained fashion, and to this end I will enrich the formal background by incorporating a temporal dimension into the framework.

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There are two major motivations behind this. Firstly, previous works have been mostly couched in the Stalnaker-Lewis possible worlds framework (Stalnaker 1968, Lewis 1973), but they all have assumed an *atemporal* view of worlds, abstracting away from the way the structure of possibilities changes over time.[9] Although it may be mostly innocuous and perhaps beneficial in some cases, such abstraction may come at the expense of resolution, which could prevent a theory from capturing subtle but empirically significant differences. We will see that augmenting the framework with a temporal dimension enables us to make more detailed, precise predictions regarding *might*-CFs. Secondly, there is independent evidence from linguistics that the scope relation with respect to temporal ingredients affects what construal the modal will obtain. Condoravdi (2002) showed this for English matrix *'might have'* constructions, and it is reasonable to speculate that *might*-CFs inherit it. In the next section, we will first introduce the formal setup, and then construct the linguistic analogues of the three logical forms.

3   Constructing linguistic structures for *might*-CFs

I adopt Thomason's (1984) $T \times W$-frames for the formal framework. Many of the auxiliary definitions will come from Kaufmann (2005b). I will then introduce the basics of the so-called Past-as-Past approach to CFs, which I will rely on in formulating the linguistic structures for *might*-CFs.

3.1   Formal setup: $T \times W$-frame

Throughout I will presuppose an asymmetry of *fixed past* and *open future*, which represents the idea that the past is always settled in a sense in which the future is not. Thomason's (1984) '$T \times W$-frame', the two-dimensional space consisting of worlds and times, formally captures this concept.

Definition 1 ($T \times W$-*frame*). *A $T \times W$-frame is defined as a quadruple $\langle W, T, <, \approx \rangle$, where W is a non-empty set of worlds, T is a non-empty set of times, $<$ is a linear order on T,[10] and '$\approx$' is a relation in $T \times W \times W$ such that (i) for all $t \in T$, $\approx_t$ is an equivalence relation, and (ii) for all $t, t' \in T$ and $w, w' \in W$, if $w \approx_t w'$ and $t' < t$, then $w \approx_{t'} w'$.*

The '$\approx$' relation identifies for each $\langle w, t \rangle$ the *historical alternatives* of w at t, an equivalence class of worlds that share the same past as w up to t. Historical alternatives are indistinguishable in that they assign to any atomic sentences exactly the same truth values

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[9]Lewis (1979, 1986), however, attempted to capture the dynamics of possibilities by proposing the system of 'miracles', which stipulates how worlds depart from each other (and get fused again) in the flow of time.

[10]A relation R is a linear order iff it is *transitive* and *trichotomous*; transitive iff for any x, y, z, if xRy and yRz, then xRz; trichotomous iff for any x, y, exactly one of xRy, yRx or $x = y$ holds.
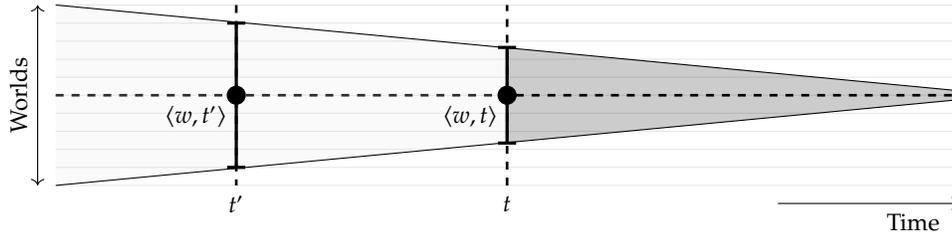
Figure 1: A depiction of the filter-funnel model of historical necessity. The historical alternatives of w at t record the same truth values up to t, but the future from then on is not foreseeable, as depicted by the darker shade.

up to some point, but they keep departing from each other as time proceeds, recording different facts and thereby drawing distinct lines of history. Figure 1 is an illustration of the so-called *filter-funnel* model of historical necessity (Thomason 1984; Kaufmann 2009).

In $T \times W$-frames, sentences are interpreted at world-time pairs (i.e. Montagovian indices). It will be helpful to extend $<$ and $\approx$ to the relations between indices.

Definition 2. *Given a $T \times W$-frame $\langle W, T, <, \approx \rangle$, let $I = W \times T$. The relations $<$ and $\approx$ are extended to $I \times I$ as follows:*

a. $\langle w, t \rangle < \langle w', t' \rangle$ *if and only if $w = w'$ and $t < t'$.*

b. $\langle w, t \rangle \approx \langle w', t' \rangle$ *if and only if $w \approx_t w'$ and $t = t'$.*

The letters '$i, j, ...$' are used to refer to world-time pairs in I. I use '$\phi, \psi, ...$' as the symbols for sentences in object langauge, whose interpretations are defined as sets of indices at which they are true, namely as *propositions*.[11]

As is standardly assumed, modal expressions are interpreted as quantifying over the domain that is restricted by a certain accessibility relation. Existential and universal quantification over a set of historical alternatives correspond to *metaphysical* possibility and necessity, respectively. Metaphysical modality is the modality that is purely concerned with objective facts. The domain for *epistemic (or doxastic)* modality is generally defined as the union of different sets of historical alternatives. This is to formally capture the idea of 'uncertainty about the past', under which an epistemic agent presupposes that the past event in question is already settled but does not know which set of historical alternatives has turned out actual. The same idea is reproducible by defining an accessibility relation slightly different from '$\approx$' (Kaufmann 2005b).

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[11]I will use '$[\![\cdot]\!]$' as an interpretation function, which assigns extensions to natural language expressions relative to an evaluation index and a frame. The extension of a sentence at an index relative to a frame is a truth value, namely 1 or 0. I will throughout omit the superscript for frames, and also omit the superscript for indices to indicate the propositions that sentences express (i.e. $[\![\phi]\!] = \{i \mid [\![\phi]\!]^i = 1\}$).

Definition 3 (*Epistemic Accessibility*). *Given a T × W-frame $\langle W, T, <, \approx \rangle$, '~' in I × I is transitive, serial and euclidean,[12] and such that if i ~ j, i' < i and j' < j, then i' ~ j'.*

'~' expresses an equivalence relation on the set of indices seen from any given index i.[13] '~' defines an epistemic modal domain as a union of sets of historical alternatives if it *lacks foreknowledge* (Kaufmann 2005b).

Definition 4 (*Lack of Foreknowledge*). *An accessibility relation R lacks foreknowledge if and only if iRj and j ≈ k jointly imply iRk.*

Intuitively, if some index can be reached through an accessibility that lacks foreknowledge, so can all of its historical alternatives (this guarantees that objective uncertainty always implies subjective uncertainty; see also Kaufmann et al. 2006). Another important constraint on accessibility (especially on '~') is *historicity*.

Definition 5 (*Historicity*). *An accessibility relation R is historical if and only if iRj and i ≈ k jointly imply kRj.*

An accessibility that satisfies historicity is 'factual' in that the set of worlds accessible through it at a given time is constant across historical alternatives (Kaufmann 2005b). This implies that a speaker's epistemic state is subject to historical necessity: what one's evidence says must be objectively fixed just like facts, not subject to objective uncertainty.

A *modal base* at i is defined as a set of indices that are accessible from i through a certain modal accessibility relation. Metaphysical and epistemic modal bases at i are notated as '$MB^{\approx}(i)$' and '$MB^{\sim}(i)$', respectively.[14]

Definition 6 (*Modal Bases*). *$MB^{R}(i)$ is a modal base at i gained from an accessibility R such that $MB^{R}(i) = \{j \mid iRj\}$.*

Conditional sentences are often interpreted in terms of universal quantification over indices whose domain is restricted by the antecedent: a conditional form '*if ϕ, then ψ*' is true at an index i if and only if at *all* the indices that are accessible from i and in which ϕ is true, ψ is also true. Whether and how conditionals come to express universal quantification is still controversial. The standard view in linguistics is Kratzer's proposal that an *if*-clause restricts an overt modal in the consequent but a covert necessity modal '□' is inserted when no modal is present (Kratzer 1986, 1991). I will use her analysis as

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[12]A relation R is *serial* iff for any x there is y such that xRy; *euclidian* iff for any x, y, z, if xRy and xRz, then yRz.

[13]This means that the restriction of '~' to the set $\{j \mid i \sim j\}$ is an equivalence class. Transitivity is trivial because it is a property of '~' and preserved under restriction. Reflexivity and symmetry follow from the euclidity of '~'.

[14]Note that this diverges from Kratzer's use of 'modal base' for conversational backgrounds, i.e. functions from worlds to sets of propositions (Kratzer 1977, 1981, 1991, 2012).

a practical tool to compare with previous philosophical works, but throughout I take a neutral stance on the validity of her assumption.[15]

3.2 Past-as-Past approach to CFs

It is a cross-linguistic fact that many languages mark counterfactuality by using additional layer(s) of past or perfect morphology, which are often called *fake past* (Iatridou 2000). By and large, previous works on fake past can be classified into the *Past-as-Modal* approach (Iatridou 2000; Schulz 2014; Mackay 2015, 2019; a.o.) and the *Past-as-Past* approach (Ippolito 2006, 2013; Khoo 2015; a.o.). The two approaches share the same underlying idea that fake past serves to reach worlds that aren't currently metaphysical or epistemic alternatives, but they differ as to what meaning they attribute to it. Past-as-Modal, giving up the original temporal meaning of past, resorts to a somewhat abstract notion of 'remoteness' and applies it directly to the modal domain. Past-as-Past on the other hand attempts to reach counterfactual worlds by somehow preserving the temporal meaning of past morphology. A thorough examination of the two approaches is beyond the reach of the present study (but see Mizuno and Kaufmann 2019 for recent review). Here I simply adopt Past-as-Past because of its straightforward compatibility with $T \times W$-frames. I am open to any possibility of adopting Past-as-Modal to explain all the empirical facts that will be laid out in this paper.

As its name suggests, Past-as-Past assumes that the use of past in CFs preserves the same temporal meaning at its core, that is, its ability to shift a certain time into the past. Crucially, however, what fake past shifts is not the reference time of any proposition, but rather a *perspective* from which the conditional claim is evaluated. The idea itself finds a precursor in the philosophical literature on conditionals. It has been assumed that CFs are conditionals that 'held in the past', and should be distinguished from conditionals that are 'about the past' (Adams 1970, 1975; Thomason and Gupta 1981; Dudman 1984, 1988; Edgington 1995; a.o.). According to this view, (5c) is best analyzed as a past analogue of (5a), and is assumed to have a distinctive meaning from (5b).

(5)   a.   If Mary comes, she will attend the meeting.
      b.   If Mary came, she attended the meeting.
      c.   If Mary had come, she would have attended the meeting.

As Kaufmann (2001, 2005a,b) highlights, the two indicative conditionals (5a) and (5b) are most typically associated with so-called *predictive* and *epistemic* readings respec-

tively.[16,17] The two readings differ in terms of the 'flavor of uncertainty' they represent. Predictive readings are concerned with *objective uncertainty*, since they make claims about the events that are yet to be manifested, whereas epistemic readings are concerned with *subjective uncertainty*, since they presuppose that the antecedent events are already manifested but the speaker does not know in which way the results have turned out. In the above case, (5a) typically assumes that whether Mary comes is not yet settled, whereas (5b) typically assumes that it already is. The underlying similarity between predictive conditionals and CFs may strike one as surprising given the traditional indicative/subjunctive bifurcation. However, viewing CFs as some sort of future predictions is by no means an unreasonable association. The idea is that the antecedent of a CF makes reference to a set of the 'alternative courses of events' that could have obtained but have eventually departed from the actual history. According to this view, the past tense on CFs rewinds the history to a time prior to the point of departure (or 'the time of fork' in Bennett's (2003) terms), and from there one calculates how things would have gone in another possible future. CFs are thus in a sense predictive conditionals in the scope of a past or perfect operator (see also Adams 1975; Thomason and Gupta 1981; Dudman 1984, 1988; Edgington 1995; a.o.).

In $T \times W$-frames, Past-as-Past capitalizes on the fact that the set of historical alternatives in the past is always a superset of what it will be in the future. Under the current Kratzerian assumption, I assume that fake past operates on the evaluation time of the modal restricted by the antecedent. Shifting the evaluation time into the past amounts to domain-widening, which helps reach worlds that *were* historical alternatives to the actual world. This operation is often called *temporal backshift*, and is the main feature of the recent Past-as-Past analysis (Condoravdi 2002; Ippolito 2006, 2013).

In order to capture the predictive nature of CFs, I assume the forward-extension of modal base (Kaufmann 2005b). Kaufmann introduced this notion to explain the future-lookingness of predictive conditionals, and attributed such property to the lexical meaning of '*if*'. Forward-extension is defined as an operation on accessibility relations.

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[16]As Kaufmann (2005b) argues, it is incorrect to assume that the forms of indicative conditionals categorically determine their interpretations. For instance, in (i), as the context signals, whether he submits his paper to a journal is assumed to be settled, but the speaker is blind to the truth. In (ii), despite the past tense in the consequent, it is most natural to assume that the interview will be held in the future, and it is still objectively uncertain how it will go (and because whether I smile depends on the result of the interview, the antecedent is objectively uncertain as well).

(i) *[We'll check what was decided about these manuscripts at yesterday's meeting]*
    If he submits his paper to a journal, we won't include it in our book. (Kaufmann 2005b: 4a)

(ii) If I smile when I get out, the interview went well. (Kaufmann 2005b: 53)

[17]This statement is actually simplifying the picture. The distinctions of predictive/non-predictive and epistemic/non-epistemic are orthogonal to each other, though there exists a tendency that non-predictive conditionals receive epistemic interpretations. See Kaufmann (2005b) for further discussion.
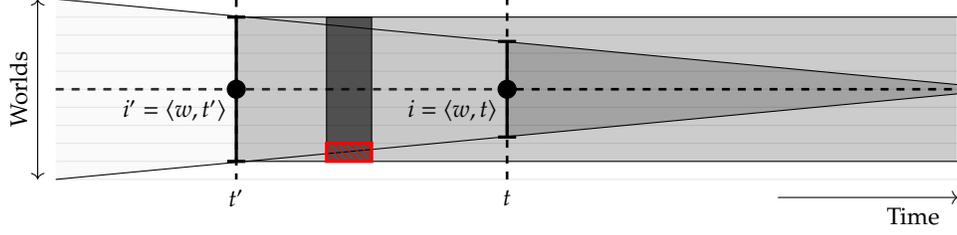
Figure 2: Forward extension of the modal base $MB^{\approx}(i')$. Contextual temporal restriction confines the quantification domain to the contextually most relevant area (the darkest zone). In evaluating CFs, the domain is further restricted by the antecedent (the dashed red rectangle).

Definition 7 (***Forward Extension of*** R). *For any accessibility relation R, R* is the* forward-extension *of R such that iR^*j if and only if for some k, iRk and $k \leq j$.*

The idea is that one can access indices 'diagonally' from the evaluation index i, covering both cotemporal and subsequent moments at all worlds accessible from i via R. For instance, if i can access k via R, R^* allows i to access any j that is on the future trajectory of k. Pictorially, forward-extension slides the modal base of i horizontally into the future, and as a result creates an area that looks like a rectangle. The rectangular domain constitutes the forward-extended modal base of i, which is the quantification domain for predictive conditionals. Forward-extension thus defined captures the intuition behind predictive conditionals: even if the truth value of the antecedent is not settled at the utterance time, forward-extension helps reach the future indices at which it is already settled, and shift the perspective of the speaker to those future points. In CFs, forward-extension applies to the backshifted (and thus expanded) modal base.

Importantly, which future indices are taken into account in the extended modal base is contextually restricted. For instance in (5a), the time of Mary's coming may be sometime tomorrow, on her next working day, a month later, etc. To capture this Kaufmann (2005b) added a free variable in his truth conditions that limits the extended modal base to a contextually relevant and appropriate domain. I will not make it explicit in my own formulation of truth conditions, but assume throughout that the same contextual restriction is implicitly at work.

The truth conditions of (5c) under the current $T \times W$-frame are given in (6). Roughly speaking, a CF is true precisely when at any point in the (contextually restricted) extended modal base at which the antecedent is true, the consequent is also true (see also Figure 2).

(6)   (5c) is true at i if and only if there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap$
        $[\![$'*Mary come*'$]\!])$, $k \in [\![$'*Mary attend the meeting*'$]\!]$.

Note that (6) is fairly simplified as the truth conditions of (5c), mainly for the sake of

argument and brevity. There are three implicit assumptions that need clarifying. Firstly, I ignore the granularity of the different layers of past/perfect in English CFs. Ippolito (2006, 2013) distinguished the so-called Simple Past (SP) subjunctives (e.g. *'If Mary came, she would attend the meeting'*) and Past Perfect (PP) subjunctives (e.g. (5c)) in terms of the number of fake past involved, and assigned different semantic roles to the past tense in *would* (i.e. woll + past) and the perfect *have*. While the distinction between the two subjunctives is linguistically significant, how it figures in other languages is still debatable (see Mizuno and Kaufmann 2019).[18] I assume for simplicity that (6) represents the truth conditions of a PP subjunctive in English, and that it is the perfect *have* in the consequent that forces the temporal backshift.

Secondly, the antecedent and consequent in (5c) are represented as tenseless forms in (6), which are interpreted as propositions. The lack of tense in the latter comes from the standard assumption that there is no tense in the scope of the modal (Crouch 1993, Enç 1996, Condoravdi 2002). The lack of tense in the former may seem in conflict with predictive conditionals, in which a tense morpheme appears on the verb in the antecedent. In English, such tense in indicative predictive conditionals can induce temporal shifts from the evaluation point, as evidenced by the 'past-in-the-future' reading as in *'if the interview went well, I will come out smiling'* (Kaufmann 2005b). I assume that tense in CF antecedents is ignorable at least in the examples we will consider, because we will not deal with cases in which the interpretation of CFs is affected by temporal shift in the antecedents.[19]

Finally, it is a common assumption that the evaluation of CFs is subject to similarity ordering of worlds or causal dependence (Goodman 1947; Stalnaker 1968; Lewis 1973; Pearl 2000; a.o.). I simply assume that the domain of quantification is confined to those indices at which all the relevant causal laws hold. I omit this restriction for simplicity and for the sake of space, but it will be implicit in all the forthcoming truth conditions.

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[18]In particular, as we will see later, Japanese has only one layer of fake past that uniquely forces the English PP subjunctive meaning, and encodes the SP subjunctive counterpart by using a different strategy. We will discuss this in Section 4.1.

[19]One may also wonder if we need to implement a forward-shifting of the consequent. (6) may seem to gloss over the temporal gap between the antecedent and consequent, since it is normal to think that Mary's attending the meeting would have taken place *later than* her coming to the office, rather than simultaneously. As will also be discussed in the next section, I will assume that tenseless sentences may obtain implicit temporal restriction to future times in interaction with the lexical aspects of verbs or pragmatic factors. One may rather want to argue that forward-shifting is semantically hard-wired, possibly in the lexical meaning of *'would'*, but there are so-called 'backtracking CFs' (Lewis 1979; Kaufmann 2013; Khoo 2017; a.o.), such as *'if the match had not lit, it would (still) have been struck'*, in which the consequent event is supposed to take place prior to the antecedent time. I leave open what solution best captures the putative forward-shifting, but our assumption should suffice for the purposes of this study.

3.3 From Condoravdi to *might*-CFs

Now recall the three logical forms we started with, namely '$\phi\diamond\rightarrow\psi$' (One-Modal), '$\diamond(\phi\square\rightarrow\psi)$' (Wide-Scope), and '$\phi\square\rightarrow\diamond\psi$' (Narrow-Scope). We will construct their linguistic analogues by first establishing the semantics of the matrix *'might have'*, which figures in the consequent of their natural language counterpart. For this we exploit Condoravdi's (2002) argument.

Condoravdi argues that there is a robust correlation between the temporal reference of the modals and the kind of modality they express, and it is conceptually governed by the asymmetry of fixed past and open future, the underlying assumption of $T \times W$-frames. She observes that English *'might have'* is ambiguous between the *epistemic* reading and the *metaphysical* reading. While the former represents the speaker's current epistemic uncertainty about a past event which is presumed already settled, the latter represents metaphysical uncertainty about the future from a past perspective. Condoravdi attributes the ambiguity of *might have* to the differing scopal relations between the modal *might* and the perfect *have* as shown in (7). The two LFs in (7) each roughly translate into (8a) and (8b) (the present tense taking the widest scope is assumed to provide the utterance time index).[20] Thus, in the matrix clause, the interpretation of *might* is predictably constrained with regard to its scope relation to *have*. I refer to the LFs in (7a) and (7b) as *'might>have'* and *'have>might'*, respectively.

(7)   John *might have* won.

    a.   Pres [*might* [*have* [John win]]] → *Epistemic Reading*

    b.   Pres [*have* [*might* [John win]]] → *Metaphysical Reading*

(8)   a.   (7a) is true at i iff there is $j \in MB^{\sim}(i)$ such that for some $k < j$, $k \in [\![$*'John win'*$]\!]$.

    b.   (7b) is true at i iff there is $j < i$ such that for some $k \in MB^{\approx}(j)$, $k \in [\![$*'John win'*$]\!]$.

Two things must be noted before we move on. Firstly, the truth conditions here do not make explicit the forward-shifting of tenseless sentences (see also footnote 19). This is particularly relevant in (8b), since the metaphysical reading construes John's winning as a future event from the viewpoint of the past, one whose results were yet to be manifested then. As I do not assume that *might* lexically enforces forward-shifting just as Condoravdi does, a similar effect must be brought from somewhere. For this, I assume that tenseless sentences can obtain implicit temporal restriction to future times,

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[20]We need to distinguish 'logical forms' mainly used in the philosophical literature and 'LFs' used by linguists as different representational entities. With the former I refer to Lewis's '$\phi\square\rightarrow\psi$' for instance, whereas with the latter I refer to the linguistic structures like (7a,b). Logical forms are meta-linguistic expressions that function as intermediate translations from sentence forms to model-theoretic objects, whereas LFs are in the realm of object languages, which are subject to syntactic constraints and are usually mapped directly to model-theoretic correlates.

in interaction with the lexical aspects of verbs or contextual factors. I admit that this is sloppy as a treatment, and to make the semantics more precise we would need to consider eventualities as in Condoravdi's original account, but I go for simplifying the truth conditions at the expense of some extent of formal precision.

Secondly, (7b) can also produce the so-called *past epistemic* reading (von Fintel and Gillies 2008), which Condoravdi didn't discuss but is reported to exist as a reading in a limited range of contexts. I defer a detailed discussion to Section 5.2. Until then I confine my attention to the metaphysical interpretation.

Now in bridging Condoravdi's account to *might*-CFs, we rely on three theoretical assumptions. The first is that *if*-clauses function as restrictors of modals, the assumption that is standardly embraced in the linguistic literature. The second is that CFs must come with a backshift of the main modal of the conditional. As mentioned above, the backshift is achieved by letting the past/perfect scope over the modal which is restricted by an *if*-clause. The third is that the scope relation between *might* and *have* in the matrix clause and the resultant flavor of *might* should be preserved in the corresponding *might*-CF. This is important so as to export Condoravdi's insights into *might*-CFs. Thus, if *might* gets an epistemic interpretation because it scopes over *have*, that should carry over even after the addition of an *if*-clause.

With these assumptions in place, let us first consider '*have>might*', the LF in (7b). Under the restrictor view of conditionals, directly restricting the *might* in this LF by an *if*-clause creates a conditional form. This represents a CF, since *have* imposes a backshift on the *if*-restricted modal. (9) can be considered an analogue of the One-Modal logical form (note, as mentioned above, that I omit the causal restriction or similarity ordering between worlds in the truth conditions for simplicity's sake). Here *might* is assumed to preserve the metaphysical interpretation in *have>might*.

(9) **One-Modal LF and Truth Conditions**:

a.   Pres [*have* [*might*$_{if\phi}$ [ψ]]]

b.   (9a) is true at i iff there is $j < i$ such that for some $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, $k \in [\![\psi]\!]$.

Consider then '*might>have*' in (7a). Here merely having an *if*-clause restrict *might* does not lead to an LF of a CF, since *might* scopes over *have* (recall our second assumption above). To make a CF out of it, one can insert a covert necessity modal similar to *would* immediately below the perfect and make it restricted by an *if*-clause instead. Then *might* becomes an epistemic possibility modal scoping over a *would*-CF. (10) is thus an analogue of the Wide-Scope logical form.

(10)   **Wide-Scope LF and Truth Conditions**:

    a.   Pres [*might* [*have* [**would**$_{if\phi}$ [ψ]]]]

    b.   (10a) is true at i iff there is $j \in MB^{\sim}(i)$ such that there is $k < j$ such that for all $l \in (MB^{\approx^*}(k) \cap [\![\phi]\!])$, $l \in [\![\psi]\!]$.

Finally, the linguistic analogue of Narrow-Scope builds on '*have>might*'. One can insert a covert *would* immediately below *have* and make it restricted by an *if*-clause, as in (11a). But I assume that the interpretation of Narrow-Scope LF is subject to an additional constraint. Unlike the previous two, this LF contains a modal that is in the scope of another one that is restricted by the antecedent. I assume that the restriction to the antecedent worlds in the higher modal is inherited by the lower one; otherwise the quantification domain would not be properly 'closed', allowing the worlds in the lower modal base to access non-antecedent worlds.[21] The truth conditions of Narrow-Scope LF are thus as in (11b), in which the modal base for *might* is intersected with the antecedent proposition. Here again, *might* is assumed to obtain metaphysical interpretation.

(11)   **Narrow-Scope LF and Truth Conditions**:

    a.   Pres [*have* [**would**$_{if\phi}$ [*might* [ψ]]]]

    b.   (11a) is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, there is $l \in (MB^{\approx}(k) \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.

    We have constructed three possible linguistic structures for *might*-CFs.[22] Notice that they all preserve the structural characteristics and the salient construals of *might* in each logical form we saw in Section 2. The next step is to investigate which ones give us the desired truth conditions.

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[21]The discussion here can be paralleled with Gillies's (2010) idea that conditionals are 'shifty', i.e. *if*-clauses shift both the index at which the consequent is evaluated and the context at which it is evaluated. See also Kaufmann and Kaufmann (2015) for detailed discussion of Gillies's account.

[22]It should be noted that (9)-(11) do not exhaust all the possible linguistic structures. For instance, the following LF may also be derived from '*have>might*'.

   (i) Pres [*have* [*might* [**would**$_{if\phi}$ [ψ]]]]

What (i) would convey is roughly that it was metaphysically possible for the predictive conditional '*if* ϕ, *then* ψ' to hold. One could argue that (i) qualifies as one of the LFs for *might*-CFs because the conditional modal is (indirectly) backshifted by the perfect *have*. While I admit that this structure is one of the logical possibilities that can be derived from the current theoretical assumptions, I suspect that it is not necessarily a salient one as an actual structure of *might*-CFs, given its idiosyncratic backshift and the fact that no previous work has ever suggested the targeted reading. Proving or disproving of the existence of (i) in natural language must be done somewhere, but here I focus on (9)-(11) as the most plausible candidates.

3.4 Possible positions and issues to be settled

Most philosophers seem to have assumed that we need just one structure for *might*-CFs. While it is simple as a theory, the question accompanying this line of thought is how a single structure can capture the variable interpretations. Stalnaker (1981), who upheld Wide-Scope exclusively, addressed this question by drawing on the general flavor variation of *might* in non-conditional environments, which he argued varies between epistemic and non-epistemic interpretations.[23] However, the range of meaning that such an account can cover is still limited. For instance, as Bennett (2003, p.191) points out, the Wide-Scope analysis faces a challenge when it deals with cases that involve an indeterministic chance process. Take (3) for instance, which is repeated in (12). Our intuition is that the sentence is unquestionably true.

(12)   If I had tossed this fair coin, it might have landed heads.

Whether *might* is interpreted epistemically or non-epistemically, Wide-Scope would predict that the sentence is false, because in no worlds is it the case that if I had tossed this fair coin, it *would* have landed heads, since the coin is fair. The failure to capture the truthfulness of (12) is rather an issue inherent to the structural characteristic of Wide-Scope.[24]

Note that a similar difficulty may arise for those who advocate One-Modal or Narrow-Scope LF as a unique structure. Although they may make a correct prediction for (12), it is not clear whether the two LFs can account for *might*-CFs conveying the speaker's current epistemic uncertainty similarly by assuming that *might* itself is interpretively variable. For instance, how can *might* represent uncertainty at the utterance time while its accessibility time is backshifted into the past? This question likewise applies to Lewis (1979, 1986), who endorses the ambiguity between One-Modal and Narrow-Scope (in his terms *'not-would-not'* and *'would-be-possible'* readings respectively). Lewis himself acknowledged the existence of the Wide-Scope construal, for which he had received criticism from Stalnaker (1981) on his earlier work (Lewis 1973), but he left it aside from his own logical pursuit. The point, however, is that as far as natural language is concerned, having only One-Modal and/or Narrow-Scope LF (and similarly only Wide-Scope LF) could come with a risk of losing empirical coverage.

It thus seems more plausible to assume that *might*-CFs can inherently have multiple structures, at least the Wide-Scope one and one or both of the other two. But how

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[23]Stalnaker called the non-epistemic one a 'quasi-epistemic' construal, a close kin to a metaphysical interpretation which represents a possibility relative to an idealized state of knowledge.

[24]Of course, Stalnaker himself may wiggle out of this potential problem with his supervaluation-based treatment (van Fraassen 1966). I leave it as an open question, since it is not easy to compare analyses couched in different frameworks. However, as far as our own Wide-Scope LF and truth conditions are concerned, the criticism seems to make a point.

plausible is it? Note that this view remains stipulative as long as we only deal with English, since the putative scope relations cannot be directly observed from the surface form. This is the first issue that we will address in the next section. We will see that Japanese, which represents the scope differences transparently, offers an effective testing ground.

Independently, we need to examine what conclusion will be drawn regarding One-Modal and Narrow-Scope. Actually, given the truth conditions above, the Narrow-Scope construal asymmetrically entails the One-Modal one. I refer the reader to the Appendix for the formal proofs. Thus, to decide between the two construals, we have to find a case where One-Modal predicts a sentence to be true, whereas Narrow Scope predicts it to be false. One-Modal will have to be adopted or rejected depending on whether native speakers judge the sentence to be true or false, respectively. However, it is empirically not easy to tease them apart, as they cover a very close range of interpretation. Resolving this hinges on whether we can find concrete contexts in which the two truth conditions make different predictions. We will tackle this as our second issue in the next section.

4 Analysis

I will first introduce the grammatical basics of Japanese conditional sentences. I refer the reader to Mizuno and Kaufmann (2019) for a more detailed review of Japanese conditionals and a Past-as-Past approach to Japanese CFs.[25] We will then construct Japanese *might*-CFs and establish the correspondences between them and the three LFs we built above. The two issues introduced in the previous section will then be addressed in order.

4.1 Japanese conditionals

Simple Japanese sentences consist of tensed 'sentence radicals', with optional aspectual morphology and/or negation intervening between the radical and the tense. Sentence radicals are saturated verb phrases with all their required arguments, but without any aspectually or temporally significant morphology (they correspond to tenseless sentences we saw in the LFs of English '*might have*').[26] The Japanese tense system encodes either present or past. An aspectual morpheme '*-tei*' optionally appears between the

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[25]See also Ogihara (2014) for recent Past-as-Modal approach to Japanese CFs.

[26]The term 'sentence radicals' originates in Stenius (1967), but Stenius used this term slightly differently. For him, sentence radicals are what results from stripping sentences of sentential moods, meaning that temporal information could still be included. My use of sentence radicals here is more in line with what Kaufmann (2005b) intends them to be, namely as saturated but tenseless and non-modalized event descriptions.

sentence radical and the tense, but for simplicity I will limit attention to those not involving it (see Kaufmann and Kaufmann 2017; Kaufmann to appear for recent formal semantic work on this aspectual marker).

Japanese has a relatively rich variety of conditional connectives (Masuoka 1993; Arita 2007, 2009; a.o.). We confine our discussion here to '*-ba*', both for reasons of space and because *-ba* lacks some of the intricacies that complicate the patterns with other connectives (see the works cited above for a detailed description of the entire inventory). (13) is the schema for the surface conditional sentential structure with *-ba*. Importantly, the complement of *-ba* must be a sentence radical, optionally with the aspectual morpheme *-tei*, but without tense. Furthermore, as Mizuno and Kaufmann (2019) highlighted, the lack of *-tei* in the non-stative antecedent signals that the conditional is future-oriented (i.e. either a predictive indicative or a CF). I will also confine attention to those not involving *-tei* in the antecedent clause.

(13)   [Rad_A] *-ba*, [Rad_C] *-Tense*

Note also that conditionals about the future in Japanese lack modal auxiliaries equivalent to '*will*' or '*would*' in English. Following Kratzer (1986, 1991), I assume that a covert necessity modal is inserted whose domain is restricted by the *-ba* clause.

As the tense is the only variable factor, the schema in (13) produces two conditional forms. The one with the present tense (14) translates as either (i) the English predictive indicative '*if V_1, will V_2*' or (ii) the SP subjunctive '*if V_1-ed, would V_2*'. In contrast, (15) corresponds to the English PP subjunctive '*if had V_1-ed, would have V_2-ed*'. In other words, from the English perspective, (14) is underspecified between indicative and SP subjunctive. Which meaning it represents can only be determined contextually.

(14)   [*Mary-ga asita   ku*]*-reba,   [kaigi-ni   de*]*-ru.*
        Mary-NOM tomorrow come-COND meeting-at attend-PRES
        (i) 'If Mary *comes* tomorrow, she *will* attend the meeting.' or
        (ii) 'If Mary *came* tomorrow, she *would* attend the meeting.'

(15)   [*Mary-ga asita   ku*]*-reba,   [kaigi-ni   de*]*-ta.*
        Mary-NOM tomorrow come-COND meeting-at attend-PAST
        'If Mary *had come* tomorrow, she *would have* attended the meeting.'

Note that the contrast in (14) and (15) indicates that the fake past in Japanese CFs always signals 'strong counterfactuality' in the same sense in which Ippolito (2013) analyzed English PP subjunctives. According to Ippolito, English SP subjunctives require that the antecedent's presuppositions be compatible with what is currently possible, whereas PP subjunctives require that the presuppositions be compatible with what was possible at a past time. As shown in (16) and (17), the present tense/past tense difference in Japanese

reflects the presuppositional difference found between SP/PP subjunctives in English: as shown in (16), the existence presupposition for the subject noun phrase triggered by the verb 'come' in the antecedent does not have to be satisfied at the utterance time in English PP subjunctives and Japanese conditionals about the future with the past tense, but has to be in English SP subjunctives and Japanese conditionals about the future with the present tense.

(16)   Context: Mary died yesterday.

Mary-ga   asita   kur-eba,   kaigi-ni   de-{#ru/ta}.
Mary-NOM tomorrow come-COND meeting-at attend-{PRES/PAST}
(#'If Mary came tomorrow, she would attend the meeting.')
'If Mary had come tomorrow, she would have attended the meeting.'

Conversely, when the presupposition is satisfied at the utterance time (and Mary's coming is not yet ruled out categorically for independent reasons), the felicity is reversed.

(17)   Context: Mary's not likely to come to the office tomorrow

Mary-ga   asita   kur-eba,   kaigi-ni   de-{ru/#ta}.
Mary-NOM tomorrow come-COND meeting-at attend-{PRES/PAST}
'If Mary came tomorrow, she would attend the meeting.'
(#'If Mary had come tomorrow, she would have attended the meeting.')

Based on these facts, Mizuno and Kaufmann (2019) proposed that the past tense in (16) takes a structural position outside the entire conditional, as shown in the schema in (18).

(18) $\left[\left[Rad_A \right] \text{-}ba \left[Rad_C \right] \right] Past$

The wide-scoping of the past tense leads to a temporal backshift which, under the Past-as-Past analysis, shifts the accessibility time of the covert modal back to a time at which antecedent-worlds were accessible. Such backshift effected by the past tense yields a reading corresponding to the English PP subjunctive.

4.2 Japanese *might*-CFs

While English is analyzed to show the scopal interaction between *might* and *have* at a covert level, Japanese encodes the relevant difference by overt scope alignment. Throughout I will stick to '*kamosirena-*', a possibility modal in Japanese which, like English *might*, can express both epistemic and metaphysical modality. As shown in (19), *kamosirena-* takes a tensed clause as its prejacent (i.e. the sentence in the immediate scope of a modal), but also is tensed itself. I call the tense on the prejacent the **lower tense (or Tense1)**, and the tense on the modal the **higher tense (or Tense2)**. Since the Japanese

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tense system encodes either present or past, there are logically four possible combinations: (i) Pres1-Modal-Pres2, (ii) Past1-Modal-Pres2, (iii) Pres1-Modal-Past2 and (iv) Past1-Modal-Past2.

(19)   [[*John-ga   kat-*{***u/ta***}]   *kamoshirena-*{***i/katta***}].
John-NOM win-{PRES/PAST} might-{PRES/PAST}

   (i)   Pres1-Modal-Pres2: 'It is possible (now) that John will win.'
   (ii)   Past1-Modal-Pres2: 'It is possible (now) that John won.'
   (iii)   Pres1-Modal-Past2: 'It was possible (then) that John would win.'
   (iv)   Past1-Modal-Past2: 'It was possible (then) that John had won.'

The translations indicate that the higher tense and the lower tense make distinct contributions. The higher tense controls the accessibility time of the modal: the accessibility time of *kamosirena-* in (i) and (ii) is co-temporal to the utterance time but that in (iii) and (iv) lies in some past time, respectively because of the higher present and past tenses. Differently put, the higher tense determines which temporal viewpoint the speaker takes. In contrast, the lower tense determines the event time of the prejacent relative to the accessibility time: in (i), the event time of *kat-* ('win') lies in the future of the utterance time (because of the eventive property of this verb); in (ii), the past of the utterance time; in (iii), the future of some past time; in (iv), the past of some past time.

   Here the focus is on (19ii) and (19iii). We first confirm the semantic correspondence between them and the two scope relations of English *might have*, and then establish the mapping between the forms of Japanese *might*-CFs and the truth conditions for *might*-CFs we constructed in the previous section.

   Given their interpretations, (19ii) and (19iii) can be considered the overt realizations of '*might>have*' and '*have>might*' respectively, which we saw in Section 3.3. As shown in (20), when the difference in headedness is taken into account, the scopal order of the semantic exponents in (19ii) and *might>have* matches exactly. Here Past1 in Japanese and *have* in English are equivalent in function in that they both shift the event time of 'John win' into the past. Furthermore, in both languages, the accessibility time of the modal is determined by the present tense residing on the top, which merely provides the utterance time index. I thus assume that (20a) and (20b) are interpreted as having (20c) as their truth conditions.

(20)   a.   Pres [*might* [*have* [John win]]]   (English LF: (7a))
   b.   [[[John win] *Past1*] *might*] *Pres2*   (Japanese Surface Form: (19ii))
   c.   (20a)/(20b) is true at i iff there is $j \in MB^{\sim}(i)$ such that for some $k < j$, $k \in [\![\,'John\ win'\,]\!]$.

(19iii) and '*have>might*' do not show an exact match between ingredients, but I assume

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that the differences are negligible. I assume that the utterance time index will be in any case provided in (21b) to evaluate the sentence. Pres1 in Japanese restricts the event time of John's winning to the points cotemporal to, or in the future of, the accessibility time. This is lacking in English, but I assume as above that implicit temporal restriction enables a similar effect (see Section 3.3 for the discussion). Generalizing to the English case, I assume that (21a) and (21b) are interpreted as having (21c) as their truth conditions. Note that the flavor of *might* here is metaphysically construed. Like in English, (19iii) can also convey the past epistemic reading (see Section 3.3 and Section 5.2), but I confine attention to the metaphysical one.

(21) a. Pres [*have* [*might* [John win]]] (English LF: (7b))
      b. [[[John win] *Pres1*] *might*] *Past2* (Japanese Surface Form: (19iii))
      c. (21a)/(21b) is true at i iff there is $j < i$ such that for some $k \in MB^{\approx}(j)$, $k \in [\![\,'John\ win'\,]\!]$.

With these points in mind, we now construct Japanese *might*-CFs. We can create CF constructions by simply adding a '*-ba*'-clause to (19ii) and (19iii) (recall the discussion in Section 4.1). They lead to the *might*-CFs in (22a) and (22b) respectively.

(22) a. [*Mary-ga ouen-ni kur*]-*eba*, [*John-ga kat*]-***ta*** *kamosirena-**i***.
          Mary-NOM cheer-for come-COND John-NOM win-PAST might-PRES
          'If Mary had come to cheer him on, John might have won.'
      b. [*Mary-ga ouen-ni kur*]-*eba*, [*John-ga kat*]-***u*** *kamosirenakat-**ta***.
          Mary-NOM cheer-for come-COND John-NOM win-PRES might-PAST
          'If Mary had come to cheer him on, John might have won.'

What meaning does each form represent? Recall that the Wide-Scope LF for *might*-CFs was created out of the LF of '*might>have*'. Given that the Japanese (19ii) is an equivalent of '*might>have*', we predict that (22a) uniquely represents the Wide-Scope construal. That is, our prediction is that (22a) has (23) as its truth conditions.

(23) (22a) is true at i if and only if there is $j \in MB^{\sim}(i)$ such that there is $k < j$ such that for all $l \in (MB^{\approx^*}(k) \cap [\![\,'Mary\ come\ to\ cheer\ John\ on'\,]\!])$, $l \in [\![\,'John\ win'\,]\!]$.

Recall likewise that the One-Modal and Narrow-Scope LFs were created out of the '*have>might*' LF. Similarly, given that the Japanese (19iii) is an equivalent of '*have>might*', we predict that (22b) represents the One-Modal or Narrow-Scope construal. Our prediction is that (22b) has one of (24) and (25) as its truth conditions. Here the possibility modal is assumed to obtain a metaphysical interpretation.

(24)   (22b) is true at i if and only if there is $j < i$ such that for some $k \in (MB^{\approx^*}(j) \cap$ $[\![$'*Mary come to cheer John on*'$]\!]$), $k \in [\![$'*John win*'$]\!]$.

(25)   (22b) is true at i if and only if there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap$ $[\![$'*Mary come to cheer John on*'$]\!]$), there is $l \in (MB^{\approx}(k) \cap [\![$'*M come to cheer J on*'$]\!]$) such that $l \in [\![$'*John win*'$]\!]$.

To sum up the discussion, the following are the generalized predictions of the form-meaning mapping in Japanese *might*-CFs.

(26)   a.   [Rad_A] -*ba*, [Rad_C] -*ta kamosirena-i*

        b.   (26a) is true at i iff there is $j \in MB^{\sim}(i)$ such that there is $k < j$ such that for all $l \in (MB^{\approx^*}(k) \cap [\![Rad_A]\!])$, $l \in [\![Rad_C]\!]$.   (**Wide-Scope**)

(27)   a.   [Rad_A] -*ba*, [Rad_C] -*(r)u kamosirenakat-ta*

        b.   (27a) is true at i iff there is $j < i$ such that for some $k \in (MB^{\approx^*}(j) \cap [\![Rad_A]\!])$, $k \in [\![Rad_C]\!]$.   (**One-Modal**)

        c.   (27a) is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap [\![Rad_A]\!])$, there is $l \in (MB^{\approx}(k) \cap [\![Rad_A]\!])$ such that $l \in [\![Rad_C]\!]$.   (**Narrow-Scope**)

   With these assumptions in place, the next section will turn to the difference between Wide-Scope on the one hand and One-Modal and Narrow-Scope on the other. For the sake of argument, I call the latter two 'Non-Wide-Scope' collectively and ignore their truth-conditional difference for the moment.

4.3   Settling the first issue: structural difference feeds interpretive difference

Mapping Japanese *might*-CFs onto LFs that match their overt tense morphology (as in (26) and (27)) predicts that Japanese disambiguates overtly between Wide- and Non-Wide-Scope construals. In the following, I will show that this is indeed borne out.

   First, we consider a situation in which the Wide-Scope construal is true, but the Non-Wide-Scope construal is false. Recall the truth conditions: '*if ϕ, might have ψ*' is true with respect to Wide-Scope precisely when it is epistemically possible that there was a time in the past at which all the ϕ-indices in the extended modal base were ψ-indices; true with respect to Non-Wide-Scope only when there was a time in the past at which it was metaphysically possible that ϕ and ψ were both true. Our prediction is that the Non-Wide-Scope construal is judged false if it is conceivable that no 'ϕ ∧ ψ'-possibilities metaphysically existed at all. Or, differently put, the Non-Wide-Scope construal is only available if the possibility of the corresponding '*would-not*-CF' is excluded. We also predict that the Wide-Scope construal can be true in such context, since it does not commit the speaker to the existence of a metaphysical possibility.

With this in mind, consider (28). The context stipulates that the speaker is completely uninformed of the other restaurant that she didn't enter. We predict that the formula resulting from the interpretation of (26a), which represents the Wide-Scope construal, is true in this scenario: because of the sheer lack of information, the *would*-CF *'if I had entered Restaurant B, I would have been able to use Amex'* is compatible with the speaker's epistemic state. We also predict that the formula resulting from the interpretation of (27a), which represents either the One-Modal or Narrow-Scope construal, is false, because the speaker's epistemic state also tolerates the possibility of the *would-not*-CF *'if I had entered Restaurant B, I would not have been able to use Amex'*. The predictions are borne out.

(28)   **Amex**: You are now traveling in Japan. You found two restaurants standing alongside, Restaurant A and Restaurant B, and entered Restaurant A. After you ordered food, you came to wonder if they accept American Express. You asked a staff member, and he told you that they don't. This was disappointing because the only card you have is Amex. While you have no information about Restaurant B, you imagine:

       a.   *B-ni hair-eba,*   *Amex-ga*   *tuka-e-**ta***   *kamosirena-**i**.*
          B-to enter-COND Amex-NOM use-able-PAST might-PRES
          'If I had entered Restaurant B, I might have been able to use Amex.'

       b. ??*B-ni hair-eba,*   *Amex-ga*   *tuka-e-**ru***   *kamosirenakat-**ta**.*
          B-to enter-COND Amex-NOM use-able-PRES might-PAST
          'If I had entered Restaurant B, I might have been able to use Amex.'

(29) is another case in point. Because the inventor Thomas Edison died nearly a century ago and smartphones did not exist back then, the *might*-CFs here are a thought experiment whose answer we will never know. Since we have no clue in the real world, we are open to the possibility that he would have been surprised, and equally that he wouldn't have at all. It is thus predicted for the same reason as above that the sentence is true with respect to Wide-Scope but it isn't with respect to Non-Wide-Scope. The predictions are borne out here as well.

(29)   a.   *Edison-ga*   *iPhone-o*   *mir-eba,*   *hidoku odoroi-**ta***   *kamosirena-**i**.*
          Edison-NOM iPhone-ACC see-COND terribly be.surprised-PAST might-PRES
          'If Edison had seen an iPhone, he might have marveled at it.'

       b. ??*Edison-ga*   *iPhone-o*   *mir-eba,*   *hidoku odorok-**u***
          Edison-NOM iPhone-ACC see-COND terribly be.surprised-PRES
          *kamosirenakat-**ta**.*
          might-PAST
          'If Edison had seen an iPhone, he might have marveled at it.'

We then move on to the the context in which the Wide-Scope construal is false, but the Non-Wide-Scope construal is true. Recall that, as we saw in Section 3.4, the Wide-Scope LF would make a wrong prediction for cases that involve an indeterministic chance process like a coin-toss. That was because it embeds an entire *would*-CF under *might*: there is no such world that if a fair coin had been tossed, it *would* have landed heads. Likewise in our current discussion on Japanese *might*-CFs, if the context excludes the possibility of *would* or *would-not*-CFs in the first place, it is predicted that (26a), the Wide-Scope form, cannot be used.

Now consider (30).[27] The context here stipulates that there be no such world in which *'a student would have passed if he had goofed off'* or *'a student would have failed if he had goofed off'* holds, since pass or fail for goof-offs is determined by a fair coin. As we predict, (30a), the Wide-Scope form, sounds odd, while (30b), the Non-Wide-Scope form, sounds natural.

(30) **Teacher's Coin**: The only requirement of Prof. Yang's course is to attend her lecture every week. But even if a student goofs off, she promises the following salvation: she gathers all the goof-offs in her office in the final week, and flips a fair coin for each of them. If the coin lands heads, the student passes; if the coin lands tails, the student fails. That is, a student may fail with 50% chance if he goofs off. Today we had the last session in the semester. John has already secured himself a passing grade. Several students, however, are supposed to go to Prof. Yang's office tomorrow to experience the coin-toss, because they goofed off. John thinks:

a. ??*Namaker-eba, asita   ochi-**ta** kamosirena-**i**.*
   goof.off-COND tomorrow fail-PAST might-PRES
   'If I had goofed off, I might have failed tomorrow.'
b. *Namaker-eba, asita   ochi-**ru** kamosirenakat-**ta**.*
   goof.off-COND tomorrow fail-PRES might-PAST
   'If I had goofed off, I might have failed tomorrow.'

The data presented here have thus shown that, at least in Japanese, the scope relation between *might* and its surrounding temporal ingredients differentiates the interpretations of *might*-CFs: those with Past1-Modal-Pres2 and Pres1-Modal-Past2 in the consequent respectively represent the Wide-Scope interpretation and the Non-Wide-Scope interpretation. Notice that English *might*-CFs are silent on all the diagnostics, as can be seen from the translations in each example. It thus remains a conjecture that we are actually witnessing an ambiguity of the surface string that results from two different LFs similar to the ones encoded more transparently in Japanese. However, I still

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[27]The context got inspiration from Mandelkern (2018, p.300).

take it that the evidence from Japanese is strong enough to hold that assuming more than one structure for *might*-CFs is justified from both explanatory and cross-linguistic perspectives. We now move on to the examination of One-Modal and Narrow-Scope.

4.4   Settling the second issue: One-Modal vs. Narrow-Scope

Recall that, while One-Modal and Narrow-Scope are both intended to convey metaphysical uncertainty, they correspond to different truth conditions, which I repeat in (31) and (32), respectively.

(31)   One-Modal:
        '*if ϕ, might have ψ*' is true at i iff there is $j < i$ such that for some $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, $k \in [\![\psi]\!]$.

(32)   Narrow-Scope:
        '*if ϕ, might have ψ*' is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, there is $l \in (MB^{\approx}(k) \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.

One-Modal simply existentially quantifies over the (forward-extended) metaphysical modal base. It just requires that there be at least one index where the antecedent and consequent are both true. Narrow-Scope implements point-wise evaluation at each index in the modal base. For every index in the modal base where the antecedent is true, one needs to find at least one co-temporal index which is metaphysically accessible from it and in which the consequent is also true.

   However, One-Modal and Narrow-Scope nevertheless make the same predictions in most cases. Recall our 'fair coin' example.

(33)   If I had tossed this fair coin, it might have landed heads.

In (33), it is assumed that, at the time of the antecedent, the result of the coin-toss is metaphysically uncertain. So there must be both *heads*- and *tails*-indices in the modal base restricted by the antecedent.[28] Hence One-Modal holds. Meanwhile, since '$\approx$' is an equivalence relation, every co-temporal index in the metaphysical modal base can access

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[28]The relevant constraint here is the *Diversity Condition* (Condoravdi 2002, 45), a presupposition regarding the selection of modal bases. Very roughly, the Diversity Condition is satisfied for a sentence ϕ precisely when the relevant modal base involves both ϕ- and $\neg\phi$-indices (see Condoravdi 2002 for its precise definition and original motivation, and Thomas 2014 for recent discussion). Of particular relevance here is the idea that a metaphysical modal base can be chosen for a possibility modal only if the context satisfies the Diversity Condition. In other words, in order for a possibility-modal expression '$\Diamond\phi$' to obtain a metaphysical reading (that is, to represent metaphysical uncertainty), the modal base on which its evaluation is based must be such that $\Box\phi$ (and likewise $\Box\neg\phi$) is false in it. Given that One-Modal and Narrow-Scope both primarily concern the metaphysical *might* under our current assumption, I assume that the Diversity Condition or something more or less equivalent is effective in them too.

each other including itself. Therefore in every index in the modal base, whether it is a *heads-* or *tails*-index, $\Diamond heads$ holds. Hence One-Modal and Narrow-Scope converge.[29]

The question is whether we find any context in which One-Modal and Narrow-Scope diverge, and if we do, which approach makes correct predictions. Here I show that it is possible to make them come apart. I first elaborate on the design and formal background of the context that I use, and then implement the test with actual sentences.

The gist of the context design is as follows. Recall that the Narrow-Scope construal is stronger than the One-Modal construal. For instance, for '*if ϕ, might have ψ*' to be true, the existence of a '$\phi \wedge \psi$'-index in the modal base suffices for One-Modal but not for Narrow-Scope: if some ϕ-index in the same modal base can access $\neg\psi$-indices only, Narrow-Scope predicts that the sentence is false (see also the Appendix). The goal is to achieve such differentiation by creating an appropriate context. For this we elaborate a situation in which the modal base restricted by the antecedent ϕ involves *two distinct classes of historical alternatives*, one that contains at least one index at which the consequent ψ holds, and one that doesn't. This situation makes One-Modal true but Narrow-Scope false, because ψ holds at some index in the domain but $\neg\Diamond\psi$ holds at every index in the latter class of historical alternatives. If native speakers judge the sentence to be false under such context, One-Modal is rejected. If they judge it true, it is adopted.

One concrete context is (34), which involves two distinct kinds of coin.

(34)   **Two coins:** The following challenge was offered to John: "There are two coins, a fair one and a double-tailed one. If you take up the challenge, you first pick one coin up randomly, and then toss it. If it has landed heads, you win 100 dollars. If it has landed tails, you lose 50 dollars." After much contemplation, John chose not to take up the challenge.

Let me give a formal background to this context. Assume for simplicity that there are only four worlds w_1, w_2, w_3, w_4 with w_4 being the actual world, in which John didn't take up the challenge. The other three are further divided in terms of which coin has been chosen and on which side it has landed. Figure 3 illustrates the departing of worlds in this context. t_1, t_2, t_3 are respectively the times of deciding '*c(hallenge)*' or $\neg c$, '*f(air-coin)*' or $\neg f$, and '*h(ead)*' or $\neg h$. The relations among worlds become gradually disconnected as time progresses: they start with one single class of historical alternatives, and finally end up with four distinct singletons.

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[29]Notice that the equivalence holds because the modals in Narrow-Scope are both assumed to be metaphysically construed. The situation here can be seen as the collapse of stacked modal operators: with introspection properties, when multiple modal operators of the same flavor are stacked, they collapse into the innermost one. If the two modals in Narrow-Scope could have different flavors, however, the equivalence to One-Modal would not be entailed.
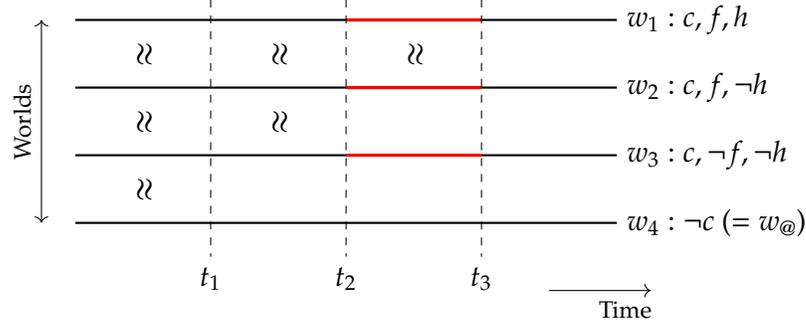
Figure 3: The departing of worlds according to time. The rotated '≈' between world-lines indicates that the two worlds are historical alternatives to each other up to the next vertical dashed line on the right. The antecedents of (35) and (36) target the indices on the red lines.

Our target is the period between t_2 and t_3. Ignoring w_4, here we have two distinct classes of historical alternatives, namely $\{w_1, w_2\}$ and $\{w_3\}$, the former being worlds in which a fair coin has been chosen and the latter a world in which a double-tailed coin has. Since w_1 is an h-world and both w_1 and w_2 can access it, w_1 and w_2 are $\Diamond h$-worlds. In contrast, w_3 is a $\neg\Diamond h$-world, since there is no h-world metaphysically accessible from it. Thus, if we can elaborate a *might*-CF whose antecedent primarily concerns this period and involves all the three worlds, that will be our desired testing sentence. For this, recall the current analytical assumption that CFs are evaluated based on the forward-extended modal base at a certain past time, and that an antecedent restricts the forward-extended domain to those future indices at which its truth value is already settled (see Section 3.2). So, in order to target the period between t_2 and t_3, the antecedent must be such that which coin has been picked up is presupposed to be settled.

Now consider the following English and Japanese sentences under (34). Here the antecedent *'if he had picked one coin up and then tossed it'* is true at w_1, w_2 and w_3, since at each of them, whether it is fair or double-tailed, at least one coin is picked up and tossed. And among them there is a world in which the coin lands heads (i.e. w_1). Furthermore, the antecedent presupposes that some particular coin has been selected, so not every world is a $\Diamond h$-world. Thus, One-Modal, but not Narrow-Scope, predicts the two sentences to be true. Crucially, the judgment by native speakers is that they sound false, both in English and Japanese.

(35)   ?If he had picked one coin up and then tossed it, it might have landed heads.

(36)   ??*Kare-ga koin-o   hitotu eran-de   nager-eba, sore-wa omote-o   das-u*
       he-NOM coin-ACC one   pick-CONT toss-COND it-TOP   heads-ACC show-PRES
       kamosirenakat-ta.
       might-PAST
       'If he had picked one coin up and then tossed it, it might have landed heads.'

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Thus, our conclusion is that it is Narrow-Scope that correctly captures the natural language data.[30]

Observe independently that if the antecedent does not presuppose the settledness of the coin choice, the sentence does not come out false. Consider (37) and (38) under the same context. They are both judged true.

(37) If he had taken up the challenge, he might have won 100 dollars.

(38) *Chousen sur-eba, 100 doru te-ni hair-u kamosirenakat-ta.*
challenge do-COND 100 dollar hand-in enter-PRES might-PAST
'If he had taken up the challenge, he might have gained 100 dollars.'

Here the antecedent *'if he had taken up the challenge'* restricts the forward-extended modal base to those in which whether he takes up the challenge is settled. This domain involves w_1, w_2 and w_3 just like in the previous case, but crucially in them (especially in the period between t_1 and t_2), the three worlds were still historical alternatives to each other. This means that w_3 was a $\diamond h$-world as well as the other two, and therefore Narrow-Scope predicts that the sentence is true. This prediction by Narrow-Scope is consistent with the native speakers' judgment.

We have thus shown that there *is* a context in which One-Modal and Narrow-Scope diverge, and in this context it is not One-Modal but Narrow-Scope that correctly captures the natural language data. I emphasize that the differentiation was made possible by the sophisticated formal framework that captures the temporal change of historical alternatives, as the difference shows up crucially in terms of the reference time of antecedent.

4.5 The double-modal view of *might*-CFs

The last section revealed two things. It was first shown that Japanese does disambiguate between the Wide-Scope construal and the other two in an explicit way. This lends support – in a weak sense, though – to the view that English *might*-CFs similarly have multiple structures, given that the results obtained in Japanese were all compatible with the predictions made for English. Furthermore, it was also shown that Narrow-Scope, not One-Modal, correctly predicts the natural language data. While there was a slight difference in sensitivity to the diagnostic, this was supported by English and Japanese.

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[30]As far as my consultants are concerned, the judgment for English is a bit subtler than that for Japanese. In addition, many of my English-speaking consultants reported that (35) becomes much better if the indefinite *'one'* is replaced with *'a'*, for which I do not have any plausible explanation right now. One possibility is that *'a'* is easier to scope out of the antecedent and induce the wide-scope interpretation (i.e. *'there is a coin such that if John had picked it up and tossed it, it might have landed heads'*), which is in fact true under the context.

These results bring to the fore one view of *might*-CFs. As we saw in Section 3.3, the wide-scoping of *might* relative to the past/perfect in the consequent requires insertion of a covert necessity modal for the sentence to be a CF. This is motivated by the backshift strategy of Past-as-Past: as long as *might* takes wide-scope and represents the current epistemic possibility, a covert modal needs to be inserted that can be the target of backshift and restriction by an *if*-clause. Meanwhile, the **Two Coins** case in Section 4.4 has shown that a covert necessity modal is necessary even when *might* does not take wide-scope: even if an overt *might* qualifies as the target of backshift and antecedent-restriction, One-Modal fails to predict the judgments. In other words, whatever the scope-relation between *might* and the past/perfect is, a covert necessity modal must figure in the structure that is to be targeted by backshift and antecedent-restriction. I submit the following view for English and Japanese *might*-CFs.

(39)　　**The double-modal view of '*if* ϕ, *might have* ψ'**:
　　　　'*if* ϕ, *might have* ψ' always introduces a covert necessity modal similar to *would*.
　　　　Backshift and restriction by an *if*-clause target the covert modal, but never the
　　　　overt *might*. Thus the possible LFs are:

　　　　(i) Pres [*might* [*have* [*would*$_{if\phi}$ [ψ]]]] and,
　　　　(ii) Pres [*have* [*would*$_{if\phi}$ [*might* [ψ]]]],

　　　　and the following LF is not attested:

　　　　(iii) * Pres [*have* [*might*$_{if\phi}$ [ψ]]]]

(39) therefore limits the ambiguity of English '*might have*'-CFs to only Wide-Scope and Narrow-Scope. It also follows that Japanese *might*-CFs with Pres1-*might*-Past2 in (27a) uniquely represents the truth conditions of Narrow-Scope.

The double-modal view is in line with the view held by the supporters of CEM in that it in a way separates the meaning of conditionals and *might* as independent entities. On the other hand, it departs from a Kratzer-style analysis of conditionals in banning the *if*-clause from directly restricting the overt modal. While the argument for assuming a covert modal has been lively debated for deontic modals (Frank 1996; Zvolenszky 2002; Kaufmann 2012; a.o.), the same issue has not been discussed much for epistemic and metaphysical modals (but see Geurts 2004, Leslie 2009 for the 'covert epistemic modal' readings in indicative conditionals). While I leave further investigation and comparison with indicative conditionals for future research, I will adduce additional evidence for the proposal in the rest of the paper. In Section 5.1, I will show that the facts regarding NPI licensing in *might*-CFs nicely go along with the double-modal view. In Section 5.2, I will discuss a novel argument from the linguistic phenomenon of 'CF epistemic possibility', in which *might* represents epistemic possibility in a counterfactual situation. That this

interpretation is available in *might*-CFs lends further significance to the Narrow-Scope LF.

5 Further evidence

5.1 NPI licensing in *might*-CFs

Hsieh (2014) pointed out that the One-Modal-style analysis makes wrong predictions regarding the licensing of *negative polarity items* (NPI) in the antecedent clauses of conditionals with a possibility modal. Although he does not specifically target *might*-CFs, his argument carries over directly to the present discussion, and provides independent support for my proposal.

The standard analysis of NPI licensing is that they must be in so-called *downward-entailing* (DE) environments, in which the entailment relation holding between expressions is reversed. NPIs such as *'any'* or *'ever'* are for instance licensed in the restrictor of *'every'*, but not in that of *'some'*, since the former is a DE environment but the latter is not.

(40)   a.   Every student passed the exam $\Rightarrow$ Every linguistic student passed the exam
        b.   Some student passed the exam $\not\Rightarrow$ Some linguistic student passed the exam

(41)   a.   Every student who had taken *any* linguistics course performed well.
        b.   *Some student who had taken *any* linguistics course performed well.

(42)   a.   Every student who had *ever* been to Paris became a good chef.
        b.   *Some student who had *ever* been to Paris became a good chef.

As long as one adopts the analysis that equates (bare) conditionals to universal quantifiers over indices and regards the antecedents as restrictors, the antecedents are expected to be DE environments, and therefore license NPIs. This is in fact true.

(43)   a.   If John subscribes to *any* newspapers, he is well-informed.
        b.   If John has *ever* been to Paris, he saw the Arc de Triomphe.

It has been independently argued that the antecedents of conditionals are actually non-monotonic, on the grounds that they fail to validate Strengthening of the Antecedent (Lewis 1973). However, von Fintel (1999, 2001) argued that monotonicity can be ensured if one rather adopts what he calls 'Strawson Entailment', a special kind of entailment that checks whether all the presuppositions of premises and conclusion are satisfied. I assume following von Fintel (and Hsieh) that the antecedents of (43a) and (43b) are downward-monotonic in this Strawsonian sense. I refer the reader to von Fintel (1999,

2001) for further discussion.

Now the problem Hsieh points out is that conditionals with a possibility modal in the consequent also license NPIs in their antecedents.

(44)   a.   If John subscribes to *any* newspapers, he *may* be well-informed.
       b.   If John has *ever* been to Paris, he *may* have seen the Arc de Triomphe.

Under the One-Modal-style analysis of conditionals, the antecedents in (43) and (44) are supposed to restrict the overt possibility modal. However, given the standard assumption that possibility modals are analogues of existential quantifiers like *some*, those antecedents, functioning as the restrictors of existential quantifiers, are not DE environments. The One-Modal-style analysis would thus wrongly predict that NPIs are disallowed in the antecedents of conditionals with an overt possibility modal.

Hsieh's argument can carry over to our discussion. As shown in (45), NPIs are also licensed in the antecedents of *might*-CFs. One-Modal fails to explain the licensing of NPIs for the same reason that Hsieh gave above.

(45)   a.   If John had subscribed to *any* newspapers, he *might* have been well-informed.
       b.   If John had *ever* been to Paris, he *might* have seen the Arc de Triomphe.

Note that the licensing of NPIs in (45) straightforwardly follows from Wide-Scope and Narrow-Scope. Since in both LFs the antecedents restrict the covertly inserted necessity modals and thus constitute (Strawson-)DE environments, NPIs in the antecedents should be safely licensed.

Hsieh indeed entertained a two-modal-style analysis for *might*-conditionals as a potential explanation to his data (*Ibid*. p.437), although he stopped short of fully committing himself to it. Along with the data presented in Section 4, Hsieh's observation on NPI licensing now constitutes a part of the evidence for the double-modal analysis of *might*-CFs.

5.2   Narrow epistemic *might*

5.2.1   CF epistemic possibility

As briefly mentioned in Section 3.3, when the past or perfect scopes over *might*, it can also represent an epistemic possibility that the speaker entertained in the past. The following example was observed by von Fintel and Gillies (2008). Assume that Sophie is looking for some ice cream and checks the freezer. You ask her why she opened the freezer (46A). She would reply in English (46B) or in Japanese (46B') as follows:[31]

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[31]Note that the 'Past1-*might*-Pres2' alignment in Japanese is not possible here:

(46) A: Why did you open the freezer?

  B: Because I might have found ice cream.

  B': *Aisu-o mituke-**ru** kamosirenakat-**ta** kara.*
     ice-ACC find-PRES might-PAST   because

Here *might* is not concerned with the metaphysical facts: although it had been meta-physically settled that there was no ice cream when she was looking into the freezer, some ice cream being in there was still compatible with her epistemic state at that time. Similarly, even if it had been settled that there was some ice cream in the freezer, no ice cream being in there was compatible with her epistemic state at the time of her search for ice cream. This so-called *past epistemic* possibility is reported to be available in a very limited range of environments, such as answering *why*-questions as in (46) (Stephenson 2007, Hacquard 2010), and therefore is taken to be a non-default interpretation of *might* in the '*have>might*' scope relation.

Although not the default interpretation, its existence is a linguistic fact. While this study has been assuming that the flavor of *might* in Narrow-Scope is metaphysical, we should examine how conditionals that involve an epistemically interpreted *might* in the scope of the past/perfect figure within the theory of *might*-CFs. This section considers the following truth conditions, a variety of the Narrow-Scope construals in which *might* is interpreted against an epistemic modal base.

(47) '*if* ϕ, *might*$_{epis}$ *have* ψ' is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, there is $l \in (\underline{MB^{\sim}(k)} \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.

Notice that the claim of (47) is what the speaker *would have believed* to be possible if such-and-such had been true. Such claim is not based on the real past epistemic state, but rather on the as it were *counterfactual epistemic state* that would have been created if the antecedent had held as a circumstantial fact. I thus call the possibility represented by (47) a *CF epistemic possibility*. The ultimate question is how examples of this kind fit into the double-modal view of *might*-CFs. So long as (47) is a logical possibility derived from (39), it must be examined whether (47) is possible at all, and if possible, how the distribution is constrained. While a full explanation is left for future work, I will show that the double-modal view is at least consistent with the observations to be made in this section.

(i) #*Aisu-o mituke-**ta** kamosirena-**i** kara.*
     ice-ACC find-PAST might-PRES because
     'Because I might have found ice cream.'

[31]Edgington (2007) observes the past epistemic interpretation even in subjunctive conditionals with *would*, but the use is similarly confined to those behavior-explaining contexts. See also Khoo (2015) for a similar point.

5.2.2 Observations and speculations

Recall that the metaphysical flavor for *might* in Narrow-Scope was motivated by *might*-CFs concerning an indeterministic chance process like (3) (repeated here).

(48)   If I had tossed this fair coin, it might have landed heads.

Now compare the following two truth conditions.

(49) a. '*if ϕ, might$_{meta}$ have ψ*' is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx*}(j) \cap [\![\phi]\!])$, there is $l \in (\underline{MB^{\approx}(k)} \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.
      b. '*if ϕ, might$_{epis}$ have ψ*' is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx*}(j) \cap [\![\phi]\!])$, there is $l \in (\underline{MB^{\sim}(k)} \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.

The question is whether Narrow-Scope *might*-CFs, *as natural language sentences*, allow the embedded *might* to have an epistemic reading at all. Given that metaphysical uncertainty implies epistemic uncertainty, (49b) will make the same prediction as (49a) regarding the truth value of (48), in which the result of the coin toss would not have yet objectively come out at the time of antecedent. However, (49b) will, but (49a) will not, allow for cases in which the truth value of the consequent would have been metaphysically settled at the time of antecedent but epistemically still uncertain.

To see this, consider (50). Under the designated context, the following *might*-CF sounds quite odd.

(50) **Lights**: You often but not always put your keys on the dining table. You know that the lights in the dining room have been on since a while ago. Before you leave home, you find that the keys are on the table. Meanwhile you imagine:

??If the lights had been off, the keys might have been somewhere else.

Even if the lights had been off, the whereabouts of the keys would have been metaphysically settled. But the speaker would have been blind to the location of the keys because, as the antecedent stipulates, the lights were off and as a result the table was not visible. That is, in the situation where the lights were off, the location of the keys would have been metaphysically settled but epistemically uncertain. (50) seems to indicate that in such situation, *might*-CFs cannot be felicitously used.

Importantly, the switch of the lights and the location of the keys are assumed to be causally independent of each other. For instance, if there exists a causal link between them, the same sentence becomes perfect, as shown in (51).

(51) **Lights & Dog**: You often put your keys on the dining table. You know that the lights in the dining room have been on since a while ago. Before you leave

home, you find that the keys are on the table. You are relieved because your dog has a very strange habit: when the room is dark, he not so often but sometimes takes your keys away and hides them somewhere in the house. So you think:

If the lights had been off, the keys might have been somewhere else.

Here the *might* should be interpreted metaphysically. Given that the dog's strange habit is a sort of random event, whether that comes into effect would have been metaphysically uncertain.

However, the infelicity of (50) still does not establish that CF epistemic *might* is not possible at all. What if the CF epistemic interpretation is merely *non-default*, just as the past epistemic reading is so in the matrix construction? One way to derive a less default reading is to use some sort of signaling device that necessarily fixes the intended reading. As shown in (52), (50) does improve if an overt frame-setter designating the epistemic reading is inserted.

(52)   The same context as (50):
        If the lights had been off, <u>for all I would have known</u> the keys might have been
        somewhere else.

Note that the framing adverbial *'for all I would have known'* is modally subordinated under the antecedent, as can be known from the PP subjunctive form *'would have'*. This signals that the interpretation of *might* is based on the CF epistemic state invoked by supposing the antecedent.

Japanese parallels English. Note that the presence of the ability modal *'-e-'* and the past tense in the frame setter indicates that the epistemic state is counterfactual.

(53)   The same context as (50):

        a. ??*Akari-ga   naker-eba,   kagi-wa tsukue-ni na-i   kamosirenakat-ta.*
           light-NOM not.be-COND key-TOP table-LOC be.not-PRES MODAL-PAST
           'If the lights had been off, the keys might not have been on the table.'
        b. *Akari-ga   naker-eba,* **sonotoki siri-e-ta**   **kagiri-de-wa** *kagi-wa*
           light-NOM not.be-COND then   know-able-PAST as.far.as-in-TOP key-TOP
           tsukue-ni na-i   kamosirenakat-ta.
           table-LOC be.not-PRES MODAL-PAST
           'If the lights had been off, for all I would have been able to know, the keys
           might not have been on the table.'

The felicity of (52) and (53b) thus shows that CF epistemic *might* is possible as an interpretation. The question still remains why such CF epistemic reading is non-default and the metaphysical reading is default in Narrow-Scope. While I cannot provide

any definite explanation now, one possible explanation is resorting to the idea that the epistemic center is hard to be shifted to someone or somewhere else. If one makes a modal claim such as *'John might be sick'*, the grounds against which *might* is evaluated are by default centered on the speaker's epistemic state at the utterance time. Shifting the epistemic center requires an overt signal. The use of attitude verbs is one of such strategies: by saying *'Mary thought John might be sick'*, the agent of the epistemic state is shifted from the speaker to Mary, and the time of the epistemic state is also shifted from the utterance time to a certain past time (Abusch 1997; Papafragou 2006; Stephenson 2007; von Fintel and Gillies 2008; Anand and Hacquard 2013; a.o.). Conversely, without the use of such signal, the epistemic center for the modal is very hard to be altered to Mary and to the past time. In the same vein, obtaining an epistemic interpretation for the embedded *might* in Narrow-Scope may need a cue that helps shift the perspective to the CF epistemic state; otherwise the center stays fixed to that at the utterance time, thereby leading *might* to be interpreted only metaphysically. Having said that, this remains a speculation. I leave further elaboration for future work.[32]

6   Concluding remarks

This study has contributed to our understanding of *might*-CFs by mapping the previous analyses proposed by philosophers to fine-grained linguistic structures, reducing the meaning variation to the differing scopal relations between tense/aspect, modal and *if-*

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[32]It is also interesting to see how it extends to the literature of epistemic contradiction, which was studied with regard to conditionals by Yalcin (2007). Yalcin observes that the following sequence of sentences gives rise to the feel of contradiction.

  (i) #Suppose that it is raining but it might not be raining.

To the best of my knowledge, epistemic contradiction in the consequent of conditionals has not been discussed so far. As far as the current CF epistemic *might* is concerned, the following sequence does not seem to lead to contradiction (ii). Compare this with (iii), which lacks an overt frame setter in the consequent.

  (ii) If the lights had been off, the keys would (still) have been on the table but for all I would have known they might not have been.
  (iii) #If the lights had been off, the keys would (still) have been on the table but they might not have been.

The reason why (ii) does not sound contradictory may have something to do with the existence of an overt frame setter, as touched on in Yalcin (2011). As (iv) shows, (i) improves with the second conjunct headed by *'for all you know'*.

  (iv) Suppose that it is raining but for all you know it might not be raining.

What implication the data like above would bring to the study of epistemic modals remains to be examined. I leave this for another future task.

clause. I argued that, as far as *'might have'*-CFs are concerned, a covert necessity modal equivalent to *would* is necessary. This led to the proposal of the double-modal view of *might*-CFs, which excludes the possibility of *if*-clauses directly restricting the overt *might*. I supported this proposal by further adducing the facts regarding NPI licensing and a novel observation of the CF epistemic interpretation of *might*. Whether the same analysis can be extended to the overall range of *might*-CFs is still an open question. While this study focused on *might have* constructions, *might*-CFs include those which do not involve the perfect *have*. I leave a more detailed investigation of the whole range of *might*-CFs for future research.

That said, I would like to emphasize that this study has shown how much Japanese and English, languages belonging to different language families, have in common regarding the structures and meanings of *might*-CFs. Because of its transparent scope alignment, Japanese has turned the conjecture derived from English – namely that *might*-CFs are ambiguous – into a cross-linguistic hypothesis. While English remains silent on several diagnostics, the fact that the results obtained in Japanese are all compatible with the predictions for English lends further generality to the proposed double-modal view. How much it extends to languages other than Japanese and English needs to be investigated in another occasion, but I hope to have submitted a promising view on the natural language semantics of *might*-CFs.

Appendix: Formal proofs

This Appendix shows the proof that Narrow-Scope asymmetrically entails One-Modal when *might* is metaphysically construed. Their truth conditions are repeated in the following.

(54) One-Modal$_{meta}$:
      '*if ϕ, might have ψ*' is true at i iff there is $j < i$ such that for some $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, $k \in [\![\psi]\!]$.

(55) Narrow-Scope$_{meta}$:
      '*if ϕ, might have ψ*' is true at i iff there is $j < i$ such that for all $k \in (MB^{\approx^*}(j) \cap [\![\phi]\!])$, there is $l \in (MB^{\approx}(k) \cap [\![\phi]\!])$ such that $l \in [\![\psi]\!]$.

I first show that (54) does not entail (55). Recall that $\approx^*$, unlike $\approx$, allows one to access future indices, but in the future historical alternatives may have departed from each other.

Proposition 1. *One-Modal$_{meta}$ does not entail Narrow-Scope$_{meta}$.*

Proof. Take any arbitrary index i and any two sentences ϕ and ψ. It is possible to have

a model in which there is $j \in MB^{\approx^*}(i)$ such that $j \in [\![\phi]\!]$ and $j \in [\![\psi]\!]$, and simultaneously there is $k \in MB^{\approx^*}(i)$ such that for every l such that $k \approx l$, $l \in [\![\phi]\!]$ and $l \notin [\![\psi]\!]$. There One-Modal holds, but Narrow-Scope doesn't. The sentences in (35) and (36) under the context (34) illustrate a concrete counterexample. $\qquad\square$

To prove that entailment does hold in the converse direction, I will first prove that in Narrow-Scope, when *might* is metaphysically construed, any lower modal base is a subset of the higher one.

Lemma. *Given any index i, for any $j \in MB^{\approx^*}(i)$, $MB^{\approx}(j) \subseteq MB^{\approx^*}(i)$*

Proof. This is equivalent to proving that for any j, k, if $i \approx^* j$ and $j \approx k$, then $i \approx^* k$. Since $i \approx^* j$, there is j' such that $i \approx j'$ and $j' \leq j$. Since $j \approx k$ and $j' \leq j$, it follows from the interaction between $\approx$ and $\leq$ that there is k' such that $k' \leq k$ and $j' \approx k'$. By transitivity, $i \approx k'$, hence $i \approx^* k$. $\qquad\square$

Proposition 2. *Narrow-Scope$_{meta}$ entails One-Modal$_{meta}$.*

Proof. Take any index i and any two sentences ϕ and ψ. Take any j such that $j \in (MB^{\approx^*}(i) \cap [\![\phi]\!])$, and let k be such that $k \in (MB^{\approx}(j) \cap [\![\phi]\!])$ and $k \in [\![\psi]\!]$. By Lemma, $MB^{\approx}(j) \subseteq MB^{\approx^*}(i)$, and since set intersection preserves subset relation, $(MB^{\approx}(j) \cap [\![\phi]\!]) \subseteq (MB^{\approx^*}(i) \cap [\![\phi]\!])$. From this and since $k \in (MB^{\approx}(j) \cap [\![\phi]\!])$, it follows that $k \in (MB^{\approx^*}(i) \cap [\![\phi]\!])$. This satisfies One-Modal$_{meta}$. $\qquad\square$

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