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Against Exclusion-Based Counterfactuality

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ABSTRACT OF THE THESIS

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In counterfactual conditionals, speakers make (at least) two counterfactual inferences. For example, upon hearing the utterance *If it were raining, I would be wet*, an interlocutor infers that it is not currently raining (CF_p) and that the speaker is not currently wet (CF_q). It has been shown that these inferences are not asserted but rather implicated since they can be cancelled without contradiction or redundancy (Anderson, 1951).

A large number of languages (*EM languages*) mark such counterfactuality with past-tense morphology in either clause of the subjunctive conditional (Iatridou, 2000). In EM languages, CF_p and CF_q are cancellable, but there exists an asymmetric independence in their cancellability. In other words, CF_q can be cancelled independently of CF_p, but if CF_p is cancelled then CF_q is necessarily also cancelled. There is another group of languages (*non-EM languages*) where counterfactuality is marked not by past tense but by some other dedicated counterfactual morphology. In these non-EM languages, CF_p is not cancellable (Nevins, 2002). In this thesis, I present novel data from Mandarin and Hebrew (both of which are non-EM languages) demonstrating that although CF_p is non-cancellable in non-EM languages, CF_q can indeed be cancelled.

Based on a broad study of Indo-European EM-languages, Iatridou (2000) proposes that counterfactuality arises as an implicature due to the presence of an *exclusion* marker realized as past-tense morphology. Under Iatridou's proposal, cancellability is an inherent property of exclusion, not of

counterfactuality itself. Therefore, it would be predicted that non-EM languages (which do not utilize exclusion to mark counterfactuality) would not be able to cancel counterfactual inferences. This much seems plausible for CF_p (Nevins, 2002), but CF_q would be expected to also be non-cancellable. As the novel data show, this is not the case. While Iatridou does not formalize her proposal, Tellings (2016) speculates how one might do so. I further present an extension on Tellings (2016), and show that it is not an adequate theory of counterfactuals, at least in non-EM languages.

The dissertation of Gabriel Enrique Teixeira is approved.

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List of abbreviations

ALT	the set of alternatives
ASP	aspect
CF	counterfactual
CF_p	counterfactual inference that the antecedent is contrary to fact
CF_q	counterfactual inference that the consequent is contrary to fact
CLASS	classifier
CT	contrastive topic
$C(t)$	utterance time
$C(w)$	the speaker worlds
DIR-OBJ	direct object
EM languages	languages that mark counterfactuality by means of exclusion morphology
ExclF	exclusion feature
Exh	exhaustivity operator
FLV	Future Less Vivid
FNV	Future Neutral Vivd
IND	indicative
NCs	negative counterfactuals
non-EM languages	languages that mark counterfactuality by means other than exclusion morphology
p	antecedent of a conditional
PERF	perfective
PTCP	participle
q	consequent of a conditional
QUD	question under discussion
R	theory-specific quantificational restriction

S_w	set of worlds epistemically available to the speaker
$T(t)$	topic times
$T(w)$	topic worlds
w	world of evaluation

1   Introduction

For centuries, the realm of counterfactual conditionals has been of interest in the fields of linguistics, philosophy, cognitive psychology, and economics, among others. When uttering a counterfactual conditional, a speaker conveys in some manner that they are introducing to the discourse a proposition (or two) that is contrary to fact. Specifically, when uttering a sentence along the lines of *if it were the case that p, then it would be the case that q*, the speaker conveys that both p and q are false. In this work, we argue against the use of exclusion, originating in Iatridou (2000), as the mechanism which generates the inference that the consequent of the counterfactual conditional is false (CF_q). Moreover, we show that exclusion-based counterfactuality, as outlined by Iatridou, is inadequate for generating the inference that the antecedent is false (CF_p).

Under an Iatridovian system, the ability to cancel counterfactual inferences is an inherent property of exclusion. Thus, it is to be expected that languages which mark counterfactuality by means other than exclusion should not posses the cancellability property. Nevins (2002) shows this to be the case for Mandarin and Hebrew (among other languages), where the counterfactual inference on the antecedent is non-cancellable. The natural next step here is then to predict that the counterfactual inference on the consequent should not be cancellable either. We present novel data from Mandarin and Hebrew, showing that these inferences are in fact cancellable, contrary to what Iatridou would predict.

As an alternative to exclusion-based counterfactuality, we present a treatment of CF_q developed by Tellings (2016) which frames counterfactuality as a discourse phenomenon relying on conditional perfection. Further, we formalize Iatridou's (2000) exclusion-based proposal and show that it does not generate the desired inferences, providing strong evidence against exclusion-based counterfactuality.

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In §2, we present the distribution of contexts in which counterfactual inferences can be cancelled. §3 provides the exclusion-based proposal, as is layed out by Iatridou (2000). Novel data from languages with specialized counterfactual morphology (specifically Mandarin and hebrew) is given in §4. What follows is an outline of Tellings's (2016) discourse-based theory in §5, along with an overview of various accounts for conditional perfection in §A. Finally, §6 contains a formalization and scrutinization of an exclusion-based system for counterfactuality.

2 Counterfactual inferences

Counterfactuals are a subset of subjunctive conditionals in which either the antecedent, p, or both the antecedent and consequent, p and q respectively, are understood to be contrary to fact in the actual world. For instance, upon hearing the utterance in (1), an interlocutor infers the following: that John did not take the bus (a counterfactual inference on p, henceforth CF_p), and that John was not on time (a counterfactual inference on q, henceforth CF_q).

(1) If John had taken the bus, he would have been on time.

     ↪ CF_p: John did not take the bus

     ↪ CF_q: John was not on time   (Tellings, 2016)

2.1 Cancellation of CF_p

An important property of counterfactual inferences is that they are cancellable. This is a well-known observation in the literature with regards to the antecedent, i.e. CF_p. The most common CF_p-cancellation examples are the so-called Anderson-type examples, such as that in (2).

(2) If Jones had taken arsenic, he would have shown just exactly those symptoms which he does in fact show. [So, it is likely that he took arsenic].   (Anderson, 1951, p. 37)

An important conclusion that has been drawn from examples like that in (2) is that because CF_p is cancellable, it must not be a logical entailment or presupposition. This follows from the felicitousness of (2) without contradiction.

Another property which suggests CF_p is implicated is that of reinforceability. Reinforceability is the property by which we can felicitously assert a counterfacutal conditional which generates CF_p followed by the assertion that ¬p without introducing redundancy, as in (3).

(3) The murderer used an ice pick. But if the butler had done it, he wouldn't have used an ice pick.

So the murderer must have been someone else.   (Stalnaker, 1975, p. 277)

2.2 Cancellation of CF$_q$

The cancellation of CF$_q$[1] (the inference that the consequent is contrary to fact) has been, albeit to a lesser extent, mentioned in the literature. The contexts in which CF$_q$-cancellation is possible are quite different than for CF$_p$, but seem to be united by the property that they introduce multiple salient causes for the same consequent.

One such context of CF$_q$-cancellation can be triggered by the presence of *also*. In isolation, the conditional in (4a) seems to convey that John in fact was not nice and did not have friends. However, when the same conditional is embedded in the discourse in (4b), with the addition of *also*, the condtional retains the understanding that John had not been nice, but does not conflict with John having had friends. Rather, John's being nice is presented as an alternative way in which John could have acquired his friendships. In other words, CF$_q$ is present in isolation, but not within the discourse in (4b).

(4) a. If John had been nice, he would have had friends.

b. A: John is very rich and his wealth has gotten him quite a few friends.

B: Yes, but if he had been nice he would *also* have had friends.   (Iatridou, 2000, p. 232n)

Another trigger for CF$_q$-cancellation is the presence of *still*. As before, the conditional in (5a), when in isolation, conveys that the consequent is not factual in the actual world, i.e. we were not on time. However, when embedded in the discouse in (5b), CF$_q$ is no longer present. The utterance by speaker B does not suggest the road that was indeed taken resulted in arriving late, but rather conveys that the alternate route would have equally enabled our arriving on time.

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[1]As a terminological note, we will utilize the term *cancellation* to refer to cases, presented in this section, where CF$_q$ is not present. While the term *cancellation* seems to convey a process wherein the inference is generated and then post-facto struck down (which seems to be the case, for instance, in Anderson-type examples), this is not necessarily the case for CF$_q$. As will be seen, the so-called CF$_q$-cancellation contexts can be thought of as contexts such that CF$_q$ is simply not generated in the first place.

(5) a. If we'd taken the other road, we would have been here in time.

  b. A: We are on time because we have taken the road I said we should take.

  B: If we'd taken the other road, we would *still* have been here in time.[2]

<div align="right">(Declerck and Reed, 2001, as cited in Tellings 2016)</div>

We note that although the sentences in (4) and (5) might suggest that *also/still* are necessary in order for CF_q-cancellation to occur, this is not the case. Tellings (2016) points out that it is neither a necessary nor sufficient condition for CF_q-cancellation, due to examples like (6), where *also* is present but CF_q is not cancelled.

(6) A: John met Mary yesterday.

  B: If John had gone to the party, he would also have met LINDA.   (Tellings, 2016, p. 28)

The next CF_q-cancellation context is the *listing context*, exemplified in (7). Upon hearing (7a), an interlocutor will infer that you did not in fact see a falling star. However, when embedded in a listing context as in (7b), where it has been stated by Speaker A that they saw a falling star, the utterance by Speaker B does not contradict Speaker A's observation of the falling star. Rather, Speaker B has provided alternate means by which Speaker A could have seen a falling star. Thus, there is CF_q-cancellation in the discourse in (7b).

(7) a. If you had gone outside at 9:41pm, you'd have seen a falling star.

  b. A: I went outside at 10:22pm, and I saw a falling star!

  B: Well, that's not so special. If you had gone outside at 9:41pm, you'd have seen a falling star, if you had gone outside at 9:54pm, you'd have seen a falling star, if you had gone outside at 10:40pm, you'd have seen a falling star,... There were lots of falling stars tonight.

<div align="right">(Tellings, 2016, p. 30)</div>

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[2]The original example in Declerck and Reed (2001) does not contain *still*, but rather uses *also*. We present here the example as was modified by Tellings (2016), see p. 28.

Yet another type of CF_q-cancellation occurs in *semifactual conditionals*. Semifactuals are characterized by the fact that they convey the truth of the consequent, and often begin with *even if*. For instance, (8) conveys that I would not ever cross the bridge, regardless of the circumstances. Because semifactuals are such that the consequent q is always true, they can be alternatively thought of as being characterized by a lack of CF_q (Tellings, 2016).

(8)   *Context: one is standing in front of a broken bridge*

    Even if the bridge were standing I would not cross.   (Bennett, 1982, p. 411)

The CF_q-cancellation contexts presented in this section all share the property that they introduce salient alternatives or causes for the truth of the consequent. While this is not an exhaustive list of CF_q-cancellation contexts, it illustrates the overarching generalization that ties all such contexts together.

3 Counterfactuality as exclusion

In this section, we present a proposal put forth by Iatridou (2000) that treats counterfactuality as arising due to an exclusion operator. In §3.1, we give data where past-tense morphology seems to receive a non-temporal interpretation. This data motivates Iatridou's (2000) proposal that the past-tense is in fact an exclusion operator in the time domain, which is co-opted to the world domain in order to give rise to a counterfactual reading, as laid out in §3.2.

3.1 Fake tense

Iatridou observes that there are various conditional constructions which exhibit 'fake' tense, meaning that the past-tense morphology is not interpreted in the standard temporal sense[3].

The sentences in (9) make reference to an event that has yet to take place, namely the taking of the syrup. While both the FNV in (9a) and the FLV in (9b) share the same assertion (that the taking of the syrup will result in getting better) and are both future-oriented, the FLV contains an additional implicature. Specifically, (9b) seems to convey that the actual world is more likely to become a $\neg p$-world than it is to become a p-world. This is not entailment because it holds under negation, i.e. 'It is not the case that if he took this syrup, he would get better.' These constructions differ only in that the FNV contains non-past tense morphology, while the FLV contains past-tense morphology. Thus, FLVs exhibit 'fake' past-tense.

(9) a. If he takes this syrup, he will get better.   Future Neutral Vivid (FNV)

    b. If he took this syrup (in the coming week), he would get better.   Future Less Vivid (FLV)

(Iatridou, 2000, p. 234)

Conditionals like those in (10), referred to as PresCF by Iatridou, convey that p and q do not hold at present, i.e. Fred isn't drunk now. Further, the situations described overlap with the utterance time,

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[3]Sequence of tense cases may or may not fall under this category. While Iatridou (2000) does not explicitly address these, Arregui (2007, 2009) might say that they are the same thing such that the perfect is not really temporal past-tense.

and are therefore not temporal past, adding PresCFs to the roster of constructions which exhibit 'fake' tense[4].

(10)   a.   If Fred was drunk, he would be louder.

     b.   If Mary knew the answer, she would be the only one.   (Iatridou, 2000, p. 244)

PastCFs, under Iatridou's terminology, convey that p and q did not hold at some point in the past (making no claims about whether they hold at the present time). The pluperfect contains two layers of past, but is ungrammatical on its own, shown in (11b). However, when embedded in antecedent of a PastCF as in (11c), the pluperfect becomes acceptable. When there is a single layer of past as in (11a), it is interpreted temporally. Thus, the pluperfect may be analyzed as containing one layer of 'fake' past and another layer of temporal past. Under such an analysis, the layer of 'fake' past is extraneous, providing an explanation for the infelicitousness of uttering (11b) out of the blue.

(11)   a.   Napoleon was tall.

     b.   # Napoleon had been tall.

     c.   If Napoleon had been tall, he would have defeated Wellington.   (Iatridou, 2000, p. 245)

As has been shown, FLVs, PresCFs, and PastCFs exhibit past-tense morphology that is not interpreted in a normal temporal fashion.

3.2 Cross-domain exclusion

In light of the non-temporal interpretation of past-tense morphology shown in the previous section, Iatridou proposes that that which we call "the past tense morpheme" is an *exclusion feature*, ExclF, which provides the following meaning:

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[4]It is not directly evident, based on morphology, why (9b) is future-oriented, but the examples in (10) are not. While this is a puzzle in and of itself, it is orthogonal to the goal of this work and therefore will not be addressed. See Iatridou (2000) for further elaboration.

(12)   The topic times $T(t)$ exclude the utterance time $C(t)$ (Iatridou, 2000, p. 246)

To exemplify this exclusion in the time domain, consider the sentence "John laughed". The ExclF provides the temporal past interpretation by conveying that the times at which John laughs are excluded from the utterance time[5].

In order to analyze the examples of 'fake' tense in the previous section, Iatridou claims that "…when access to alternative worlds is given, as is the case in conditionals …then [ExclF] can range over worlds" (p. 247), resulting in counterfactuality. How access to such alternative worlds is granted is not made clear, however Iatridou seems to suggest that it is achieved by virtue of ExclF taking scope in the antecedent of the conditional. The resulting ExclF, when co-opted into the world-domain, thus contributes a meaning akin to that in (13).

(13)   The topic worlds $T(w)$ exclude the speaker worlds $C(w)$ (Iatridou, 2000, p. 247)

More concretely:

> The speaker aims to discuss p, q, and their relationship, and while doing so marks his or her utterance as being about a set of worlds (the topic worlds) to which the actual world does not belong. The topic world is a subset of the p worlds; that is, the topic worlds do not exhaust the p worlds. (Iatridou, 2000, p. 248)

When uttering a CF conditional, the speaker is therefore not making a statement about all of the p-worlds, but rather a subset of the p-worlds such that they are in some relevant manner similar to the actual world. Thus, the speaker does not mark the actual world as not being a p-world; rather, it marks it as not being among the p-worlds that we are talking about. According to Iatridou, this creates an implicature that because the speaker predicates p of worlds other than the actual one, the speaker must not believe the actual world to be a p-world. As will be seen, problems arise when generating the implicature in such a way. In this manner, the cancellability of a counterfactual inference is not an inherent property of counterfactuality, but rather arises from the nature of exclusion itself.

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[5]Assuming, that the future is not a tense but rather the modal *woll*, time-domain exclusion is exactly the precedence relation.

3.2.1 Cross-linguistic support

The co-opting of exclusion markers into domains other than the ones over which they originally range is supported cross-linguistically. In Burmese, for instance, the exclusion particle *khé* can be used to mark spatial exclusion, as in (14a), as well as marking counterfactuality, as in (14b).

(14)   a.   *mʷei   chau? khé   Re*

           snake scare KHE decl.

           '(I) scared a snake [in another place before I arrived here]'
<div align="right">(Wheatley, 1982, as cited in Nevins, 2002, p. 442)</div>

      b.   *shèi   Θau? khé yin, nei kàun la   gé   léin-me*

           medicine drink KHE if,   stay good come KHE predictive-irrealis

           'If he took the medicine, he would have gotten better'
<div align="right">(Nichols, 2002, as cited in Nevins, 2002, p. 442)</div>

In this section, we have laid out Iatridou's (2000) exclusion-based proposal for counterfactuals. Crucially, the ability to cancel counterfactual inferences under such a system is not inherent to counterfactuals, but rather a property of exclusion. Thus, we now turn to an examination of the cancellation behavior of languages that do not utilize exclusion morphology in marking counterfactuals.

4 Languages with specialized counterfactual morphology

4.1 Non-EM languages

Iatridou focuses exclusively on Indo-European languages that utilize overt past-tense morphology to mark counterfactuality, henceforth Exclusion-Morphology (EM) languages. However, there is a whole host of languages (non-EM languages) that use specialized or dedicated counterfactual markers occupying the syntactic position of the complementizer.

Nevins investigates counterfactual data from Mandarin, Tagalog, Slovenian, Hebrew, and Turkish, all of which are non-EM languages. Nevins notes that the existence of these dedicated counterfactual markers in such a wide array of unrelated languages provides strong support for the generalization that specialized counterfactual morphology is a legitimate alternative to exclusion for marking counterfactuality. (Nevins, 2002, p. 443)

Given the data reported by Nevins, the strategies employed by non-EM languages for marking counterfactuality can be split into two general categories:

- Mandarin and Tagalog have no past tense morphologhy, and thus employ a specialized counterfactual complementizer (which is often glossed as *if-not-that*). When a speaker utters this complementizer, they are in effect saying "If not for the fact that…".

- Slovenian, Hebrew, and Turkish all have two different ways of expressing conditionals. One of these corresponds to a hypothetical conditional, while the other is distinctly counterfactual.

In the case of counterfactual marking in languages like Slovenian, Hebrew, and Turkish, Nevins claims that "…when this specialized morphology is present, there is no need for exclusion-operator morphology to be borrowed from the temporal domain" (Nevins, 2002, p. 446). In other words, for languages that do mark tense, we expect that an extraneous exclusion marker (as would be the case in co-occurrence with specialized counterfactual morphology) would render the sentence infelicitous, as in (11b). These are reasonable hypotheses, and the goal herein is to check whether or not they are

confirmed.

Further, the Iatridovian system outlined in §3 predicts that because cancellability is a property of exclusion and not of counterfactuality itself, non-EM languages should not be able to cancel counterfactual inferences. In the rest of this section, we shall probe the cancellation behavior of non-EM languages and evaulate how such data aligns with the stated predictions. To this end, we will henceforth focus our efforts on one language from each of the categories specified above, namely Mandarin and Hebrew.

4.1.1 Mandarin

Mandarin employs a wide variety of strategies to express counterfactual conditionals (for an overview, see Jiang, 2019). The complementizer *yaobushi* can be morphologically decomposed as the complementizer *yaoshi* 'if' with infixed negation *bu* 'not', and can be paraphrased in English as "if not for the fact that…". *Yaobushi* is differentiated from *yaoshi* in that it is distinctly counterfactual. As shown in (15), a *yaobushi* conditional cannot receive an indicative interpretation.

(15) *Yaobushi   ni   gen   wo   lai   kan   dianying, wo jiu   hui yi-ge   ren   qu*
      If-not-that you with me come watch movie,   I   then will one-CL person go

  *'If you don't come with me to the movie, I will go alone'

  ✓'If not for the fact that you're coming with me to the movie, I would go alone'
<div align="right">(Nevins, 2002, p. 443n)</div>

In contrast to *yaobushi*, the complementizer *yaoshi* is ambiguous between an indicative and counterfactual reading, as shown in (16). Note that the *yaoshi* conditional does not utilize any tense/aspect/mood morphology to differentiate between the two readings. While a counterfactual reading may be conveyed via tense-mismatches or irrealis aspectual marking (see Jiang, 2019), the counterfactual interpretation may be obtained purely from contextual cues.

(16) *Yaoshi ta zuotian   you rehe wuqi,   haiguan jiu   hui kouliu ta.*

if   he testerday have any weapon Customs then will detain he

'If he had any weapons yesterday, Customs detained him.' (IND)

'If he had had any weapons yesterday, Customs would have detained him.' (CF)
(Ippolito and Su, 2014, p. 228)

The complementizer *yaobushi* exclusively heads negative counterfactuals (NCs), first described by Henderson (2010). A crucial characteristic of NCs, usually taking the form *if not p, q*, is that they must take veridical antecedents. In other words, *p* must be factually true. Thus, the antecedent of *yaobushi* in (17) is factive, such that it is in fact true that he drank the poison. Such a counterfactual does not imply the falsity of the antecedent, but rather has been argued to carry a factive presupposition (Henderson, 2010). Thus, the meaning of (17) can be characterized as "If it were not the case that *he drank that poison*, then (contrary to fact) *he would not have died.*"

(17) *Yaobushi   ta he   le   neige duyao, ta jiu   bu hui si   le*

If-not-that he drank PERF that poison, he then not will die PERF

'If he hadn't drank that poison, he wouldn't have died.'   (PastCF)
(Nevins, 2002, p. 443)

In the rest of this section, we will present data characterizing both *yaobushi* NCs as well as regular counterfactuals using *yaoshi*. However, we first provide an overview of counterfactual marking in Hebrew.

4.1.2 Hebrew

Modern Hebrew has two complementizers that appear in conditionals: *im* and *ilu*. The complementizer *im* can only appear in hypothetical conditionals (although it can be used in counterfactuals that have two layers of past), and *ilu* can only occur in counterfactual conditionals.

The counterfactual complementizer *ilu* appears with one layer of past-tense morphology along with an additional optional participle morphology, as shown in (18c). In contrast, *im* can only appear

in counterfactual conditionals containing the additional participle morphology, (18a), but not in counterfactuals with just the one layer of past, (18b). Under the Iatridovian hypothesis, the grammaticality of (18a) can be expected if we assume this additional morphology also consists of an exclusion operator. In this case, the additional morphology obviates the need for a dedicated counterfactual complementizer. Thus, the counterfactuality in (18a) is not coming from the complementizer but rather from the additional morphology, and *im* is therefore simply acting as a complementizer in the same way as it would in a hypothetical conditional.

(18) a. *Im hu hayah lokeach   et   ha trufah,   hu hayah   mevri*[7]

       IM he had   take-PTCP DIR-OBJ the medicine he would-be healthy

       'If he had taken the medicine, he would be healthy.'

    b. ** Im hu lakach et   ha trufah,   hu hayah   mevri*

       IM he took   DIR-OBJ the medicine he would-be healthy

       Intended: 'If he had taken the medicine, he would be healthy.'

    c. *Ilu hu {hayah lokeach/lakach} et   ha trufah,   hu hayah   mevri*

       ILU he had   take-PTCP/took DIR-OBJ the medicine he would-be healthy.'

       'If he had taken the medicine, he would be healthy.'

<div align="right">(modified from Nevins, 2002, p. 446)</div>

4.2 Cancellability of CF$_p$

The cancellability of CF$_p$ in EM-languages results from the fact that the falsity of the antecedent is implicated, but not asserted. This follows from the fact that the implicature can be cancelled, as was seen in the Anderson-type examples in (2) and (3).

Under an Iatridovian system, cancellability arises in EM counterfactuals because rather than asserting that the actual world is a $\neg p$ world, they implicate that the actual world is excluded from the p worlds we are talking about. In other words, cancellability would be predicted to be a property of

exclusion, rather than of counterfactuality itself (Nevins, 2002). Thus, CF_p is predicted to always be cancellable in EM languages.

Following the logic above, Nevins provides data suggesting that CF_p is not cancellable in non-EM languages. The example in (19) is based on the Anderson-type example, and shows that it is infelicitous to cancel CF_p in Mandarin.

(19) * *Yaobushi   ta   mei   you   fengzhen, tade pifu shang*
    If-not-that she didn't have measles, her skin surface

hui   you   bao.   Qishi,   yinwei tade pifu   shang
will have bumps. Actually, since   her skin surface

xianzai you zheiyang   de bao,   ta   haoxiang   you
now   has those-kind of bumps, she appears-to have

fengzgen
measles

Intended: 'If it were the case that she has measles, she would have bumps on her skin. Actually, since she does have those kind of bumps on her skin now, she appears to have the measles.'

(Nevins, 2002, p. 448–449)

However, as Nevins points out, this should not be surprising given that cancellability is a property of the exclusion operator. Therefore, in non-EM languages which mark counterfactuality by alternate means, we should not expect cancellability. By virtue of being non-cancellable, non-EM counterfactuals do not implicate the falsity of the antecedent in the actual world. Rather, non-EM counterfactual morphology must be either presupposing or asserting that the antecedent is false. Nevins notes that it is difficult to ascertain whether it is the former or the latter; however, at least in Mandarin it seems to be the former, as shown by (20). This is because Speaker B interjects with surprise, presumably because Speaker A's money getting stolen was not already in the common ground.

(20)   A: *Yaobushi wode qian bei tou le, wo keyi gei ni mai kafei.*
    'If not for the fact that my money was stolen, I could buy you a coffee.'
    B: *Ai, wo bu zhidao nide qian bei tou le! Zheige hen kexi a!*
    'Oh, I didn't know that your money was stolen–that's a pity.'   (Nevins, 2002, p. 449n)

However, as was previously mentioned, *yaobushi* conditionals are NCs. It has been argued that the counterfactual inference in conditionals marked with *yaobushi* is asserted, while in ambiguous conditionals marked with *yaoshi* it is implicated (Yang, 2007, p. 161–163). Whether we take the counterfactual inference in *yaobushi* NCs to be asserted (Yang, 2007) or presupposed (Henderson, 2010), we should not expect the inference to be cancellable either way.

If the counterfactual inference in *yaoshi* conditionals is implicated, then we should expect said inference to be cancellable. We present in (21) a variant of the Anderson-type example which utilizes the *yaoshi* complementizer. In such a construction, it is felicitous to cancel CF_p.

(21) *Yaoshi ta you fengzhen, tade pifu shang hui you*
      If-that she have measles, her skin surface will have

      bao. Qishi, yinwei tade pifu shang xianzai you
      bumps. Actually, since her skin surface now has

      zheiyang de bao, ta haoxiang you fengzhen
      those-kind of bumps, she appears-to have measles.

      'If it were the case that she has measles, she would have bumps on her skin. Actually, since she does have those kinds of bumps on her skin now, she appears to have the measles.'

Under an Iatridovian system, this cancellability arises due to the presence of exclusion. One possible explanation for the data in (21) is that, unlike *yaobushi*, the complementizer *yaoshi* is not responsible for the counterfactual inference. Rather, we might argue that there is indeed exclusion morphology present somewhere in the antecedent, as was the case in (a) with Hebrew *im*. However, there is no clear candidate which can be motivated as fulfilling that role, especially since there is no change in morphology between the indicative and counterfactual readings of a *yaoshi* conditional, as shown in (16).

We have shown that CF_p is not cancellable in *yaobushi* counterfactuals, but can be cancelled in *yaoshi* conditionals. We now turn to the cancellability (or not) of CF_p in Hebrew. Since Nevins does not provide an example of CF_p-cancellation in Hebrew, we provide in (22) the translation of the Anderson-type example, analogous to that in (21). The Hebrew example in (22) is grammatical when using *im*, but contentious amongst our consultants when using *ilu*.

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(22) *Im/?Ilu Dan haya bolea   ra'al   hayu lo*
    IM/ILU Dan was swallow poison were to-him

    bediyuk et   ha-simptomim she yesh lo
    exactly DIR-OBJ the-symptoms that are to-him

    az savir   she hu bala   ra'al.
    so plausible that he swallowed poison

'If Dan had swallowed poison, he would be showing exactly those symptoms which he is in fact showing, so it's likely that he swallowed poison.'

The Iatridovian exclusionary system provides a possible explanation for the contrast in (22). When *ilu* is utilized, which is a strictly counterfactual complementizer (and not an exclusion operator), CF_p would be predicted to be be non-cancellable. Contrastingly, *im* is simply a hypothetical complementizer. Thus, the presence of a counterfactual reading when using *im* must arise from an exclusion marker present elsewhere in the clause. If such an exclusion marker is present, then Iatridou would predict CF_p to be cancellable, since cancellation is an inherent property of exclusion (and not of counterfactuality). Since the *ilu* and *im* variants contain the same morphology apart from the complementizer, it is possible that the cancellability of CF_p when using *ilu* depends on whether the counterfactuality is interpreted as coming from exclusionary morphology or the counterfactual complementizer. However, it's not immediately clear where this exclusion marker may reside in the antecedent, as there is no second layer of past that may be argued to be 'fake' past.

4.3 Cancellability of CF_q

It was claimed by Nevins that non-EM languages, by virtue of marking counterfactuality by means other than an exclusion operator, cannot cancel CF_p. However, we have shown that this is not the case, at least in Mandarin *yaobushi* NCs and Hebrew counterfactuals marked with *im*. The logical next step is therefore to test whether CF_q is cancellable in such languages.

A possible route for analyzing the generation of CF_q in EM languages is a direct extension of Iatridou's (2000) exclusion-based proposal to the consequent, which we will be exploring in more detail in §6. Such an analysis would require that there be an ExclF marker in the consequent (in addition to

the one in the antecedent). Similarly, non-EM languages would be expected to not contain exclusion morphology in either clause. Therefore, the predicted behavior is that CF_q would be non-cancellable in non-EM languages for the same reasons as CF_p.

To this end, we present novel data from Hebrew and Mandarin showing that CF_q actually *is* cancellable in (at least these two) non-EM languages. The data takes the form of translations of the CF_q-cancellation contexts that were presented in §2.2. The gathering of analogous data for the other non-EM languages studied by Nevins, we leave for future work.

4.3.1 Mandarin

We begin by presenting examples illustrative of *yaoshi/yaobushi* counterfactuals in Mandarin, showing that CF_q can indeed be generated in such constructions. The sentences in (23) both convey an inference that John is not currently 100 years old (CF_q). However, the *yaobushi* conditional in (23a) does not convey the falsity of the antecedent (i.e. it is not the case that John is dead), but rather conveys that John is in fact dead. Conversely, (23b), which utilizes the complementizer *yaoshi*, conveys an inference that the antecedent is false. Namely, an inference that John is not still alive.

(23)   a.   *Yaobushi   John si   le, ta jiu yijing   yibai sui   le.*
            If-not-that John dead ASP he will already 100   year ASP
            'If John weren't dead, he would be 100 years old.'

      b.   *Yaoshi John hai   huo-zhe, ta jiu yijing   yibai sui   le.*
            If-that John still live-ASP he will already 100   year ASP
            'If John were still alive, he would be 100 years old.'

The first CF_q-cancellation context is the *also* context, first presented in (4). The counterfactual conditional in (24a), when uttered in isolation, conveys both that the person in question is mean and that he doesn't have many friends. However, when *haishi* 'also' is added to the consequent and the resulting sentence, shown in (24b), is uttered in response to a statement like "John is very rich and his

wealth has gotten him quite a few friends", the inference that he doesn't have many friends (CF$_q$) goes away.

(24) a. *Yaobushi   ta xingge   cha, ta jiu hui   you   henduo pengyou.*

If-not-that he character bad, he will have many friend

'If he hadn't been mean, he would have had many friends.'

b. *Dui, buguo yaobushi   ta xingge   cha, ta haishi hui   you   henduo pengyou.*

Yes, but   if-not-that he character bad, he also   will have many   friend

'Yes, but if he hadn't been mean, he would also have had friends.'

We again illustrate CF$_q$-cancellation in the *also* context, but this time using *yaoshi* in (25). As before, the conditional in isolation generates CF$_q$, the inference that he does not have many friends, as in (25a). When embedded in the same context as above, the sentence in (25b) no longer generates CF$_q$.

(25) a. *Yaoshi ta xingge   hao,   ta jiu hui you   henduo pengyou le.*

If-that he character good, he will have many friend ASP

'If he had been nice, he would have had friends.'

b. *Dui, buguo yaoshi ta xingge   hao,   ta haishi hui you   henduo pengyou de.*

Yes, but   if-that he character good, he also   will have many   friend   ASP

'Yes, but if he had been nice, he would have had friends.'

Next, we turn to the *still* context for CF$_q$-cancellation, exemplified by (5). In isolation, the *yaobushi* conditional in (26a) conveys an inference that we were not on time. Consider a situation in which an interlocutor asserts "We're on time because we've taken the road I said we should take". In response, it's not necessarily felicitious to utter (26b).

(26) a. *Women yaobushi   zhou zhe yi-tiao   lu,   jiu hui lai-de-ji le.*

We   if-not-that walk this one-CLASS road, will be   on-time ASP

'If it weren't the case that we took this road, we would have been here on time.'

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b. *? Women yaobushi zhou zhe yi-tiao lu, haishi hui lai-de-ji.*

　　We if-not-that walk this one-CLASS road, still be on-time

　　'If it weren't the case that we took this road, we would have still been here on time.'

However, this does not seem to be the case when utilizing *yaoshi* instead of *yaobushi*. In isolation (27a) also conveys that we were not on time. However, when uttered in the context posed above, (27b) is not only felicitous but also no longer generates the inference that we were not on time (CF$_q$).

(27) a. *Women yaoshi mei zhou zhe yi-tiao lu, jiu hui lai-de-ji le.*

　　We if-that not walk this one-CLASS road, will be on-time ASP

　　'If it were the case that we hadn't taken this road, we would have been here on time.'

　　b. *Women yaoshi mei zhou zhe yi-tiao lu, haishi hui lai-de-ji.*

　　We if-that not walk this one-CLASS road, still be on-time

　　'If it were the case that we hadn't taken this road, we would still have been here on time.'

Finally, we turn to the listing context, illustrated in (7). The CF$_q$-cancellation behavior of *yaobushi* and *yaoshi* is exactly the same in the listing context. When the conditional is uttered in isolation, as in (28a) and (29a), an inference is generated such that you did not see a shooting star. Now consider a scenario in which an interlocutor says "I went outside at 10:22 and I saw a shooting star!". In response, one can utter either (28b) or (29b) felicitously. In both cases, the inference that you did not see a shooting star is no longer present.

(28) a. *Yaobushi ni 9:41 zai shinei, jiu hui kan-dao yi-ke liuxing.*

　　If-not-that you 9:41 at inside, will be see-PERF one-CLASS shooting-star

　　'If you had gone outside at 9:41, you'd have seen a falling star.'

b. *Na mei shenme   tebie. Yaobushi ni 9:41 zai shinei,*
that not something special if-not-that you 9:41 at inside

jiu hui kan-dao yike   liuxing.   Yaobushi   ni
will be see-PERF one-CLASS shooting-star if-not-that you

9:54 zai shinei, jiu hui kan-dao yike   liuxing.
9:54 at inside will be see-PERF one-CLASS shooting-star

Yaobushi   ni   10:40 zai shinei, jiu hui kan-dao
if-not-that you 10:40 at   inside will be see-PERF

yi-ke   liuxing.
one-CLASS shooting-star

'Well that's not so special. If you hadn't been inside at 9:41, you'd have seen a falling star. If you hadn't been inside at 9:54, you'd have seen a falling star. If you hadn't been inside at 10:40, you'd have seen a falling star…'

(29) a. *Yaoshi ni   9:41 chu-men le, jiu hui kan-dao yi-ke   liuxing   le.*
If-that you 9:41 exit-door ASP, will be see-PERF one-CLASS shooting-star ASP

'If you had gone outside at 9:41, you'd have seen a falling star.'

b. *Na mei shenme   tebie. Yaoshi ni   9:41 chu-men*
that not something special if-that you 9:41 exit-door

le, jiu hui kan-dao yi-ke   liuxing   le. Yaoshi
ASP will be see-PERF one-CLASS shooting-star ASP if-that

ni 9:54 chu-men le, jiu hui kan-dao yi-ke
you 9:54 exit-door ASP will be see-PERF one-CLASS

liuxing   le. Yaoshi ni   10:40 chu-men le, jiu
shooting-star ASP if-that you 10:40 exit-door ASP will

hui kan-dao yi-ke   liuxing   le.
be see-PERF one-CLASS shooting-star ASP

'Well that's not so special. If you had gone outside at 9:41, you'd have seen a falling star. If you had gone outside at 9:54, you'd have seen a falling star. If you had gone outside at 10:40, you'd have seen a falling star.'

4.3.2 Hebrew

As explained earlier in this section, Hebrew counterfactuals may be marked with the complementizers *ilu* and *im*, where the former is strictly counterfactual and the latter may be interpreted counterfactually when certain morphological criteria are met. As an illustration of a typical Hebrew counterfactual, we present (30). When uttered, (30) generates CF_p, that Dan is not in fact alive, as well as CF_q, that Dan is not in fact 90 years of age.

(30)   *Ilu dan haya ba-xayim hu haya ben 90.*

        ɪʟu Dan was in-life   he was of 90

        'If Dan were alive he would be 90.'

We now turn to the *also* cancellation context in (31). When uttered in isolation, the conditional in (31a) conveys an inference that the person in question was not nice, nor did he have any friends. Consider a scenario in which two acquaintances are attending John's funeral. Upon hearing his acquaintance state that 'John was very rich, and his wealth has gotten him quite a few friends', the speaker responds with the sentence in (31b). The speaker's utterance no longer holds the inference that John had no friends, since an alternate cause for John's having friends has been introduced into the discourse.

(31) a. *Im/ilu hu haya nexmad, hayu lo   xaverim.*

          ɪm/ɪʟu he was nice   were to-him friends

          'If he had been nice, he would have had friends.'

     b. *Ken, aval im/ilu hu haya nexmad, gam hayu lo   xaverim.*

          Yes but ɪm/ɪʟu he was nice   also were to-him friends

          'Yes, but if he had been nice he would also have had friends.'

The next CF_q-cancellation context is the *still* context. When in isolation, the conditional in (32a) generates both CF_p and CF_q, that we did not take the other road and that we were not on time,

respectively. When *still* is added as in (32b), CF_q is no longer generated, while CF_p remains.

(32) a. *Ilu/im hayinu lokxim et   ha-derex ha-shniya, hayinu megi'im ba-zman.*

ILU/IM were taking DIR-OBJ the-road the-second were arrive on-the-time

'If we'd taken the other road, would have been here on time.'

   b. *Ilu/im hayinu lokxim et   ha-derex ha-shniya, adayin hayinu megi'im*

ILU/IM were taking DIR-OBJ the-road the-second still   were arrive

   ba-zman.

on-the-time

'If we'd taken the other road, we would still have been here on time.'

Finally, we turn to the *listing* context. As in the previous examples, the conditional in isolation shown in (33a) generates both CF_p and CF_q. In a context where an individual excitedly says 'I went outside at 10:22 and saw a falling star!', the speaker can respond with the utterance in (33b). In this case, there is no longer an inference that you did not see a falling star.

(33) a. *Ilu/im hayita yoce   be-9:41 hayita roe koxav nofel.*

ILU/IM were go-out at-9:41 were see star   falling

'If you had gone outside at 9:41, you'd have seen a falling star.'

   b. *Ilu/im hayita yoce   be-9:41 hayita roe koxav*   'If you had gone outside at 09:41,

ILU/IM were go-out at-9:41 were see star   you'd have seen a falling star. If

   nofel.   Ilu/im hayita yoce   be-9:45 hayita   you had gone outside at 9:54,

falling ILU/IM were go-out at-9:54 were   you'd have seen a falling star. If

   roe   koxav nofel.   Ilu/im hayita yoce   you had gone outside at 10:40,

see   star   falling ILU/IM were   go-out   you'd have seen a falling star...'

   be-10:40 hayita roe koxav nofel.

at-10:40 were see star   falling

4.4 Summary of cancellation behavior

Contrary to what would be predicted under an Iatridovian system, non-EM languages are able to cancel CF_q. In the Hebrew data presented in this section, we saw that both *im* and *ilu* counterfactuals were able to cancel CF_q in all three contexts: *also*, *still*, and the listing context. Further, we saw that while Anderson-type conditionals using *im* are grammatical, this is not necessarily the case for their *ilu* counterparts. As was mentioned previously, it is possible that there is indeed exclusion morphology present in these examples that are generating the (therefore cancellable) counterfactual inferences. Independent motivation for where the presence of such exclusion morphology is left for future work.

A greater challenge to an Iatridovian exclusionary account comes from the Mandarin data. For the *yaoshi* counterfactuals, which are more closely analogous with English counterfactuals, all of the cancellation contexts were grammatical (for both CF_p and CF_q). Since *yaoshi* conditionals are ambiguous between an indicative and counterfactual reading, it is possible that there is indeed exclusion morphology present that allows for the cancellation of counterfactual inferences. However, *yaobushi* NCs cannot cancel CF_p in an Anderson-type context, and yet can cancel CF_q in at least the *also* and listing contexts. Being a distinctly counterfactual complementizer, the non-cancellability of CF_p must arise from the lack of exclusion, as per Nevins (2002). However, if this is the case, we would expect CF_q to also not be cancellable, which we find to not be the case.

5 Counterfactuality sans exclusion

Before formalizing an exclusionary account of counterfactuality, we present a viable alternate mechanism for generating CF_q. In his dissertation, Tellings (2016) provides a framework for analyzing counterfactuality as a dicourse phenomenon, focusing on CF_q. By looking at cases where CF_q gets cancelled, Tellings can explore the conditions necessary for CF_q to arise. He identifies the unifying property amongst these as being that they are *multiple cause contexts*, such that they make salient more than one cause for the same consequent. Based on reasoning sketched by Karttunen (1971), he argues that conditional perfection (CP) is a necessary ingredient for CF_q to be generated. Therefore, the ultimate prediction is that if a conditional does not have CP, then CF_q will not be generated.

5.1 Multiple cause contexts

The contexts which Tellings identified as exhibiting cancellation of CF_q are those in (4)–(8). He also points out that all of these contexts share the property that they provide multiple salient causes for the same consequent. For instance, in (4), which is repeated in part below, there are two salient causes for John having friends. Speaker A suggests that John's wealth is a cause for his having many friends, and Speaker B then suggests another possible way for John to acquire friends would have been to be nice.

[(4), repeated]   A: John is very rich and his wealth has gotten him quite a few friends.

B: Yes, but if he had been nice he would *also* have had friends.

Perhaps more transparently, in the listing context from (7), repeated below, going outside at any of the mentioned times is a plausible and sufficient cause for seeing a shooting star.

[(7), repeated]   A: I went outside at 10:22pm, and I saw a falling star!

B: Well, that's not so special. If you had gone outside at 9:41pm, you'd have seen a falling star, if you had gone outside at 9:54pm, you'd have seen a falling star, if you had

gone outside at 10:40pm, you'd have seen a falling star,... There were lots of falling

stars tonight.

Having established that CF_q-cancellation contexts seem to all be multiple cause contexts, we must

now ask the question of wether, and if so how, the act of being a multiple cause context relates to the

generation (or not) of CF_q.

5.2 Karttunen's schema

In order to lay out the role that multiple cause contexts play in the generation of CF_q, we must first

provide a mechanism by which CF_q can be generated. Tellings proposes that counterfactuality (at least

CF_q) is a discourse phenomenon, which should be analyzed along the lines of what he dubs *Karttunen's*

schema, presented in (34).

Karttunen (1971) proposes that the implicature CF_q is generated by means of a conditional per-

fection: the strengthening of a conditional into a biconditional (i.e. strengthening from $p \rightarrow q$ into

$p \rightarrow q \wedge \neg p \rightarrow \neg q$). This mechanism proceeds as follows. Given the utterance of a conditional $p \rightarrow q$

where the hearer both infers CF_p and undergoes conditional perfection, by Modus Ponens the hearer

can also infer CF_q. Note that this analysis makes no assumptions about how CF_p is generated, it merely

assumes that CF_p was generated by some means.

(34)   Karttunen's schema   (Karttunen, 1971, as cited by Tellings, 2016, p. 120)

      Utterance: $p \rightarrow q$

      Implicatures: $\neg p$ (counterfactuality of p)

                        $\neg p \rightarrow \neg q$ (conditional perfection on $p \rightarrow q$)

                        $\neg q$ (by Modus Ponens)

The relevant prediction upon adopting Karttunen's schema is thus that (assuming CF_p has been

generated by some mechanism) whether or not the conditional undergoes perfection modulates

whether or not CF_q is generated. If this is indeed the case, we should find that the CF_q-cancellation

contexts discussed above are ones where conditional perfection does not occur. Further, Tellings predicts that multiple-cause contexts are ones where conditional perfection is blocked, and therefore CF_q cannot be generated.

5.2.1 Augmenting Karttunen's schema for subjunctive conditionals

Before moving on, some revisions must be made to Karttunen's schema. Karttunen's schema, as presented in the previous section, does not allow for perfection of subjunctive conditionals. Karttunen assumed that the asserted content of a counterfactual conditional was the corresponding indicative conditional, and it is on this content that the inferences he describes take place. Thus, Karttunen's schema as presented above is at odds with a semantics which assigns different assertive content to indicative and subjunctive conditionals.

For indicative conditionals, the premises of Modus Ponens can be uttered in the same context. For instance, (35a) and (35b) may be uttered felicitously in the same context.

(35) a. It rains.

b. If it rains, John brings his umbrella.

However, the same is not true in counterfactuals. Because there is an inference that p is contrary to fact, it is incompatible with the utterance of p in the same context. Thus, in any context where $p \boxright q$ can be uttered[8], one cannot felicitously also utter p, exemplified by (36). In other words, the contexts that admit p and $p \boxright q$ are disjoint.

(36) a. It is raining.

b. #If it were raining, John would bring his umbrella.   (Tellings, 2016, p. 129)

If we assume, analogously to indicatives, that conditional perfection for subjunctive conditionals amounts to the strengthening of $p \boxright q$ into the conjunction of $p \boxright q$ and $\neg p \boxright \neg q$, we run into a problem. The contexts which admit $p \boxright q$ and $\neg p \boxright \neg q$ are disjoint. This is because the

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[8]We use the box-arrow notation, $\boxright$, in the standard Lewisian sense to refer to subjunctive *would*-conditionals.

former imiplicates $\neg p$ while the latter implicates $\neg\neg p$, or p. For this reason, (37a) and (37b) cannot be felicitously uttered in the same context.

(37)   a.   If you had mowed the lawn, I would have given you \$5.

   b.   If you hadn't mowed the lawn, I wouldn't have given you \$5.   (Tellings, 2016, p. 129)

These pragmatic restrictions, however, do not mean that conditional perfection does not occur in counterfactuals. They still undergo perfection in the sense that a sufficient condition is elevated in status to that of a necessary condition. Horn remarks on this notion as follows:

> …what I *say* is that in the closest world to the actual one in which you mowed the lawn, I gave you \$5; what I *implicate* is that in that world I gave you the money (not just *if* but also) *only if* you mowed the lawn. (Horn, 2000, p. 321)

Tellings formalizes Horn's interpretation of conditional perfections in counterfactuals, shown in (38), where R stands for any theory-specific quantificational restriction. While Horn assumes a similarity-ordering semantics for counterfactuals, the notion above is not specific to such an analysis. As Tellings notes, Horn's idea is that perfection takes place under the scope of the universal.

(38)   Horn interpretation of Conditional Perfection

$\forall w'. [R(w, w') \rightarrow (p(w') \rightarrow q(w'))]$ is strengthened to $\forall w'. [R(w, w') \rightarrow (p(w') \leftrightarrow q(w'))]$

(modified from Tellings, 2016, p. 130)

Given this formal notion of what it means for a counterfactual to be perfected, Tellings arrives at a revised version of Karttunen's schema, augmented to account for subjunctive conditionals, presented in (39).

(39) Karttunen's schema (revised version)   (Tellings, 2016, p. 130)

Utterance: $p \mathbin{\square\!\!\rightarrow} q$ in world of evaluation w

Implicatures: $\neg p\,(w)$ (counterfactuality of p)

$R\,(w, w)$ (centering on R)

$\forall w'\,[R\,(w, w') \rightarrow (p\,(w') \leftrightarrow q\,(w'))]$ (CP for subjunctives)

$\neg q\,(w)$ (counterfactuality of q)

In this section, we have outlined Tellings's (2016) proposal for treating counterfactuality (specifically CF_q) as a discourse phenomenom. The only remaining ingredient for this theory is a model of CP, a candidate analysis for which is given in §A. Tellings's (2016) theory can adequately capture both the English and Hebrew CF_q-cancellation data, as well as the Mandarin *yaoshi* counterfactuals. However, the *yaobushi* NCs pose a problem for this theory. By definition, NCs presuppose or assert the factivity of the antecedent. Thus, there is no CF_p, a crucial premise for the reasoning that derives CF_q under Karttunen's schema. It is possible that a Tellingsian analysis could capture the cancellation behavior of *yaobushi* NCs. However, such an account would further necessitate a definition of what it means for NCs to be perfected. This extension of a Tellingsian account, we leave for future work.

6 Formalizing exclusion

6.1 Formalizing ExclF in the antecedent

In §3, we presented Iatridou's (2000) exclusion-based proposal for generating CF_p. However, Iatridou does not actually formalize her proposal. Thus, with the goal of testing the predictions made by an exclusion-based account of counterfactuality, we will attempt to show how one might formalize Iatridou's account.

What was proposed by Iatridou is that the 'fake' past tense morphology in counterfactuals is not interpreted as temporal past, but rather consists of an exclusion operator, ExclF. The exclusion operator in the time domain can be co-opted to range over the world domain, whence it conveys the meaning in (40).

(40)   ExclF in the world domain:

$T(w)$ excludes $C(w)$; the topic worlds exclude the speaker worlds   (Iatridou, 2000, p. 247)

We assume, based on Tellings (2016), that the structure of a conditional looks as in (41), where R is short-hand for a theory-specific restriction over worlds. Given two worlds, R returns true if the second world is accessible from the first.

(41)
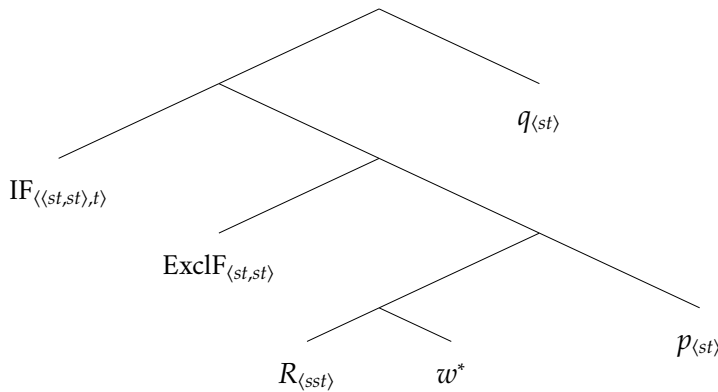
(modified from Tellings, 2016, p. 109)

Before diving into the formalization of ExclF, we must briefly address a failure of the mechanism (noted by Tellings, 2016, p. 111) by which the counterfactual implicatures are generated under Iatridou's proposal. Iatridou claims that the CF$_p$ implicature arises because the speaker "chooses to predicate p of worlds other than the actual one" (Iatridou, 2000, p. 248). However, the asserted content of a conditional is not that p holds of some set of worlds, but rather that what holds is the material implication $p \rightarrow q$, which is a weaker claim. The corresponding implicature would thus be that because the speaker did not assert $p \rightarrow q$ as pertaining to the actual world, the speaker must not believe the materical implication to hold in the actual world, i.e. the speaker believes $\neg (p \rightarrow q)$, which is logically equivalent to $(\neg p \vee q)$. This implicature does not entail that CF$_p$ holds in the actual world. In this work, we will set aside this issue and pretend that, given the appropriate exclusionary relations, the assertion of a conditional results in the implicature that p is contrary to fact in the actual world. In such a manner, we can evaluate the cancellation behavior that would be predicted under a formal exclusion-based account of counterfactuality.

Iatridou (2000) claims that the meaning conveyed by a counterfactual is exactly that of an indicative conditional along with the separate contribution from exclusion. For this reason, we assume exclusion does not alter the asserted content, but rather introduces a definedness condition as in (b). Following Tellings (2016), we take exclusion to be expressed at the propositional level. We utilize S_w to signify the set of worlds epistemically accessible to the speaker from the world of evaluation. ExclF is thus a partial function, taking a proposition and a world as arguments, which is defined only if the worlds in which the proposition holds exclude the epistemic speaker-worlds, S_w. In this manner, the asserted content is exactly that of a non-counterfactual conditional. We further update the denotation of IF in (42e) such that we ensure the partiality of the exclusion operator projects. In other words, if exclusion does not hold, then $[\text{ExclF} [[R \ w^*] \ p]]$ will be undefined, and the whole conditional will subsequently also be undefined. In order to ensure that we are checking for accessibility from the world of evaluation, we introduce w^*, as in (42c), which simply picks out the world of evaluation, and composes with R as in (42d). Further, $R (w^*)$ composes with p via PREDICATE MODIFICATION.

(42)　a.　IF [ExclF [[$R \ w^*$] p]] [q]

b. $[\![\text{ExclF}]\!]^w = \lambda p_{\langle s,t\rangle}.\lambda w' : [\{w'' \mid p(w'') = 1\} \cap S_w = \varnothing].p(w') = 1$

c. $[\![w^*]\!]^w = w$

d. $[\![R(w^*)]\!]^w = \lambda w'.R(w,w') = 1$ iff w' is accessible from w

e. $[\![\text{IF}]\!]^w = \lambda P_{\langle s,t\rangle}.\lambda Q_{\langle s,t\rangle} : [P$ is defined in $w].\forall w'.P(w') \to Q(w')$

The new denotations above now provide adequate truth conditions, as well as conveying the separate contribution of exclusion, as intended by Iatridou (2000). However, Iatridou notes that in the languages under discussion in her paper (e.g. English and Modern Greek), it appears that ExclF must appear in both clauses (Iatridou, 2000, p. 268)[9]. We further note that the only examples of English conditionals of which we are aware that implicate CF_p but not CF_q are exactly the CF_q-cancellation cases discussed in §2.2. One might argue that (42a) is thus the appropriate LF for said CF_q-cancellation cases. If this were the case, we would need an explanation of how the addition of *also* or *still* results in the prescence of ExclF in only the antecedent, but not the consequent. We will not pursue this further, and instead focus on exploring the ramifications of having ExclF also appear in the consequent.

6.2 Extending ExclF to the consequent

Given Iatridou's (2000) proposal, we take CF_q to be the implicature that the worlds epistemically accessible to the speaker are excluded by the q-worlds. We assume that ExclF is formalized as in (42b). In order for the aforementioned exclusionary relations to arise, ExclF must be semantically composed with q, and so an instance of ExclF must be present in the consequent. The structure for a counterfactual conditional would then include two ExclF markers, as shown in (43).

(43) IF [ExclF [[$R\ w^*$] p]] [ExclF q]

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[9]Iatridou also points out that in language like Japanese or Korean, it appears to be sufficient for ExclF to appear only in the antecedent (Iatridou, 2000; Cho, 1997). It is possible that such in such a language, the denotations/LF in (42) prove adequate. However, languages that do not mark counterfactuality in the antecent but still have CF_p seem to pose a problem for this analysis. This has been claimed to be the case in Navajo (Nevins, 2002, p. 444n) and in Imbabura Quichua (Tellings, 2016, p. 109n).

The first and most immediate question posed by (43) is how ExclF is realized in the consequent, and how it can be argued that ExclF is indeed present in the consequent. In the antecedent, there was a clear and motivated realization for ExclF, namely the past-tense morphology. However, Iatridou claims that in English, ExclF must be present in the consequent, but does not provide an answer to the question at hand. Following Tellings (2016), we claim that there are three possibilities, shown in (44).

(44) Possible realizations of ExclF in the consequent: (Tellings, 2016, p. 112)

- in 'would' (=woll+PAST)

- in another morpheme

- as a null morpheme

The latter two possibilities are unlikely, given that Iatridou's proposal states that an exclusion operator in one domain (e.g. time or space) is co-opted into interpretation in a different domain (e.g. worlds). Therefore, it seems unreasonable to expect some other morpheme that does not already express exclusion to be the realization of ExclF. The only exclusion morphology present in the consequent is therefore the past-tense component of *would*, where it is analyzed as the modal *woll* plus the past tense (Abusch, 1997). As shown in §3.2.1, there is cross-linguistic support for this borrowing of exclusion markers between different domains. One such example comes from Burmese, where the particle *khé* normally expresses spatial exclusion, but can be co-opted in counterfactuals as well (see (14) in this work, from Nevins, 2002, p. 442).

Despite *would* being the only feasible realization of ExclF in the consequent, Tellings notes that independent motivation for claiming the presence of ExclF in the consequent is missing. The presence of ExclF in the antecedent could be argued for due to the fact that past tense morphology can be interpreted in ways other than its normal temporal manner. For instance, an antecedent containing past tense morphology can be interpreted as future-oriented, as in (45).

(45) If John ran the marathon tomorrow, he would win.   citep[p. 114]tellings

However, this same argument cannot be made for the presence of ExclF in the consequent, since *would* can already receive a future interpretation.

An alternate motivation for ExclF in the consequent has been argued to be the possibility that the tense morphology in the consequent is in agreement with that of the antecedent (Arregui, 2004; Arregui, 2007, p. 234; Iatridou, 2000, p. 268). However, the verbal morphology between p and q in subjunctive conditionals is not always the same, such as in (46). Thus, an agreement-based treatment of tense morphology in subjunctive conditionals would necessitate delineating the conditions that are sufficient for the two clauses to not be in agreement.

(46)   If Napoleon was tall, he would have defeated Wellington

Putting aside concerns regarding independent motivation for including ExclF in the consequent, we assume that ExclF is realized in the past tense component of *would*, resulting in the LF in (47a). The denotation of a conditional is updated, as in (47c), such that the proposition P entails the definedness of Q. The denotation of ExclF is as before, meaning that the conditional is defined only if both the q-worlds and the restricted p-worlds are disjoint from the epistemic speaker-worlds, S_w.

(47)   a.   IF $[\text{ExclF} \, [[R \; w^*] \; p]] \; [\text{ExclF} \; q]$

      b. $[\![\text{ExclF}]\!]^w = \lambda p_{\langle s,t \rangle}.\lambda w' : [\{w'' \mid p(w'') = 1\} \cap S_w = \varnothing] . p(w') = 1$

      c. $[\![\text{IF}]\!]^w = \lambda P_{\langle s,t \rangle}.\lambda Q_{\langle s,t \rangle} : [P \text{ is defined in } w \wedge (P(w) = 1 \rightarrow Q \text{ is defined in } w)].$
            $\forall w'.P(w') \rightarrow Q(w')$

The denotations in (47) thus give rise to adequate truth-conditions for a counterfactual conditional, with the appropriate exclusions being presupposed. Continuing to assume that the counterfactual implicatures are generated according to Iatridou's (2000) account, we consider the cancellation properties of such an analysis. The cancellation of CF_q amounts to showing that the proposition q holds in the world of evaluation. Assuming that S_w is reflexive (i.e. the world of evaluation is epistemically accessible from itself), if q holds in w, then the q-worlds and S_w are no longer disjoint. This does not affect any change in the disjoint relationship between the relevant p-worlds and S_w. Therefore,

CF$_q$ can be cancelled independently of CF$_p$. As for the antecedent, cancellation of CF$_p$ amounts to showing that p holds in w, resulting in the relevant p-worlds and S$_w$ no longer being disjoint. The asserted material conditional corresponds to the assertion that the relevant p-worlds are a proper subset of the q-worlds. Thus if the relevant p-worlds are not disjoint from S$_w$, then the q-worlds are necessarily also not disjoint from S$_w$. Therefore, the cancellation of CF$_p$ necessitates the cancellation of CF$_q$ in conjunction.

The above asymmetry in the cancellation properties of counterfactual implicatures is predicted by Tellings's (2016) theory, which we presented in §5. CF$_p$ is a necessary premise for the reasoning in Kartunnen's schema. Thus, cancellation of CF$_p$—or rather a lack of CF$_p$ in the first place—blocks the generation of CF$_q$. While this prediction is desirable, we see no mechanism by which the system outlined in this section can explain the distribution of CF$_q$-cancellation cases. More specifically, it provides no explanation for how *also*, *still*, and the listing contexts result in CF$_q$-cancellation. The multiple-cause nature of CF$_q$-cancellation contexts strongly suggests the need for a treatment of counterfactuality as a discourse phenomenon, as in Tellings (2016), and not merely a semantic one.

A formalization of exclusion-based counterfactuality thus can produce the correct presupposed exclusion as well as predict the desired asymmetrical cancellation properties of counterfactuals. However, it has yet to be shown how such a system can generate the correct counterfactual implicatures. As discussed earlier in this section, the asserted content is the material conditional and not p itself. Thus, following Iatridou's (2000) logic, an interlocutor would infer that because the speaker uttered $p \rightarrow q$ of a set of worlds other than the actual world, the speaker must not believe $p \rightarrow q$ to be true of the actual world. In other words, the speaker must believe the actual world to be a p-world, but not a q-world. Thus, we generate CF$_q$, but not CF$_p$. Such a pattern is not attested, as far as we are aware.

Appendix A. Conditional perfection

CF_q-cancellation has been identified as occurring in multiple cause contexts, and has been argued to be generated by a mechanism wherein conditional perfection modulates the presence (or lack) of CF_q. The revised Karttunen's schema in §5.2.1 tells us what it means for a counterfactual conditional to be perfected. What is thus needed is an analysis of how conditional perfection occurs that explains why multiple cause contexts block perfection.

A.1 Unperfectable conditionals

There are certain classes of conditionals which cannot undergo perfection. These are of special interest because it is exactly in the cases where perfection fails that CF_q is not generated.

One such group of unperfectable conditionals are the semifactual conditionals, also known as concessives or even-if conditionals. Semifactuals being with 'even if' and are characterized by the fact that the consequent is always true. In other words, there is no causal link between then antecedent and consequent. For example, in (8), John's going home has no bearing on whether or not I go home.

(48)   Semifactual conditionals

Even if John goes home, I (still) won't come.

↛ (even) if John doesn't go home, I will not come.

Yet another type of unperfectable conditionals are the 'biscuit conditionals', like that in (49), where rather that p acting as a condition for q, it provides a condition for the felicity of making the speech act in q.

(49)   Biscuit conditionals

If you're hungry, there are biscuits in the cupboard.

↛ If you're not hungry, there are no biscuits in the cupboard.

There are also a group of unperfectable conditionals, first pointed out by Lilje (1972), which Tellings dubs 'discourse unperfectables', shown in (50).

(50) "Discourse unperfectables"

    a. If this cactus grows native to Idaho, then it is not *Astrophytum*.

       $\nrightarrow$ If this cactus doesn't grow native to Idaho, it is an *Astrophytum*.

    b. If you scratched on the eight-ball, then you lost the game.

       $\nrightarrow$ If you didn't scratch on the eight-ball, then you didn't lose the game.

Finally, Tellings makes the claim that multiple cause context conditionals also fall under the umbrella of unperfectable conditionals. He argues that this makes sense intuitively. If there are multiple salient causes for the consequent, the antecedent in question is not a necessary condition for the consequent, and therefore the conditional cannot be perfected. More concretely, upon uttering $p_1 \rightarrow q$ and $p_2 \rightarrow q$, the former cannot be strengthened into the biconditional $p_1 \leftrightarrow q$, because p_2 is another salient condition for q.

A.2 Herburger's truth and whole truth theory

There are two main goals that must be met by a theory of conditional perfection. The first is to provide a mechanism by which an implicature is generated which strengthens a sufficient into a necessary condition. The second is to explain the empirical distribution of conditional perfection. More concretely, why do we not observe conditional perfection in (48)–(50) and multiple cause contexts?

Various attempts have been made to analyze conditional perfection as a classical Q-implicature based on various entailment scales (Van der Auwera, 1997, for a historical overview, see). These theories largely fail to account for the empirical data, providing no explanation for why conditional perfection arises in some contexts but not others. Other attempts have been made to model conditional perfection as an R- or I-implicature (Horn, 2000; Levinson, 2000). Such accounts have been criticized

for being less lexicalized and more context-dependent than normal R-implicatures (Herburger, 2015, p. 619), as well as for issues pertaining to how R-implicatures are computed as the discourse progresses (Tellings, 2016, p. 138).

Herburger (2015) provides a treatment of conditional perfection as a type of exhaustification. Previous work has suggested a connection between exhaustive answers and conditional perfection (Groenendijk and Stokhof, 1984; Van Rooij and Schulz, 2004; Von Fintel, 2001). For example, in an interrogative discourse such as that in (51), when the answer is taken to be exhaustive, it means 'only if Mary walks', giving rise to the biconditional meaning.

(51)   Q: Does John walk?

      A: (John walks) if Mary walks.   (Groenendijk and Stokhof, 1984, p. 324)

The account proposed by Herburger (2015), can be thought of as a grammatical Q-implicature. It has its roots in Chierchia et al. (2012), who propose an analysis of scalar implicature as arising by means of an implicit syntactic exhaustivity operator, often named *Exh* or O_{ALT}. This operator can be defined over sentences, as in (52), such that the exhaustified interpretation of a sentence S is true just in case S itself is true and all of the contextually relevant alternatives that are not already entailed by S are false.

(52) $[\![Exh\ S]\!]\,(w) = 1$ iff $[\![S]\!]\,(w) = 1 \land \forall q \in \text{ALT}.\,(S \nsubseteq q \rightarrow q\,(w) = 0)$ (Tellings, 2016, p. 140)

The set of alternatives, ALT, is given by focus on the scalar element. For instance, the focused element in (53a) (shown in uppercase) provides the scalar alternatives in (53b)–(53c).

(53)   a. p: If you work HARD you succeed.

      b. p': If you work LITTLE you succeed.

      c. p'': If you DON'T WORK AT ALL you succeed.   (Herburger, 2015, p. 620)

Where Herburger (2015) deviates from Chierchia et al. (2012) is in claiming that in some cases, exhaustification amounts to not simply *Exh S*, but rather the conjunction $S \land Exh\ S$, where the second

conjunct is not pronounced. In (54), *Exh* appears as *only*, and the crossed-out material is unpronounced. The pronounced first conjuct in (54a) conveys its usual meaning such that working hard is a sufficient condition for success. Further, the silent conjunct expresses that hard work is a necessary condition for success. Thus, what remains is to explain how we obtain this meaning from the *only if* conditional.

(54)   a.   If you work HARD you succeed ~~and only if you work HARD do you succeed~~

      b.   Ben ate SOME of the biscotti ~~and Ben only ate SOME of the biscotti~~

<div align="right">(Herburger, 2015, p. 621)</div>

Only if conditionals express necessary conditions, such as in (55). Under the assumption that *only* contributes the same meaning as *Exh* in (52), a universal analysis of conditionals will predict that *only* simply rules out that all alternative cases are *q*-cases. In other words, we would predict that you do not succeed in all cases such that you work little, in all cases such that you don't work at all, etc. However, (55) does not deny that all cases of not working hard lead to success, but rather says that no such cases lead to success. It conveys that in any case where you do anything other than working hard, you will not succeed.

(55)   Only if you work hard do you succeed.   (Herburger, 2015, p. 621)

Under a universal account of conditionals, we would predict (55) to entail that success is guaranteed by hard work. However, *only if* conditionals don't suggest that the antecedent is a sufficient condition for the consequent–this would be similar to a biconditional. This contrast is exemplified in (56). The *only if* conditional in (56a) can be, without contradiction, followed by an assertion that the prejacent is not a necessary condition. Conversely, the biconditional in (56b) cannot precede the same assertion.

(56)   a.   Only if you work hard do you succeed but hard work does not guarantee success.

      b. # If and only if you work hard you succeed but hard work does not guaranteed success.

<div align="right">(Herburger, 2015, p. 622)</div>

This overly-strong presupposition that is generated by the prejacent of *only* seems to persist as long as we assume that antecedent of the conditional exerts universal force. This seeming difference in quantificational force of conditionals in contexts of differing monotonicities was first observed by Higginbotham (1986). As a solution, Herburger (2015) proposes what is essentially a theory of ambiguity by means of Conditional Duality, presented in (57). We note that Herburger's ambiguity approach has been criticized due to the behavior of bare conditionals in non-monotonic contexts as well as ellipsis constructions where the antecedent and the elided material are in environments of different monotonicity (Bassi and Bar-Lev, 2018).

(57) Conditional Duality:

Normally, bare conditionals have universal force but in downward entailing contexts, bare conditionals have, all things being equal, existential force.   (Herburger, 2015, p. 622)

Adopting conditional duality, a perfected conditional thus looks like the conjunction in (58a). The conditional in the first conjunct, not being in a downward-entailing environment, exhibits universal quantificattion. However, the conditional in the second (silent) conjunct, under the scope of exhaustification, receives existential force[10]. We shall further illustrate this using the working hard example in (54a). The pronounced conjunct receives a universal interpretation as in (58b), conveying that in all relevant worlds where you work hard, success is attained. The second conjunct, under the scope of *Exh*, receives existential interpretation as in (58c). This silent clause thus conveys that for each contextually restricted alternative, there is no world such that it leads to success. In other words, working little does not lead to success, working sometimes does not lead to success, not working does not lead to success, etc.

(58) a. $(p \rightarrow q) \wedge Exh\,(p \rightarrow q)$

b. $\forall w'\,[(R\,(w, w') \wedge p\,(w')) \rightarrow q\,(w')]$

in all relevant worlds where you work hard, you succeed

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[10]While *only* is not classically downward entailing, it is Strawson downward entailing (Von Fintel, 1999). Like Tellings (2016), we assume that Herburger (2015) intended this weaker condition for interpreting conditionals with existential force.

c. $\forall p' \in \text{ALT}.\neg\exists w' \, [R\,(w, w') \wedge p'\,(w') \wedge q\,(w')]$

      there is no world such that working little results in success

      there is no world such that not working at all results in success

      …   (modified from Tellings, 2016, p. 142)

A.2.1 Exhaustivity and multiple cause contexts

Having laid out a candidate theory of Conditional Perfection, we must now make clear the connection between Conditional Perfection and exhaustivity. If we thought that exhaustiveness arises only from embedding under *Exh*, then we would expect *if*-clauses given as exhaustive answers to pattern like *only if* answers. We find that the *only if* answer in (59c) entails you do not swim when not on vacation. However, the *if*-clause in (59b) only entails it when read exhaustively. In other words, under an exhaustive reading, (59b) implies that you swim regularly when on vacation, whereas (59c) means that there are some morning swims when on vacation (but only when on vacation, and not otherwise). This suggests that when (59b) is an exhaustive answer, it is interpreted as *S ~~and only S~~*.

(59)   a.   Do you ever go swimming in the morning?

      b.   If I'm on vacation.

      c.   Only if I'm on vacation.   (Herburger, 2015, p. 626)

Tellings (2016) notes that in Herburger's framework, the fact that conditionals in multiple cause contexts don't get perfected can be "derived very naturally" (Tellings, 2016, p. 144). In a situation where the utterance $p_1 \rightarrow q$ is followed by $p_2 \rightarrow q$, two salient causes for the same consequent have been introduced. The exhasutified interpretation for the latter, $[p_2 \rightarrow q] \wedge Exh\,(p_2 \rightarrow q)$, cannot be intended, because the alternative cause p_1 is in direct conflict with the interpretation. In other words, p_2 cannot be interpreted as a necessary condition when p_1 is already a sufficient condition.

     To further illustrate this point, Tellings (2016) compares this to (60), where the contrastive topic on *Mary* generates an exclusivity implicature, namely that *only* Mary lives in France. This exclusivity

implicature conflicts with the earlier statement that John lives in France.

(60) #John lives in Frances and [Mary]$_{CT}$ lives in France.   (Tellings, 2016, p. 144)

In order to make the connection between multiple cause contexts and conditionals which are perfected, we must delineate the contextual restrictions on CP, which we can now do by studying restrictions on exhaustive answers. One such instance is mention-some questions, such as that in (61). The question is not a request for an exhaustive list of every place where an Italian newspaper may be purchased, but rather for a single closest or most convenient answer. Thus, because it's not intended to be exhaustified, *Exh* is not applied to the answer.

(61)   Where can I buy an Italian newspaper?   (Groenendijk and Stokhof, 1984, p. 278)

In (37) below, the conditional answer in (62b) is not an exhasutive list (i.e. it may be followed by offering to give $5 for cleaning the garage or taking out the trash), it is a mention-some answer to the QUD in (62a), so *Exh* is not applied.

(62)   a.   How can I earn five dollars?

        b.   If you mow the lawn, I'll give you $5.

Similarly, the "discourse unperfectables" in (50), repeated below, do not undergo perfection because they are not exhaustive answers to the questions 'When is this an *Astrophytum*?' and 'When do you lose the game?'.

[(50), repeated]   a.   If this cactus grows native to Idaho, then it is not *Astrophytum*.

                    b.   If you scratched on the eight-ball, then you lost the game.

Finally, the matter of predicting whether a question is interpreted as requiring a mention-some or mention-all answer is not addressed by Tellings (2016) or Herburger (2015). Work by Groenendijk and Stokhof (1984) reports that mention-some interpretations arise with verbs that are "tied to typical human concerns" (p. 544). Elsewhere in the literature, Rooy (2004) utilizes Bayesian decision theory

to calculate utility values for questions in order to help interlocutors resolve whether a given question is intended to be a mention-some or -all. Like Tellings (2016) and Herburger (2015), we will consider this problem as a pragmatic matter orthogonal to our current goal.

In conclusion, we have laid out a framework by Tellings (2016) which predicts that via Kartunnen's schema, when a subjunctive conditional is not an exhaustive answer to the QUD, the conditional is not perfected, and therefore CF_q is not generated.

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