Prolegomena to a theory of X-marking*

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The goal

The morphological marking that distinguishes conditionals that are called "counterfactual" or "subjunctive" from those that are not called that does not always signal counterfactuality, nor is it consistently "subjunctive". It is often found in other modal constructions, such as in the expression of unattainable desires and in weak necessity modality. We propose to call it "X-marking". In this paper, we lay out desiderata for a successful theory of X-marking and make an initial informal proposal. Much remains to be done.

1 Some terminology

Consider the following pair of sentences:

(1) a. If Miranda knows the answer, Emily knows the answer.
b. If Miranda knew the answer, Emily would know the answer.

While (1a) leaves it open whether Miranda and Emily know the answer and only claims that there is a conditional linkage, (1b) gives rise to a "counterfactual inference": Miranda does not know the answer and Emily does not know the answer. For this reason, (1b) is often called a "counterfactual conditional". This term is misleading, however, because, for one thing, sentences that have the same morphological make-up as (1b) but differ in lexical aspect, for example the following "Future Less Vivid" conditional, do not give rise to a counterfactual inference:

(2) If you left at 5pm, you would arrive there at 7pm.

One doesn't conclude from (2) that you will not leave at 5pm and that you will not arrive there at 7pm.

* We have worked individually and collaboratively on some of the questions discussed in this paper for a long time and thus it's impossible to list the valuable input and feedback we've received over the years. We thank all of our audiences and colleagues for their help.

There are other examples of non-counterfactual "counterfactuals", such as the famous case from Anderson 1951:

(3) If Jones had taken arsenic, he would show exactly the symptoms he is in fact showing.

Clearly (3) can be uttered by someone who believes that Jones has taken arsenic.[1]

Possibly for this reason, a number of philosophers do not use the term "counterfactual conditional" but instead the term "subjunctive conditional". However, this term is also misleading, as the subjunctive mood is neither necessary nor sufficient for such conditionals (Iatridou 2000, 2014).

Some languages (Dutch and English, for example) simply do not have a subjunctive mood but can still construct conditionals of this sort. That subjunctive mood is not necessary can be seen even in languages that otherwise do have a subjunctive like French. French has a subjunctive, for example in the complement of the verb "doubt":

(4) Marie avait un parapluie rouge hier.
Marie had a umbrella red yesterday

'Marie had a red umbrella yesterday.'

(5) Je doute que Marie {ait | *a | *avait} un
I doubt that Marie {have.SUBJ | have.PRS.IND | have.PST.IND} a
parapluie rouge hier.
umbrella red yesterday

'I doubt that Marie had a red umbrella yesterday.'

But the subjunctive is not used in sentences like (1b)/(2)/(3):

(6) Si Marie {avait | *ait} un parapluie rouge, il
if Marie {have.PST.IND | have.SUBJ} a umbrella red, he
{l'aurait | *ait} vu.
{it have.COND | have.SUBJ} seen

'If Marie had a red umbrella, he would have seen it.'

1 Virtually the same example appears in Karttunen & Peters 1979: ex. (4) on p.6 without reference to Anderson's paper.

Instead of the subjunctive, in the antecedent we see a past indicative, and in the consequent, we see the "conditionnel", a concoction of future+past imperfective (Iatridou 2000).

That the subjunctive is not sufficient can be seen in Icelandic, where it appears under I-to-C movement necessarily, without any "counterfactual inference" (Iatridou & Embick 1993, Iatridou 2014):

(7) a. Ef hann hefur farið, kem ég.
if he has.PRES.IND gone, come I

'If he has left, I will come.'

b. Hafi hann farið, kem ég.
has.PRES.SUBJ he gone come I

'if he has left, I will come.'

c. *Ef hann hafi farið …
if he has.PRES.SUBJ gone

d. *Hefur hann farið …
has.PRES.IND he gone

Both (7a) and (7b) are non-counterfactual, non-FLV conditionals. (7a) with the verb in situ has indicative mood, while (7b) with the verb in first position is subjunctive, with no concomitant change of meaning with regards to counterfactuality. (7c,d) show that the mood switch is necessary and conditioned by the position of the verb.

Since neither the term "counterfactual conditional" nor "subjunctive conditional" will do, we propose that we need new terminology, which will have the advantage of not suggesting (right or wrong) associations. We propose to use the term "O-marked conditional" (where "O" can stand for *open*, *ordinary,* or whatever other mnemonic the reader prefers) for (1a). We propose to use the term "X-marked conditional" (where "X" can stand for *eXtra,* or whatever other mnemonic the reader prefers) for (1b)/(2)/(3).

We see that when it comes to X-marking, (1b) shows a difference in the antecedent and in the consequent. In (1b), X-marking on the antecedent consists of "past tense" morphology, while the consequent has the modal *would*. We also saw that in French, X-marking in the antecedent is not the same as X-marking in the consequent. So whenever relevant, we will distinguish between "antecedent X-marking" and "consequent X-marking".

The obvious questions that arise, and that have received some attention in the literature in the last few years, are (i) what the morphological difference between O- and X-marking is crosslinguistically, and (ii) how these markings bring about the difference in meaning between (1a) and (1b), which in turn is part of the larger question of (iii) what the meaning difference between (1a) and (1b) exactly is. In this paper, we survey some core facts about (i), and argue that before (ii) can be tackled productively, it is important to understand (iii): the overall meaning contribution of X-marking, and not just in conditionals but also in two other constructions (desire ascriptions, necessity claims).

The paper has two parts. In Part 1, we widen the empirical picture of X-marking in several ways that should inform the analytic work of finding a compositional semantics. In Part 2, we develop the outlines of a unified view of X-marking, but our aims remain modest and we do not provide a worked out formal analysis. We conclude with a to-do list.

Part I: Widening the empirical picture

2 The form

As with many research projects in linguistics, the question is how a difference in meaning relates to a difference in form. In order to explore this question, let us take a quick look at the crosslinguistic patterns of X-marking. For the purposes of this discussion, we will follow the common (though perhaps not justified) assumption that O-marking is absence of X-marking. We will therefore only look at X-marking in this paper. If this assumption proves wrong, the presentation of facts will have to be different, though hopefully not drastically.

When it comes to X-marking, languages fall into two groups: those that have dedicated X-marking, and those where the exponent for X-marking appears to have other functions as well.

Hungarian[2] is a language with dedicated X-morphology: the morpheme *–nA* is added to an O-conditional, and *–nA* does not appear to have any other use in the language. Our pair in (1a,b) appears as (8)/(9) in Hungarian, where (9) differs from (8) only in the presence of *–nA*. Moreover, what we see is that in Hungarian, there is no difference between antecedent-X-marking and consequent-X-marking.

2 All of the Hungarian data in this paper are due to Dóra Kata Takács (p.c.).

(8) Ha János tudja a választ, Mari is tudja a választ.
if János knows the answer-ACC Mari too knows the answer-ACC

'If János knows the answer, Mari knows the answer (too).'

(9) Ha János tudná a választ, Mari is tudná a
if János know–*nA* the answer-ACC Mari too know–*nA* the
választ.
answer-ACC

If János knew the answer, Mari would know the answer.

Like (1b), (9) is a "present X-marked Conditional" (presX): both p and q are about the time of utterance.

There are also past X-marked Conditionals (pastX), where p, q are about a time prior to the utterance time. Again, Hungarian is transparent here: the verbs take past tense morphology and on top of that, on a light verb[3], comes –*nA*. Compare the presX in (9) with the pastX in (10):

(10) Ha János tudta volna a választ, Mari is
if János know.PAST.3sg be–*nA* the answer-ACC Mari too
tudta volna a választ.
know.PAST.3g be–*nA* the answer-ACC

'If János had known the answer, Mari would have known the answer too.'

Finally, Future Less Vivid conditionals, which talk about the antecedent-consequent relation in an unlikely future also contain the X-morphology of Hungarian. The difference between a presX and a FLV is a function of the lexical aspect of the predicates involved (Iatridou 2000) and so we would expect an FLV to look morphologically like a presX in terms of its tense and (viewpoint) aspect morphology, which it does also in Hungarian. Compare the FLV in (11b), with the neutral future-oriented conditional in (11a). The two differ only in the presence of –*nA* in (11b):

3 The presence of the light verb/auxiliary is not an issue. Many languages have the property of being able to carry only one morpheme on the verb, and the presence of an additional morpheme requires the addition of a light verb. This pattern can be seen very clearly in e.g. Hindi, a language completely unrelated to Hungarian.

(11) a. ha holnap el-indul, a jövő hétre oda-ér.
if tomorrow away-leave the following week.onto there-reach

'If he leaves tomorrow, he will get there next week.'

b. ha holnap el-indulna, a jövő hétre
if tomorrow away-leave–*nA* the following week.onto
oda-érne.
there-reach–*nA*

'If he left tomorrow, he would get there next week.'

So for Hungarian, the task ahead would appear to be straightforward: find the difference in meaning between O-marked and X-marked conditionals and attribute that meaning to *–nA*.

The project becomes much more complicated with languages where the exponent(s) associated with X-marking play(s) different role(s) in other environments. Such languages variably use past tense, imperfective, future and sometimes subjunctive to mark the difference between X and O-marked conditionals.

For example, Greek uses past and imperfective. The hypothetical events described in (12) are not interpreted in the past, as one would expect from the presence of the past tense, nor as being in progress or habitual, as one would expect from the presence of the imperfective. The (complete) burial would happen after the chief has (completely) died, a perfective description, rather than when he is in the process of dying:

(12) An o archigos pethene avrio, tha ton thavame
If the chief died.PST.IMP tomorrow, FUT him bury.PST.IMP
eki.
there

'if the chief died tomorrow, we would bury him there.'

Yet, the morphology is past and imperfective and obligatorily so. For this reason, the relevant morphemes are sometimes referred to as "fake" (following Iatridou 2000), regardless of the analysis of this phenomenon. So, Greek antecedent X-marking consists of fake past and fake imperfective. Consequent

X-marking in Greek consists of fake past, fake imperfective and the future marker[4].

English, among many others, is also a fake past language. That is, its antecedent X-marking consists of past, as can be seen in (13a,b) where the past morpheme in the antecedent clearly does not yield past event descriptions. To get a pastX, one more level of past is needed for the actual temporal backshifting. Among the languages we discuss here, English is in a minority where antecedent X-marking appears to consist only of past tense.

Consequent X-marking in the examples below consists of past tense and the modal *woll*[5,6]:

(13) a. If he left tomorrow, he would get there next week. (FLV)

b. If I had a car now, I would be happy. (presX)

c. If he had been descended from Napoleon, he would have been shorter. (pastX)

The literature identifies many other languages whose X-marking strategy employs morphemes that have apparently different uses in other environments. Here the challenge is much harder than in Hungarian. It is not sufficient to find the difference in meaning between O- and X-marked conditionals and hardcode it as the meaning of the relevant morpheme(s). What is required is to understand what the meaning of the morpheme(s) is so that the non-X-marking uses are also explained. For example, in Greek, one would have to give a meaning for the past tense and imperfective morphemes so that sometimes they yield the meaning of X-marking, and sometimes they yield past progressive (or past habitual) event descriptions.

3 Mapping form to meaning

There has been a fair amount of literature on trying to identify how the different morphological ingredients contribute to the meaning of the difference between X and O conditionals (Iatridou 2000, Nevins 2002, Ippolito

4 Iatridou 2000 argues that what is called the "conditional mood" in the Romance languages, which appears only in consequent X-marking, is not a separate mood, but also a future+past+imperfective combination, just as in Greek.

5 We adopt here the assumption that *would* is *woll* + past; see Abusch 1988 and Ogihara 1989: p.32; Abusch (1997: fn.14, p.22) attributes the coinage of *woll* to Mats Rooth in class lectures at UT Austin.

6 English X-marked conditionals can also contain other modals like *might* and, for some speakers at least, *was going to* (Halpert 2011).

2003, 2007, 2013, Legate 2003, Arregui 2005, 2007, Schlenker 2005, Han 2006, Anand & Hacquard 2010, Bittner 2011, Halpert 2011, Halpert & Karawani 2012, Karawani & Zeijlstra 2013, Schulz 2014, Ogihara 2014, Romero 2014, Karawani 2014, Ferreira 2016, Bjorkman & Halpert 2017, von Prince 2019, Mackay 2019, among others). We will not address the specifics here, nor propose an analysis of our own for this particular part of the research project. However, we would like to point to two problems that the literature has not yet fully grappled with.

3.1 Beyond fake past

Most proposals concentrate on the role of (fake) past tense alone in the role of X-marking, ignoring other elements in X-marking, like imperfective aspect in Greek, Romance etc). This would not have been detrimental if all languages were like English, where (antecedent-) X-marking consists only of fake past. But as we already said, a great number of languages have additional morphological exponents in their X-marking. For example, Greek (the Romance languages and others) also has fake imperfective[7]. If X-marking consists of past and imperfective in Greek and just past in English, one would have to come to either one of two conclusions about $[\text{past}]_{\text{G(reek)}}$ and $[\text{past}]_{\text{E(nglish)}}$:

a. Since $[\text{past}]_{\text{G}}$ needs help from the imperfective for X-marking and $[\text{past}]_{\text{E}}$ does not, the past morphemes in the two languages make different semantic contributions:

   $[\text{past}]_{\text{G}} \neq [\text{past}]_{\text{E}}$

   or

b. The past morphemes in the two languages do make the same contribution:

   $[\text{past}]_{\text{G}} = [\text{past}]_{\text{E}}$

7 Lest the reader think that English has no fake imperfective simply because it has no imperfective at all, we would like to point out that the question of the distribution of fake imperfective is more complex than that. For example, Russian, among other Slavic languages, has a fake past but no fake imperfective in the most standard X-marked conditionals. Yet, Russian is known for its many imperfectives. (The pointer to "standard X-marked conditionals" is because Grønn 2013 shows that there is a certain register used in annotations of chess games, in which Russian behaves like Greek and French, with its X-marking consisting of fake past and fake imperfective, instead of fake past and subjunctive by in standard Russian X. See Iatridou & Tatevosov 2015 for a critique of Grønn's analysis of "Chess Russian".)

and the obligatory imperfective in Greek X-marking makes no semantic contribution but has to be there for language-specific morphological rules[8].

Either conclusion has gone mostly under-appreciated by work that focuses only on the role of past in X-marking. But one has to be conscious of the fact that one of these conclusions is unavoidable if one gives the job of X-marking to the past morpheme alone. One should not assign a meaning to fake past alone without addressing this consequence.

However, for the purposes of the current paper, we do not care what X consists of morphologically. That is, Hungarian, English and Greek will be treated on a par in our discussion.

3.2 Beyond conditionals

We come to the second point where the literature has so far been too narrow. The prevalent practice has been to try to understand the contribution of X-marking by looking only at the difference between X and O-marked *conditionals*. However, X-marking appears in other parts of the grammar as well. The default assumption should be that the contribution of X-marking remains the same, regardless of whether it appears in conditionals or elsewhere.

So what we will do in the rest of the paper is to look at some such non-conditional environments that contain X-marking and see what we can learn from them. More specifically, we will try to find out if we need to amend our views of X-marking in conditionals, in order to maintain a consistent interpretation for X across all environments where it appears. We should first start with demonstrating to the reader that there are indeed non-conditional environments that contain X-marking. We do this in the next section.

4 X-marking outside conditionals

We will focus on just two (apparently) non-conditional environments where X-marking appears: "X-marked desires", where X-marking appears in a desire construction, and "X-marked necessity", where X-marking appears on a necessity modal.

8 This was, in fact, the position taken for Greek aspect in Iatridou 2000.

4.1 X-marked desires

Consider (14a), which has the (non-cancellable) inference in (14b):

(14) a. I wish I had a brother.
b. I do not have a brother.

The complement of *wish* is (presupposed to be) false (contrary-to-fact).[9] Note that the frequently used term "counterfactual wish" would potentially be misleading: the desire is a desire in the actual world, and crucially not a desire in a counterfactual world. So, we prefer the term "unattainable desire".

In many languages, there is a morphological commonality between X-marked conditionals and unattainable desires (Iatridou 2000). In the full version of the generalization, "consequent X-marking" morphology appears on the embedding verb *want*, and "antecedent X-marking" morphology appears on the complement of *want*.

The Conditional/Desire (C/D) generalization:

(15) a. X-marked conditional: if p_{ant}, q_{cons}
b. unattainable desire: I $want_{cons}$ that p_{ant}

As we have said, there are languages without a morphological difference between antecedent and consequent X-marking. We saw that Hungarian is such a language, and that moreover, it has a dedicated X-marker. In accordance with the C/D generalization then, the X-marker *–nA* will appear on the embedded desire verb, as well as its complement. Recall Hungarian X-marked conditionals:

(16) Ha János tudná a választ, Mari is tudná a
if János know–*nA* the answer-acc Mari too know–*nA* the
választ.
answer-acc

'If János knew the answer, Mari would know the answer.'

9 This description of the verb *wish* holds only when its complement is a finite CP. If it is an NP (*I wish you a happy New Year*) or an infinitival complement (*I wish to leave now*), the complement is obviously not considered unattainable. This, moreover, is indirect evidence that the X-marking on the complement plays a crucial role in itself.

(17) Ha János tudta volna a választ, Mari is
if János know.past.3sg be–*nA* the answer-acc Mari too
tudta volna a választ.
know.past.3g be–*nA* the answer-acc

'If János had known the answer, Mari would have known the answer too.'

To talk about desires and wishes, here is the verb that means 'like'[10]:

(18) Szeretem, hogy tudja a választ.
like-1sg that know-3sg the answer-acc

'I like that she knows the answer.'

X-marking on the 'like'-verb and its complement yields the predicted (and desired) effect:[11]

(19) Szeretném ha Marcsi tudná a választ.
like–*nA*-1sg if Marcsi know-3sg–*nA* the answer-acc

'I wish Marcsi knew the answer.'

In other languages, like Greek and Spanish, antecedent X-marking differs from consequent X-marking and there the C/D generalization shows up more clearly. In Spanish, antecedent X-marking consists of past subjunctive and consequent X-marking consists of "conditional" mood (though see Footnote 4). The prediction then of the C/D generalization is that conditional mood will appear on *want* and past subjunctive on the complement of *want*. This prediction is verified. Here is a Spanish X-marked conditional:

10 This verb is factive without *–nA*. The paradigm can be set up with the verb translating as 'want', but this verb selects for subjunctive/imperative morphology on its complement and so displays only half of the C/D generalization, just like French does. See Footnote 21.

11 The switch from the complementizer *hogy* ('that') to *ha* ('if') does not concern us here. This switch also happens in English:

(i) a. I am happy that you know the answer.
b. I would be happy if you knew the answer.

See Longenbaugh 2019, section 4.4.

(20) Si fuera más alto sería un jugador de
If be.3.sg.PAST.SUBJ more tall be.3.sg.COND a player of
baloncesto.
basketball

'If s/he was taller, s/he would be a basketball player.'

And here is a Spanish X-marked desire:

(21) Querría que fuera más alto de lo que
Want.3.sg.COND that be.3.sg.PAST.SUBJ more tall than it that
es.
be.3.sg

'I wish s/he was taller than s/he is.'

We will use the term "transparent *wish*" for those cases where the meaning of *wish* (i.e. actual world desire for an unattainable complement) is expressed by X-marking on a desire predicate. The idea of the terminology (which is parallel to the term "transparent *ought*" coined in von Fintel & Iatridou 2008) is that what English expresses in the lexicalized form *wish* is instead expressed in combinatory morphology.

Spanish, Greek, Hungarian, French and others are "transparent *wish*" languages. English has a lexicalized item *wish* and obeys only one part of the C/D generalization, namely "antecedent" X-marking on the complement of the desire verb.[12] This can be seen in the pair in (22), where there is "fake" past in the antecedent in (22a) and the complement in (22b):

(22) a. If I had a car now, I would be happy.
b. I wish that I had a car now.

12 Note that with *wish*, the unattainable desire reading results only with finite complements, which have to be X-marked, and not with nominal complements (*I wish you a Happy New Year*) or infinitives (*I wish to leave now*).

If English had been a transparent *wish* language,[13]it would have had *would* on *want*, as *would* is consequent X-marking, as in (23a). That is, if English were a transparent *wish* language, (23b) would have meant (23c), which it does not:

(23) a. If I had a car, I would be happy.

b. I would want that I had a car now. ≠

c. I wish that I had a car now.

Even though English *wish* is not an example of a transparent *wish*, sentences with this item do obey one part of the C/D generalization, as we saw, namely the same morphology (fake past) appears on the conditional antecedent and on the complement of the desire predicate.

Turkish[14] is another language like English, which has a specialized morpheme for unattainable wishes. And like English, it obeys the C/D generalization only in the complement of the desire predicate. So first let us look at X-marking in Turkish conditionals. Turkish is a fake past language, as can be seen by the use of the "fake" past morpheme in both antecedent and consequent of the FLV in (24). More specifically, consequent X-marking consists of *aorist+past*.

Antecedent X-marking consists of what is called by grammars the "conditional" affix –sA, followed by the past morpheme, namely *SA+past*[15]:

13 The statement "English is not a transparent wish language" is actually a misleading simplification. We are not dealing with a language-level parameter setting. A language can have lexicalized items, like English *wish*, but at the same time behave like a "transparent language" with other verbs. For example, Longenbaugh 2019 shows that (i)/(ii) are instances of clausal subordination, not conditionals, and that moreover, they abide by the C/D generalization in terms of morphology: the embedding predicate has consequent X-marking and the embedded predicate has antecedent X-marking (and strikingly the antecedent marker *if*):

(i) I would be happy if you knew the answer.

(ii) I would prefer if you left.

In addition, and crucially, Longenbaugh shows that (i)/(ii) are about actual-world preferences, not preferences in a counterfactual scenario. So even English has corners where it is a "transparent language", since it has (i)/(ii) in addition to the lexicalized item *wish*. Even so, we continue using the term "transparent language", hoping that the reader will remember this footnote.

14 All of the Turkish data in this paper are from Ömer Demirok (p.c.).

15 It should be noted here that in Turkish we see the very interesting phenomenon in which fake past in a conditional antecedent appears in a different place than the temporally interpreted past. So in an epistemic conditional like *if he left last Tuesday he must have arrived on Friday*, the order of morphemes is past–SA.

(24) John önümüzdeki salı gel-*se-ydi*, annesi çok mutlu
John next Tue come-SA-PST his.mom very happy
ol-*ur-du*.
be(come)-AOR-PST

'If John arrived next Tuesday, his mom would be very happy.'

Turkish has the undeclinable (non-verbal) particle *keşke*[16] to convey *wish*:

(25) Keşke önümüzdeki salı gel-se-ydi.
Keşke next tuesday come-SA-PST

'I wish he would come next Tuesday.'

In (25) the speaker believes that her wish will not come true. What we also see in (25) is that the complement of the desire-embedder carries antecedent X-marking, namely *SA+past*.[17] The past morpheme is obviously "fake" since we are talking about (im)possible events in the future. Moreover, the order of morphemes is the tell-tale one of X-marked antecedents: *SA+past* (see Footnote 15). So Turkish is a language which, like English, satisfies the complement part of the C/D generalization but not the *want* part (i.e. it does not have transparent *wish*).

Hindi[18] has a similar particle to Turkish, but we will look into this language because even though Hindi's *kaash* may be related to Turkish *keşke*, its X-marking is different. Hindi *taa* is described as a habituality marker. However, it cannot appear on a predicate that is by its nature individual-level (as reported by Iatridou 2000, based on p.c. from Rajesh Bhatt). It can only appear on "derived" generics:

(26) vo macchlii khaa-taa hai.
he fish eat-HAB be.PRS

'He eats fish.' (i.e. he is a fish-eater)

16 *keşke* is probably related to Hindi *kaash*, which we will discuss shortly, with both elements possibly derived from Persian. Similar particles are Spanish *ojala*, Greek *makari*, Italian *magare*. Possibly even English *if only* and *would that*.

17 The fact that the affix *SA* appears in the complement of *keşke* makes it clear that it is not a "conditional" affix in the sense of a conditional complementizer.

18 All Hindi facts in this paper are either due directly to Rajesh Bhatt (p.c.), or Iatridou 2000, 2009, which in turn also relied on Bhatt (p.c.) for Hindi judgments and discussion.

(27) *vo lambaa ho-taa (hai).
he tall be-HAB (is)

But *taa* does appear on individual-level predicates in X-marking:

(28) agar vo lambaa ho-taa, to army use bhartii kar le-tii.
if he tall be-HAB then army he.Dat admit do take-HAB.f

'If he was tall, the army would have admitted him.'

That is, "fake" habitual aspect is part of Hindi X-marking in both antecedent and consequent.[19] The same conclusion is supported by the following argument. Unsurprisingly, the habitual marker cannot co-occur with the progressive:

(29) *vo gaa rahaa ho-taa
he sing PROG be-HAB

But in an X-marked conditional, HAB and PROG co-occur:

(30) He is not singing …
agar vo gaa *rahaa ho-taa*, to log wah wah kar rahe
if he sing PROG be-HAB then people 'wow' 'wow' do PROG.MPl
ho-te.
be-HAB.MPl

'If he was singing, people would be going 'wah wah'.'

Since the habitual marker is part of Hindi (antecedent) X-marking, by the C/D generalization, we expect it in the complement of *kaash*. This prediction is verified. HAB appears on an individual-level complement of *kaash*:

(31) kaash vo lambaa ho-taa.
wish he tall be-HAB

'I wish he was tall.'

And it appears also on a progressive event description in the complement of *kaash*:

19 See Bhatt 1997 for discussion of a possible fake past in Hindi.

(32) kaash vo gaa rahaa ho-taa.
wish he sing PROG be-HAB

'I wish he was singing.'

Finally, the following verification of the C/D generalization is too cute to omit. Since Hindi X-marking contains a fake HAB, one expects (and gets) two occurrences of HAB in an X-marked conditional when there is an actual generic predicate in the antecedent:

(33) Agar vo macchlii *khaa-taa* *ho-taa*, to use yeh biimaarii
If he fish eat-HAB be-HAB then he.Dat this illness
nahiiN ho-tii.
Neg be-HAB.f

'If he ate fish (on a regular basis), then he would not have this disease.'

This correctly predicts that we should also get two HAB markers when the complement of *kaash* is a generic predicate:

(34) kaash vo macchlii khaa-taa ho-taa.
wish he fish eat-HAB be-HAB

'I wish he ate fish.' (i.e. I wish he was a fish-eater)

So the C/D generalization is real, even if there are languages, like English, Turkish and Hindi[20], which obey only one part of this generalization[21].

20 The behavior of English and Turkish are also arguments against the possibility of seeing the occurences of past under X-marked desires, in e.g. Spanish, as the result of Sequence of Tense. English *wish* is not in the past tense so we should not expect it to be an SoT trigger and Turkish *keşke* is not even a verb to begin with. We discuss this a bit more in Section 5.3.

21 French is in a way the mirror image in that it obeys the C/D generalization only in the transparent wish part: the verb *vouloir* ('want') appears in the "conditional" mood (see Footnote 4). The complement of *vouloir* takes an infinitive or a subjunctive complement depending on the (contra)indexing of the subjects, and this choice is retained under X-marked *vouloir*, contra the C/D generalization:

(i) a. Je veux aller à Paris.
I want go.inf to Paris

b. Je veux que tu ailles à Paris.
I want that you go.subj to Paris

In sum, in this subsection we have seen the first environment where X-marking appears outside conditionals: X-marked desires for unattainable situations.

4.2 X-marked necessity

The second environment where we see X-marking outside of conditionals is necessity modals. As discussed in detail in von Fintel & Iatridou 2008, necessity modals often come in strong vs. weak variants/pairs. In English, for example, we can distinguish weak necessity modals *ought, should* and strong necessity modals *must, have to*. One way to show that weak necessity modals are not strong is that they can occur without contradiction with the negation of a strong necessity modal:

(35) a. You ought to do the dishes but you do not have to.

b. #You must do the dishes but you do not have to.

English has lexicalized weak necessity modals like *ought* but many other languages do not (von Fintel & Iatridou 2008). In those languages, the modal that shows the pattern in (35) is an X-marked necessity modal.

In Hungarian, its X-marker *–nA* appears on the modal and without it the sentence is a contradiction. That is, the following pattern is exactly like (35a,b):

(ii) a. Je voudrais aller à Paris.
I want.1.sg.COND go.inf to Paris

'I wish to go to Paris.' (cf. 'I would have wanted to go to Paris')

b. Je voudrais que tu ailles à Paris.
I want.1.sg.COND that you go.2.dg.SUBJ to Paris

'I wish you would go to Paris.'

So French is a transparent wish language, but it does not abide by the complement part of the C/D generalization. The C/D generalization (rather, whatever is behind it) requires indicative past imperfective on the complement of *vouloir*, as that is what French antecedent X-marking is. On the other hand, French *vouloir* requires subjunctive on its complement and it seems that the selection requirements of *vouloir* win. The reason may well be that French has no paradigm anymore for past subjunctive (see Iatridou 2000). In Spanish, there is no such conflict: Spanish *querer* requires subjunctive on its complement. The C/D generalization requires past subjunctive. The complement of *querer* in a Spanish X-desire can satisfy both requirements, because Spanish, unlike French, has a past subjunctive.

(36) Péter-nek el kell-ene mosogat-ni-a az edény-ek-et, de senki
Péter-dat part must–*nA* wash-inf-3sg the dish-pl-acc but noone
nem követeli meg tőle.
not require-3sg.subj-3.obj part 3.sg.abl

'Péter ought to do the dishes, but he is not obliged to.'

But without *–nA* on the necessity modal there is a contradiction:

(37) #Péter-nek el kell mosogat-ni-a az edény-ek-et, de senki
Péter-dat part must wash-inf-3sg the dish-pl-acc but noone
nem követeli meg tőle.
not require-3sg.subj-3.obj part 3.sg.abl

'Péter has to do the dishes, but he is not obliged to.'

Hungarian is a language in which antecedent X-marking and consequent X-marking are the same. So we do not know which of the two appears on the modal. However, once we look at other languages, we see that it is consequent X-marking that appears on the necessity modal to yield weak necessity. Consider Spanish:

(38) a. #Tengo que limpiar los platos pero no estoy obligado.
Have COMP clean the dishes but not am obliged

b. #Debo limpiar los platos pero no estoy obligado.
must clean the dishes but not am obliged

With consequent X-marking on the modal, the sentence passes the *ought*-test:

(39) a. Deberia limpiar los platos, pero no estoy obligado.
Must+COND clean the dishes but not am obliged

'I ought to do the dishes but I am not obliged.'

b. Tendria que limpiar los platos, pero no estoy
Have+COND COMPL clean the dishes but not am
obligado.
obliged

'I ought to do the dishes but I am not obliged to.'

So Spanish, as well as Greek and others (see von Fintel & Iatridou 2008) are "transparent *ought*" languages.

If English had been a transparent *ought* language, it would have had *would* on *have to*, and (40b) would have meant (40c), which it does not:

(40) a. If I had a car, I would be happy.

b. You would have to do the dishes but you are not required to. ≠

c. You ought to do the dishes but you are not required to.

So the way there is a conditional/desire generalization, morphologically speaking, there is also a conditional/*ought* generalization, again morphologically speaking.[22]

We now understand what "consequent" X-marking is: it is X-marking on a modal operator, whether a modal in the consequent of a conditional (where, according to many researchers, the modal is located) or a desire predicate (transparent wishes) or a necessity modal (transparent *ought*). We will therefore proceed with the assumption that the difference between what we called "antecedent" and "consequent" X-marking reduces to whether X-marking is on a modal or not.

4.3 A principled ambiguity: *endo-X* vs. *exo-X*

There is a principled ambiguity that can be found in both X-marked desires and in X-marked necessity.

Let us start with X-marked necessity, that is transparent *ought*. Sentences that contain this are ambiguous between a weak necessity modality in the actual world (like English *ought*) and a strong necessity modal in a counterfac-

22 We saw that the C/D generalization has two parts, one regarding transparent wish, and one regarding the complement of the desire verb. One may therefore ask whether there is a complement part to the conditional/*ought* generalization as well. For many languages this cannot be tested because modals take infinitival complements. However, Greek is a language whose modals can take complements that are inflected and so there is an embedded verb that can in principle carry antecedent X-marking morphology. In the translation corresponding to the *ought*-test in (35), there is no X-marking on the complement, and this is expected: the complement is not a contra-to-fact situation, unlike in the cases of transparent wishes. It is possible to put X-marking on the complement of an X-marked necessity modal, but then the sentence translates as *you ought to have done the dishes*, where indeed the complement is contra-to-fact. It has not escaped our notice that the last observation about English immediately suggests a possible hypothesis: the infinitival *have* in *ought to have done* is a form of X-marking. We will not pursue this here.

tual world (English *would have to*). In transparent *ought* languages, these are the same form. Consider Greek for example, where consequent X-marking is a combination of future and past and imperfective. On the strong necessity modal, this can yield the meaning of weak necessity *ought*:

(41) *tha eprepe* na pari aftin tin varka.
must+X NA take this the rowing-boat

'he ought to take this rowing-boat.'

But it can also yield the meaning of a strong necessity modal in a "counterfactual" scenario:

(42) An o Fred ithele na pai sto nisi, *tha eprepe* na pari
If the Fred wanted to go to-the island, must+X NA take
aftin tin varka.
this the boat

'If Fred wanted to go to the island, he would have to use this rowing-boat.'

Note that the weak necessity claim in (41) signals there is more than one way to get to the island but the boat is by some measure deemed preferable by the speaker. In the strong necessity claim in (42), however, the boat is the only way to get to the island.[23]

23 One might wonder how one would express a weak modality in a counterfactual scenario. This is already hard in English:

(i) *If you wanted to please your roommate, you would have to/ought/would ought to do the dishes.

In transparent *ought* languages this is also difficult because one would need double X-marking, for which verbs in the languages that we are familiar with have no space. One might then wonder whether one layer of X-marking could serve as two, after all there is no space for exponents of two such layers. This meaning may indeed be detectable but we leave this for a different occasion.

Similar considerations apply for the expression of unattainable wishes in a counterfactual scenario. Compare (ii) and (iii) below. Both sentences have antecedent X-marking as well as consequent X-marking on the verb *thelo* ('want'). What they differ in is the form of the verb embedded under X-marked *thelo*. In (ii) the verb *agorazo* ('buy') is in the non-past perfective, the O-marking appropriate for this environment. In (iii) the verb *ime* ('be') is X-marked.

We propose to call the two interpretations of X-marking on necessity modals *endo-X* and *exo-X*:

endo-X the modal is making a claim about the *actual* world

exo-X the modal is making a claim about *other* worlds in which some hypothetical/counterfactual scenario holds

X-marked desires are equally ambiguous, and in the same two directions. Sentences that contain an X-marked desire are ambiguous between a desire in the actual world (like English *wish*) and a desire in a counterfactual scenario (English *would want to*). In transparent *wish* languages, these are the same form. Consider X-marking on the Greek verb *thelo* ('want'). It can yield a desire in the actual world towards something unattainable:

(ii) An o Haris itan psiloteros tha ithele na agorasi megalitero krevati
if the Haris be.3.sg.pst taller FUT want.pst.imp NA buy.npast.perf bigger bed

'If Haris was drunk, he would want to buy a bigger bed.'

(iii) An o Haris itan psiloteros tha ithele na itan ke Amerikanos
if the Haris be.3.sg.pst taller FUT want.pst.imp NA be.3.sg.pst and American

'If Haris was taller, he would wish that he was also American' (…so that he could be drafted to the NBA more easily)

As can be seen from the translations, the bouletic verb *thelo* appears in a counterfactual scenario in both (ii) and (iii). However, in the counterfactual scenario in (iii), the bouletic verb is marked as having an unattainable complement, since its complement is X-marked. This means, that in (iii), *thelo* should have two layers of X-marking: one layer because it is the consequent of an X-marked conditional and one layer because it is an unattainable desire. There is no space for this extra morphology, however. So the single-X-marked and the double-X-marked verbs look the same. In English, the two sentences can be easily told apart, as all that has to happen is one level of X- marking on the verb *wish* in (iii), since *wish* is the lexicalization of a bouletic verb with an unttainable complement (when the latter is a CP).

We realize that (ii)/(iii), while minimal pairs with respect to O-/X-marking, are not minimal pairs with respect to the lexical items. This is to explicate the point in a more concise manner. This is a footnote after all.

(43) tha ithele na ixe makritero krevati
FUT want+*past* na had longer bed

'He wishes he had a longer bed'

Or a desire in a counterfactual scenario:

(44) An itan psiloteros tha ithele na ixe makritero krevati
if was taller FUT want+*past* na had longer bed

'If he was taller he would want to have a longer bed'

The crosslinguistic picture is summarized in Figure 1,[24] modified from von Fintel & Iatridou 2008. With our current terminology, we would call the interpretations on the left side of the diagram *endo-X* and the ones on the right side *exo-X*.

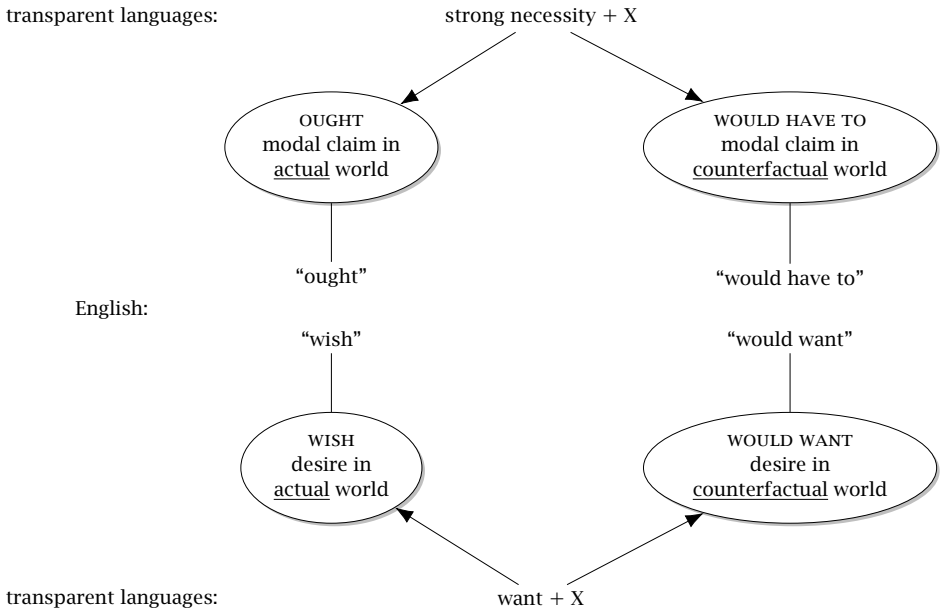

Figure 1 The ambiguity of X-marking on desires and necessity

We note one striking difference between X-marked desires and X-marked necessity. For the latter, X-marking comes with a weakening of the modal claim, but there is no sense of weakening in the case of unattainable desires. Our proposal in Section 7 will address this difference.

24 We would like to remind the reader, who is looking at the figure, of Footnote 13.

We have now seen that X-marking appears not just on conditionals but also in desire constructions and with necessity modals. A theory of X-marking should have the ambition of covering all these uses in a unified analysis. The first step towards that is to find a common denominator for the meaning contribution of X-marking in all these cases. The second step would be to find an analysis that explains how in each language the morpho-syntactic components of X-marking contribute to its meaning. For this paper, we leave the second step aside, as already mentioned, and discuss the prospects for a unified meaning for X-marking as an atom.

Part II: Widening the modal account

Existing accounts of X-marking (albeit not under that name) are all about X-marking in conditionals. From a very high level perspective, they all share the diagnosis that X-marking concerns the domain of quantification of the conditional. We will work within that general consensus and explore elaborations and extensions of the idea. First, in Section 5, we lay some groundwork, then in Section 6, we articulate the basic common insight of existing analyses and comment on some of the choice-points, and finally in Section 7, we try to extend the insight to X-marked desires and X-marked necessity.

5 Preparing the ground

We start with a couple of initial arguments: (i) *exo-X* is simply the result of having a desire predicate or necessity modal in the consequent of an X-marked conditional, (ii) our 2008 attempt to reduce even *endo-X* necessity to X-marking in conditionals is dubious and would not extend to *endo-X* marking on desire predicates. We then discuss the important general question whether X-marking is "effective" or "reflective" morphology.

5.1 Exo-X reduced

Our task is to understand what X-marking does in the following environments:

(45) a. X-marked conditionals

b. X-marked necessity which yields a weak necessity in the actual world (endo-reading)

c. X-marked necessity which yields a strong necessity in a counterfactual scenario (exo-reading)

d. X-marked desire which yields an unattainable desire in the actual world (endo-reading)

e. X-marked desire which yields a desire in a counterfactual scenario (exo-reading)

Fortunately, we can start with a reduction that seems immediately plausible: the exo-X cases (45c) and (45e) reduce to (45a). That is, (45c) is a strong necessity modal in the consequent of an X-marked conditional: *if …, I would have to …*. Similarly (45e) is a desire verb in the consequent of an X-marked conditional *if …, I would want to …*. There is no reason (nor means) to exclude desire predicates and necessity modals from appearing in the consequent of a conditional, whether this is an O- or an X-marked conditional. Therefore, we will assume that (45c) and (45e) completely reduce to (45a).

This means that our question becomes what X-marking does in the following three cases:

(45) a. X-marked conditionals (including ones with desire predicates and necessity modals in the consequent)

b. X-marked necessity which yields a weak necessity in the actual world (endo-reading)

d. X-marked desire which yields an unattainable desire in the actual world (endo-reading)

5.2 No easy way to reduce endo-X

Let us quickly dispense with one attempt at reducing all three of our uses of X-marking to a common denominator. In von Fintel & Iatridou 2008, we floated the proposal that X-marked necessity involves a meta-linguistic counterfactual conditional operating on the necessity modal: "if we were in a context in which the secondary ordering source was promoted, then it would be a strong necessity that …". Whatever one might think of the prospects of this idea, it's instructive to try to extend it to X-marked desires. Could the X-marking there be a reflection of an implicit counterfactual analysis?

The idea might be that "wish that p" means something like "if p were attainable, would want that p". To put this kind of proposal to the test, let's imagine Laura is the sort of person who only wants things that are attainable.

If something is unattainable, that suffices for her to not want it. I happen to know her general tastes in men and know with certainty that Pierce Brosnan falls within that category. As things stand, a date with him is unattainable, hence Laura has no desires about it. Now consider:

(46) Laura querría que Pierce Brosnan quedara con ella.
Laura want.3.sg.COND that Pierce Brosnan go-out with her

'Laura wishes that Pierce Brosnan would go out with her.'

If our implicit counterfactual analysis of sentences like (46) were adequate, we would expect the sentence to be judged as true in our scenario. After all, if a date with Pierce Brosnan were attainable, Laura would want to go out with him. But (46) is judged as false, which means that the sentence conveys the existence of a desire in the actual world. And since Laura doesn't have the desire to go out with him, because a date is unattainable, the sentence is false. So, a quick reduction of X-marked desires (and let's face it, X-marked necessity) to some kind of meta-linguistic implicit counterfactual is not feasible.

5.3 Effective or reflective

A crucial over-arching question in the analysis of X-marking is whether X is "effective" or "reflective" morphology. By that we mean whether X (or part of X) makes a direct contribution to compositional semantics or whether it reflects that something somewhere else in the composition is active. Similar issues arise in the analysis of tense (some tense-marking may simply reflect higher temporal operators, a.k.a. "sequence of tense"), negation ("negative concord"), and other areas of grammar.

In the case of X-marking, the question arises twice: for "consequent" X-marking and "antecedent" X-marking. We have said that consequent X-marking is simply X-marking on a modal operator. The effective/reflective issue is then whether this X-marking effects a change in the interpretation of the modal operator or reflects something about the interpretation. And for antecedent X-marking, which is the marking we have found in the antecedent of conditionals and the complement of X-marked desires, the question may be whether it is interpreted effectively and locally with scope over the proposition it occurs in, or whether it reflects something about the interpretation of the dominating modal operator. In fact, some views of X-marking go as

far as treating antecedent X-marking in conditionals as merely agreeing with the higher consequent X-marking (as early as Heim 1992: Fn.35, and more recently Romero 2014).

For the latter view, there are some problems to face: we find apparently meaningful antecedent X-marking even in the absence of any consequent X-marking anywhere in the structure.

As already mentioned in Footnote 20, antecedent X-marking on the complement of desire constructions with an unattainable desire is required even when the embedder is not itself an X-marked element, like English *wish*, and non-verbal Turkish *keşke*, Hindi *kaash*, etc.

A second reason why "antecedent" X-marking is not just agreement with a higher X comes from languages where X-marking under a desire-particle is, in fact, a choice, but a choice that co-varies with a certain meaning. Take for example the undeclinable non-verbal Greek *makari* (probably related to Italian *magare*), which can take either O-marking or X-marking on its complement:

(47) Makari na ine eki tora. [O-marking]
makari PRT is there now

(roughly): 'I want him/her to be there now.'

(48) Makari na itan eki tora. [X-marking]
makari PRT was there now

'I wish s/he was there now.'

With O-marking on the complement, the speaker expresses a desire towards a situation that may well be attainable. But with X-marking it is necessarily conveyed that the person in question is not there now.

Two more cases of meaningful antecedent O/X-marking can be illustrated with English:

(49) a. Suppose Lucy was at the rally yesterday … (O)
b. Suppose Lucy had been at the rally yesterday … (X)

(50) a. Consider the consequences if Lucy was at the rally yesterday. (O)

b. Consider the consequences if Lucy had been at the rally yesterday. (X)

In both cases, there is a meaning difference signaled by the choice of the typical antecedent X-morphology of English without the presence of a relevant higher consequent X-marking.

We hasten to add that these arguments do not show that antecedent X-marking is effective morphology. It could still be reflective of an aspect of the interpretation of the higher operator (desire particle, *suppose*, *the consequences*) but it just can't be agreement with a higher instance of X-marking.

With these preliminaries out of the way, it's time to see what's on the market for theories of X-marking.

6 X-marking on conditionals as domain widening

We start with an intuition about the meaning of X-marking on conditionals, while keeping in mind that the goal is to find a unified meaning for all three uses of X-marking that are on our agenda. The intuition is one that is common to many theories of X-marking.

6.1 Modal domain widening

The core of the insight was developed by Stalnaker within his account of conditionals (Stalnaker 1968, 1975, recently lucidly re-explicated in Stalnaker 2014). The strategy he advocates is very much congenial to our modest goals in this paper:

> I am going to assume that we can identify at least paradigm cases of the contrasting categories of conditionals independently of any contentious theoretical assumptions about the grammatical marks by which we are identifying them, and then ask what work are those grammatical marks, whatever they are, doing? That is, what is the functional difference between a so-called subjunctive and a so-called indicative conditional? (Stalnaker 2014: pp.175f.)

The idea is that before tackling the question of the compositional morpho-syntactic make-up of X-marking cross-linguistically, let's first figure out what

its overall meaning contribution is. Stalnaker's answer to that question is: "I take it that the subjunctive mood in English and some other languages is a conventional device for indicating that presuppositions are being suspended" (Stalnaker 1975: p.276).

What does this mean? The idea is that O-marked conditionals operate within the confines of the set of worlds defined by what is currently being presupposed in a conversation: the context set. X-marking signals that presuppositions are being suspended: that is, the conditional can access worlds outside the context set.

Stalnaker himself gave a semantics for *if p, q* conditionals that is relative to a selection function f that for any evaluation world w and antecedent p selects a particular p-world, which is then claimed to be a q-world. So, his proposal for the meaning of X-marking in conditionals amounts to this:

- O-marked conditionals: the selection function f is constrained to find a p-world within the context set (the set of worlds compatible with all the presuppositions made in the context of the current conversation).
- X-marked conditionals: f may reach outside the context set.
- That is, with X-marking, we abstract away from some established facts and then run a thought experiment. We then conclude that even in p-worlds outside the context set, where p is true, the consequent is true.

Why would we want to or need to reach outside the context set? One reason is that p may be presupposed to be false: there are no p-worlds in the context set. So, in that case, X-marking is necessary. But beyond that, Stalnaker convincingly demonstrates the application of his view of X-marking to two of the recalcitrant cases of X-marked conditionals: Anderson-type cases and modus tollens-type cases. Take Anderson examples:

(51) If she had taken arsenic, she would show exactly the symptoms that she is in fact showing.

Here is Stalnaker's gloss on this case:

> In this case, it is clear that the presupposition that is being suspended in the derived context is the presupposition that she is showing these particular symptoms — the ones she is in fact showing. The point of the claim is to say something like this:

> were we in a situation in which we did not know her symptoms, and then supposed that she took arsenic, we would be in a position to predict that she would show these symptoms. (Stalnaker 2014: pp.185)

And take a modus tollens case:

(52) There were no muddy footprints in the parlor, but if the gardener had done it, there would have been muddy footprints in the parlor, so the gardener must not have done it.

Stalnaker's diagnosis:

> Here, the subjunctive conditional cannot be counterfactual, in the sense defined, since one is arguing that the gardener did not do it, and one cannot presuppose something one is arguing for. That is, the argument is appropriate only in a context in which it is initially an open question whether the gardener did it.
>
> In this case, the presupposition that is suspended is the proposition, made explicit in the first premise of the argument, that there are no muddy footprints in the parlor. The idea behind the conditional claim is something like this: suppose we didn't know that there were muddy footprints in the parlor, and in that context supposed that the gardener did it. That would give us reason to predict muddy footprints, and so to conclude that if we don't find them, he didn't do it.
>
> (Stalnaker 2014: pp.185)

We think this is a successful gloss on the meaning effect of X-marking in conditionals: X-marking signals that the conditional can reach outside the normal domain of quantification. For what follows, we will adopt the Stalnaker exegesis and recast it in von Fintel 1998, which will eventually allow us to think about extending the idea to the other two uses of X-marking we're concerned with. Instead of Stalnaker's selection function analysis, we will formulate our discussion in terms of restricted modality in the tradition of Kratzer. Under that perspective, an *if p, q* conditional involves a modal operator that quantifies over the worlds in a certain domain ("modal base") and that is restricted by the *if*-clause to just quantifying over the *p*-worlds in the modal base.

We can now formulate the following idea about the meaning contribution of O/X-marking in the case of conditionals ranging over a modal base of possible worlds:

- O-marking signals that the modal base is contained in the set of epistemically accessible worlds.
- X-marking signals that the modal base is not entirely contained in the set of epistemically accessible worlds.

Obviously, this is rather specific to the case of conditionals. We will soon turn to the question of whether there is any hope of extending the coverage of this diagnosis to the other two cases of O/X-marking we are concerned with in this paper. But first, we can situate existing theories of X-marking against the basic insight about domain widening that we just explicated.

6.2 Past-as-past vs. past-as-modal

Schulz 2014 coined the terms "past as modal" and "past as past" for the two kinds of proposals for what/how past tense (part or whole of X-marking) contributes to the interpretation of X-marked conditionals.

In the past-as-modal view, which includes Iatridou 2000, Schulz 2014, Mackay 2019, and others, the "past" morpheme has an underspecified meaning which yields different meanings depending on whether it is "fed" times or worlds. Abstracting away from the specific proposals, one can represent this view as in Figure 2, with μ being the morpheme in question.

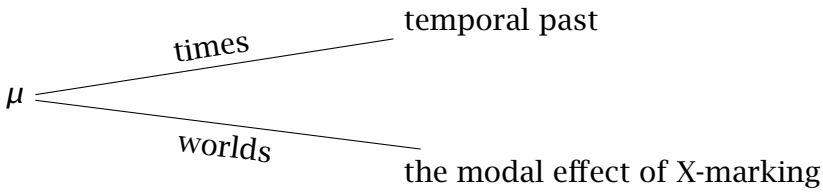

Figure 2 The duality of past according to past-as-modal approaches

In the past-as-past view, advocated among others by Ippolito 2003, 2013, Arregui 2005, 2007, Romero 2014, Khoo 2015, X-marking (that is, the past morpheme in it) is a past operator with wide scope over the conditional,

which results in the (mostly metaphysical modal's) modal base being calculated in the past time of the utterance time. Roughly: the past takes us back to a time where the (non-past) conditional could still have been true.

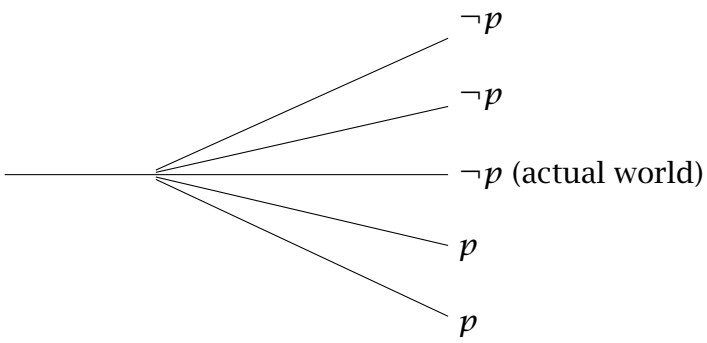

Figure 3 The past splitting point

In other words, for these accounts, the "fake" past that we see in X-marked conditionals is an actual occurrence of an honest-to-goodness past morpheme, but its scope is larger than when it yields a temporal past.

Note that past-as-past accounts by their nature treat consequent X-marking as what we've called "effective" morphology: the past tense directly changes the time of evaluation of the modal/conditional quantification. The past-as-modal accounts could in principle go either way, treating consequent X-marking as "effecting" or "reflecting" something about the domain of quantification.

How do these two views relate to the Stalnakerian domain-widening idea?[25]

The "past-as-past" analysis delivers domain widening through the fact that certain modal accessibility relations or modal bases narrow as time progresses: more and more metaphysically possible futures become impossible as facts in the world develop. And in the epistemic dimension: the more we learn or the more evidence becomes available, the fewer worlds are epistemically possible. Therefore, treating the past component of X-marking as semantically active and as moving the time of the modal operator that underlies the conditional construction into the past of the evaluation time will result in a domain that is wider than it would have been at the evaluation time. On the other hand, there are at least two kinds of cases of X-marked

25 Existing work does not always or even often explicitly make the connection to Stalnaker's idea.

conditionals that may fall under domain widening but that are harder to analyse as being due to a past time of evaluation:

(53) a. If there had been no big bang, we wouldn't be here.

b. If Monica came to the party tonight, we'd have caipirinhas.

It's not entirely clear that there was a time in the past (before the big bang?) at which whether it was open whether there would be a big bang. And FLVs such as (53b) do not clearly involve widening via a past evaluation time either.

What about the "past-as-modal" views? Here, there is a split. Iatridou 2000 proposed an "exclusion" semantics for X. In her account, X marks that the domain of quantification of the conditional is disjoint from what we have called the epistemic set. It is crucial to remember that this proposal had been made with the main aim of finding a common formulation for the 'past tense' morpheme, so that sometimes it is interpreted as a temporal past and sometimes it has the meaning associated with what we now call 'X-marking'. But as a result of trying to bring the past tense interpretation of the relevant morpheme into the fold, Iatridou's account, and also the one developed more formally in Schulz 2014, do not in fact conform to the domain widening idea (widening has proven difficult to find in the meaning of temporal past). One immediate effect of this is that while the domain of an O-marked conditional (whether it's the context set or the epistemic set) will contain the evaluation world, the domain of an X-marked conditional will not (since it's disjoint from the epistemic set). This aspect of these proposals has been shown to be problematic by Mackay 2015 (see also Leahy 2018). More generally, the prediction is that X-marked conditionals will not obey the principle of Weak Centering, which is standardly taken to be valid for both O and X-marked conditionals in the logical and philosophical literature. We therefore will henceforth assume that the "exclusion" semantics for X is incorrect.

The other strand of "past-as-modal" views, represented for example by von Fintel 1998 and much more recently Mackay 2019, does conform to the domain widening view quite directly. von Fintel 1998 is basically just a reformulation and exploration of Stalnaker's proposal, while Mackay 2019 attempts to explain the use of past tense in X-marking within this general viewpoint. We find this line of thinking very promising, but as we said, the cross-linguistic picture of the morphology of X-marking goes far beyond just a modal meaning for past tense and the account will eventually have to be extended to other uses of X-marking. That is what we turn to now.

7 Extending the account

In this final section, we continue to leave aside the question of what the morphological composition of X is and why. Instead, we pretend X is a non-decomposable whole and ask the following question: what would have to be true of the meaning contribution of X so that for conditionals it marks Stalnakerian domain widening, at the same time as it marks a desire as unattainable and a necessity as weak. We tackle the two cases of desires and necessity modals in that order. Along the way, we will see that the "past-as-past" kind of approach faces obvious issues with extending to these cases.

7.1 X-marked desires

Our Stalnaker-inspired picture of what X-marking means in the case of conditionals is that X marks the widening of the domain of quantification of the conditionals: worlds outside the default set (context set or epistemic set) are included in the domain. Can this picture be extended to the case of X-marking in desire ascriptions?

The simplest, minimally viable analysis of the semantics of *want* is something like this:

(54) $\llbracket \text{want} \rrbracket^w = \lambda p.\lambda x.\ \forall w' \in \text{BEST}_{(w,x)}(D) :\ p(w') = 1$

This says that an agent x wants p in world w iff all of the worlds in the relevant domain D that are "best" as far as x in w is concerned are p-worlds.

What is the domain D? And does it make sense to think of X-marking in the case of desires as marking a widening of the domain, just as it does by assumption in the case of conditionals?

The consensus in the literature is that the domain of desire ascriptions is the set of doxastically accessible worlds for the agent of the desire, the agent's belief set or doxastic set. The original argument for this (developed in Heim 1992, following Karttunen 1974) comes from presupposition projection, where it can be shown that presuppositions triggered in the complement of the desire ascription are projected to the belief set of the agent, rather than the context set or the speaker's epistemic set:

(55) Patrick is under the misconception that he owns a cello, and he wants to sell it. (Heim 1992)

So, we can say that the default value for D in (54) is the set of worlds compatible with x's beliefs in w.[26]

What does this mean for the analysis of X-marked desires? One option we can quickly dismiss is that just like in the case of conditionals where X marks that the domain is not entirely included in the context set/epistemic set of the conversation, X on desire would mark that the domain (here: the agent's doxastic set) is not entirely included in the context set/epistemic set of the conversation. This is not promising: an agent is likely to have *some* beliefs that are false (and hence not in any epistemic set) or disagree with the conversational context's assumptions. But then X should be virtually obligatory on desire ascriptions, which is not the case.

Much more promising is the idea that X-marked desires signal that the domain of the ascription is not entirely included in, that is, is wider than the default domain, that is, the agent's doxastic set. In other words, X marks that worlds outside the agent's doxastic set are included in the quantified claim made by the desire ascription.

When the agent has a desire for a proposition p that they think is unattainable, the default D (their doxastic set) does not contain any p-worlds and therefore, the semantics in (54), with the default value for D, would predict that the desire ascription x *wants* p is straightforwardly false (or, worse, a presupposition failure, if we build in a presupposition that D contains p-worlds).

To construct an ascription of an unattainable desire, D has to be wider than the agent's doxastic set. It needs to include some p-worlds.[27] Once these worlds have been added to D, the semantics in (54) can proceed and claim that in this widened set, the best worlds are in fact all p-worlds. The idea then is that X-marking is a signal that such a widening from the default doxastic set is active.

26 A useful overview of other arguments for the belief-set relativity of desire is provided in Phillips-Brown 2019.

27 Which p-worlds is a tricky question. We suggest that D needs to include the p-worlds that are most similar to the worlds in the agent's doxastic set. Adapting an idea developed by Grano & Phillips-Brown 2020: $D^{+p} = D \cup \{w' : \exists w \in D.\ \mathrm{Sim}_w(p) = w'\}$, D is widened to include any world that is the most similar p-world to some world in D.

Iatridou 2000 gave the following examples to show that X-marked desires indeed are associated with a signal about the agent's (and not the speaker's) belief set not containing p-worlds:

(56) a. Arnold wishes he were married to exactly the type of woman he is married to but he doesn't know it.

b. In the movie *True Lies*, Jamie Lee Curtis wishes she were married to an exciting person and she is.

c. (Said by an expert on van Gogh:) Jean, who lives in Arles, wishes he lived in a place where van Gogh had spent some of his life. Poor Jean! He thinks that van Gogh was an Icelander who never left his island.

So, X-marking on desires signals that the domain of quantification is wider than the default value, the agent's doxastic set.

While we find this picture very attractive, there are two aspects in which it needs to be refined. First, there are cases where widening beyond the doxastic set could be claimed to be necessary but that do not correlate with X-marking. Second, there are cases of O-marked desires, that is plain *want*-ascriptions, that seem to be be about unattainable desires. This raises a question about the complementarity and competition between O and X.

The first set of problematic cases are ones where the doxastic set consists entirely of worlds where the complement proposition is true but where O-marked desire ascriptions are still entirely felicitous (and X-marked versions are not possible).

(57) a. [John hired a babysitter because] he wants to go to the movies tonight.

b. I live in Bolivia because I want to live in Bolivia.

(57a), from Heim 1992, is acceptable even if John firmly believes he will go to the movies tonight. (57b), from Iatridou 2000, is acceptable from a speaker who obviously knows that they live in Bolivia.[28]

If one wants to stay close to the picture we have developed so far, the obvious reaction to the cases in (57) is to say that D needs to include the closest non-p-worlds as well. This is indeed the approach taken to such examples in von Fintel 1999, where *want* is said to presuppose that its domain includes

28 One difference between the two cases is the obvious future orientation of Heim's babysitter example, which brings in interesting complications that we will not address here.

both p and non-p worlds. Accordingly, if the default D doesn't already include such worlds (because the agent in fact believes p), the domain needs to be widened. But both of the examples in (57) are O-marked and the corresponding X-marked versions are unacceptable. So, this is problematic for the idea that X-marking on desires signals widening of the domain to include worlds outside the doxastic set. Here we have widening without X-marking.

In other words, there is an asymmetry: widening to include worlds where an unattainable desire is satisfied can give rise to X-marking, while bringing worlds into the equation where a not desired alternative proposition is true does not go with X-marking.

If we want to maintain our domain-widening view of X-marking, we need a semantics for *want* that does not require domain-widening for the cases in (57). Here is an attempt:

(58) $$[\![\text{want}]\!]^w = \lambda p.\lambda x.\ \forall w' \in \text{BEST}_{(w,x)}(D_{(w,x)}) :\ p(w') = 1 \\ \& \neg\exists w'' \in \text{Sim}_{w'}(\neg p) :\ w'' \leq w')$$

Here, $\text{Sim}_{w'}(\neg p)$ returns the closest non-p worlds to w'. What happens in (58) is that in addition to our original requirement (that all the best worlds in the domain are p-worlds), we also require that those best p-worlds are better than any of the closest non-p worlds. But crucially, those non-p worlds don't have to be found in the domain. Comparison with non-p worlds in this analysis does not require widening of the domain.[29]

The second problem for our idea that X-marking on desire predicates marks a widening of the domain beyond the agent's doxastic set is that there are O-marked desire ascriptions with unattainable complements:

(59) I want this weekend to last forever.

The example in (59) is from Heim 1992. We will ignore that weekends that last forever are probably impossible and will just focus on the fact that the agent in (59) presumably does not believe that a forever weekend is attainable. Given our idea about X-marking, we would expect that (59) would lose out to the *wish*-variant:

29 There is a price to pay: unlike our original analysis in (54), the new analysis in (58) is not upward monotonic, which was a desideratum in von Fintel 1999. Bringing non-p worlds into the comparison means that the "more upward" we go, the further out in the similarity ordering we may need to go to find non-p worlds and thus we may find a disruption of upward inferences. We do not currently see a way to combine monotonicity with a semantics that does not widen the domain to include non-p worlds. Ah well.

(60) I wish this weekend would last forever.

More precisely, if the difference between O and X-marking is a signal about whether the domain is widened beyond the default value of the doxastic set of the agent, why don't standard "Maximize Presupposition" considerations outlaw the use of the O-marked form?

We have some thoughts on this matter. First, for English it is conceivable that outright competition does not happen because there are subtle lexical differences between the items *want* and *wish* that go beyond O/X-marking. However, we find that both forms are acceptable even in transparent desire languages, like Greek:[30]

(61) a. thelo afto to savatokiriako na kratisi
want.1.sg.nonpst this the weekend NA hold.nonpst.prf
ya panda
for always

b. tha ithela afto to savatokiriako na kratuse
FUT want.1.sg.pst.imp this the weekend NA hold.pst.imp
ya panda
for alway

Second, we sometimes find non-competition between O/X-marking in the case of conditionals as well. Here are two cases of O-marked conditionals with a counterfactual interpretation:

(62) a. If he has solved this problem, I'm the Queen of England.

b. If Messi waits just a second longer, he scores on that play.[31]

So, we could say that O-marking does not by itself ensure that the domain has not been widened, but X-marking is only possible with a widened domain. For some reason, the expected competition that would result in an inference from O-marking to a non-widened domain can be obviated.

30 As discussed in Footnote 23, there is also the option of having X on the desire and an O in the complement, which is used when the X-marking on 'want' is of the Exo-X kind, signalling that we're talking about a desire in a counterfactual scenario but that the desire is attainable there.

31 O-marked conditionals of this kind are common in sportscast play-by-play commentary. They have not (yet) been studied in the semantic literature (see, however, von Fintel 2005 and https://www.kaivonfintel.org/present-indicative-counterfactuals/).

Third, we would like to consider an idea that may be traceable to a remark in Heim 1992 about the forever weekend case, which she suggests "might be seen as reporting the attitudes of a mildly split personality. The reasonable part of me knows and is resigned to the fact that time passes, but the primitive creature of passion has lost sight of it." What if a speaker who utters (59) rather than (60) is signaling that (at least temporarily) they are acting as if a forever weekend is actually attainable, perhaps willfully setting aside the harsh reality? In that case, the example is no longer a counter-example to a theory of O/X-marking that predicts that O-marking signals (via competition with X) that the default domain contains p-worlds. It's just that the speaker is acting as if their doxastic set is bigger than their rational part would allow.

We will leave things in this unresolved state and simply state that we hope that the "X marks widening beyond the doxastic set" idea will turn out to have legs.

Before we turn to our third case of X-marking, we need to note that the "past-as-past" approach does not fit well with the picture we have developed here for X-marked desires. In the case of conditionals, "past-as-past" gave a plausible account for how domain widening happens in X-marked conditionals: at prior points in time, the set of accessible worlds (under both metaphysical and epistemic accessibility relations) is strictly larger/wider than it is at later points. But this doesn't carry over neatly to desire ascriptions. First, it's not strictly true that beliefs evolve monotonically, with doxastic sets at time t_0 being subsets of those at a prior time t_{-1}: people non-monotonically revise their beliefs in the face of new observations. One might say that grammar idealizes away from this and assumes that belief sets behave just like epistemic sets. But there is a second, more severe, problem: we can X-mark desires even if there is no prior time at which the agent believed the desire to be attainable. Consider:

(63) I wish I had never been born.

Surely, there is no time t_{-1} at which I believed that it was attainable that I wouldn't be born.[32]

32 The problem we're pointing out here is reminiscent of one we've already mentioned in Section 6.2: some counterfactual conditionals countenance scenarios that at no point in the past were possible.

7.2 X-marked necessity

We turn to the prospects of extending the Stalnakerian insight to X-marked necessity modals. In von Fintel & Iatridou 2008, we proposed that X-marking in this case is a signal about ordering sources. A strong necessity modal (like *have to* or *must*) has (at most) one ordering source and choosing the weak necessity modal (whether lexicalized like *ought* or transparently X-marked) signals that a "secondary" ordering source is active. Consider for example:

(64) Everyone ought to wash their hands, employees have to.

We suggested that *have to* in (64) depends on what is required by health and safety regulations, while *ought* in addition brings in what's best by not legally binding common-sense recommendations. Rubinstein 2012, 2014 further developed our rather vague ideas and proposed (in effect) that X-marking signals that the ordering is sensitive to more than non-negotiable priorities.

This is a point where the theory of X-marking has serious trouble to provide a unified analysis. If the ordering source-based account for X-marked necessity is on the right track, it is hard to see how to view this as domain widening, since the domain is unaffected. It is also difficult to see how "past-as-past" can apply in this case.

The only way towards unification that we see is to recast what X-marking signals to encompass both domain widening (in conditionals and desires) and ordering source addition (in necessity constructions). The common denominator is that in all three cases, there is a certain kind of departure from a default setting:

conditionals	X marks widening of the domain beyond the default (= context/epistemic set)
desire	X marks widening of the domain beyond the default (= doxastic set)
necessity	X marks inclusion of priorities beyond the default (= non-negotiables)

Note that our earlier observation that X-marked necessity modals are "weakened" through X-marking while there is no sense in which X-marked desires are weak is explained by the fact that X-marking targets different modal parameters in the two cases. An additional ordering source results in weakening, while a widened modal base does not. We admit that we have no idea

whether a formal implementation of this picture is in reasonable reach. We leave this as a challenge.

8 After the prolegomena

These were the prolegomena, now comes the task of actually developing a full theory of X-marking. That will be for another occasion.

If something along the lines of the previous section proves correct and formally implementable, it would also mean that if all languages were Hungarian, we would be done now. We would assign to the dedicated X-marker *–nA* the meaning 'departure from a default value of a modal parameter' and we would be done. Not all languages are Hungarian, however. We still have the issue of morphological composition of X in the many languages where X is not atomic. If the meaning of X-marking is "departure from a default value of a modal parameter", why does it contain a past morpheme, an imperfective morpheme etc in so many unrelated languages? The challenge of explaining the morphologocal composition X will be formidable. If we are right about the contribution of X in the three different environments we have examined this paper, the task of explaining its compositional derivation will have to be on a quite different path than has been attempted so far, as the practice has been to explore X only in conditionals.

In conclusion, our modest but important point in this paper was to show that studying X-marking in just one environment (conditionals) may give us a false sense of success and security. Once we broaden our attempts to understand X-marking in non-conditional environments, we see that all existing accounts fail. The past-as-past view appear to face serious difficulty. Maybe there is hope for the past-as-modal view.[33]

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33 There are other uses of X-marking that should be brought into the discussion at some point: for example, X-marking can also occur on possibility modal (and there it may arguably effect weakening through domain widening) and on expressions that mean "almost".

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