Conditional *then* and the QUD-approach to conditional perfection[1]

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Abstract. In this paper, we (re)consider the role of conditional *then* in bringing about *conditional perfection* (CP; Geis and Zwicky (1971) and much subsequent work): the pragmatic step from a conditional *if p, q* to *if **and only if** p, q*. Our starting point is von Fintel (2001), according to whom CP depends on the type of *question under discussion* (QUD) preceding the conditional. Particular attention is devoted to focus placement on conditional *then* in German (*then*$_{\text{F}}$), which we argue to come with an *exhaustive presupposition* (Bassi et al., 2021): *if p, then*$_F$ *q* 'exhaustively presupposes' no previously considered antecedent p′ to make the consequent q true. A challenge is raised by *cataphoric* uses of German *then*$_{\text{F}}$, where said presupposition does not (always) seem to be triggered.

Keywords: conditionals, presuppositions, exhaustivity, conditional perfection

1. Introduction

Bare conditionals of the form *if p, q* often exhibit what Geis and Zwicky (1971) call **conditional perfection (CP)**: the tendency (or 'invitation') to be interpreted as *if **and only if** p, q* or simply *iff p, q*.[2]

(1) If you mow the lawn, I'll give you $5. Geis and Zwicky (1971)
If **and only if** you mow the lawn, I'll give you $5.

The 'perfectioning' of such bare conditionals is widely seen as a pragmatic step detached from the semantics (Geis and Zwicky (1971), van der Auwera (1997), Horn (2000), von Fintel (2001), Herburger (2015) a.o.). Under this view, which we share, CP should be subject to much **variability** due to contextual and grammatical factors (H1). Based on this assumed variety of factors, we further predict CP to be **gradable** (H2), i.e. more or less salient, or harder or easier to cancel, depending on how many factors come together, and how strong these factors are.[3]

(H1) variability:
CP is subject to both contextual and grammatical factors, as well as their **interaction**. There are **CP-favoring**, **CP-disfavoring** and **CP-neutral** factors.

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[2]More acccurately, Geis and Zwicky (1971) call the *only if* component an *invited inference*, and describe it as *if not p, then not q*.

[3]There sure may be factors that are so strong in and of themselves that their presence or absence alone determines whether we have CP or not. The arguably clearest case of this sort are *even if* conditionals, whose additivity clashes with the exclusiveness of CP. One may thus classify the presence of *even* as CP-*canceling*, rather than just -*disfavoring*.

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(H2) gradability:
The more CP-favoring factors are satisfied, the stronger the CP-inference becomes.

This paper's overarching goal is to probe into factors that (dis)favor CP, with special attention to the semantics and pragmatics of (focused) conditional *then*. Our theoretical starting point is a simplified version of von Fintel (2001)'s **QUD-approach to CP**. Under this account, the presence or absence of CP is linked to an implicit **question under discussion (QUD**; Roberts (2012)). CP is favored under what we follow Cariani and Rips (2023) in calling a *consequent-directed* QUD1, which asks for the conditions under which the consequent q holds, (2a). By contrast, CP is *not* favored under an **antecedent-directed** QUD2, which asks about the antecedent p's consequences, (2b).

(2) a. QUD1 (consequent-directed, CP-favoring): Under which conditions q?
b. QUD2 (antecedent-directed, CP-neutral): What if p?

It follows that a conditional *if p, q* is more prone to being perfected under QUD1 than under QUD2: the former 'favors' CP to a higher degree than the latter does.

(3) **Effect of context on CP:** QUD1 $>_{\text{CP}}$ QUD2

As promising as von Fintel's QUD-approach is, recent experimental work testing it has found mixed results (Cariani and Rips, 2023; Grusdt et al., 2023); but see Farr (2011) for some confirming evidence. To some extent, this paper is also a theoretical contribution to the question how well the QUD-approach fares in the light of certain CP-favoring strategies.

One potential such strategy is the insertion of the particle known as 'conditional *then*' into the consequent clause (*if p, then q*). At least since Iatridou (1993), conditional *then* has been linked to some form of CP in previous work. The arguably strongest link of this sort is entertained by Izvorski (1996). Iatridou (1993) and von Fintel (1994) entertain the idea that a *then*-conditional *asserts* all p-worlds to be q-worlds (as is standard under a Kratzerian approach), but more crucially *implicate* (or alternatively *presuppose*) not all non-p worlds to be q-worlds, equivalently: *some* non-p-worlds *not* to be q-worlds. This implication is strongly reminiscent of CP (McHugh, 2023: 40). Due to the existential quantification, we refer to it as a **weakly exhaustive implication**, leaving open whether it is an implicature or a presupposition.

Building on Iatridou (1993) as well as Izvorski (1996), Schlenker (2004) treats conditional *then* as a world pronoun that anaphorically relates to the antecedent-clause. He also discusses cases with intonational focus on conditional *then*. With the additional parameter '±focused', we now have three possible conditionals, illustrated for German *dann* in (4): conditionals without *then*, with unfocused and with focused *then*.

(4) Wenn du den Rasen mähst, {Ø/dann/dann$_{\text{F}}$} wirst du belohnt.
if you the lawn mow {Ø/then/then$_{\text{F}}$} get you rewarded
'If you mow the lawn, {Ø/then/then$_{\text{F}}$} you will get a reward.'

Schlenker proposes that focus on conditional *then* (*if p, then*$_{\text{F}}$ *q*) triggers the *scalar implicature* that among all of p's contextually relevant alternatives, **only** p-worlds are q-worlds. This derives CP in its strongest form, given that there is no possibility for some non-p world to be a q-world. So if we understand Schlenker's proposal correctly, it takes intonational focus to attain this strong CP-effect, although Izvorski (1996) seems to tentatively ascribe it to *then* in all its

versions, focused or not. We refer to this implication as a **strongly exhaustive implicature**.

In line with the graded notion of CP as stated under (H1), Iatridou's and Schlenker's observations jointly lead to a **scale of CP** in terms of exhaustive strength, with *then*-less conditionals at the lower and $then_F$-conditionals at the higher end:

(5) **Effect of grammar on CP:** $then_F >_{CP} then >_{CP} \emptyset$

Based on the scales in (3) and (5), we generate the following predications:

- **(P1)** All three variants { Ø / then / $then_F$ } are compatible with the CP-favoring QUD1.
- **(P2)** Ø and *then* are compatible with the CP-neutral QUD2.
- **(P3)** $Then_F$, coming with strong CP, requires the CP-favoring QUD1, and is incompatible with the CP-neutral QUD2.

The idea behind (P2) and (P3) is that with the strongly exhaustive implicature triggered by $then_F$, a CP-favoring QUD is a better match than a CP-neutral one. But (P3) additionally follows from a need for *question-answer congruence* (Rooth, 1992): QUD2 leaves q open, so it requires focus on q in the answer. Focus on *then* (anaphorically) reflects focus on p, thereby violating this need.

We observe (P2) and (P3) to be borne out, insofar as Ø and *then* are fine under QUD2, but $then_F$ is not:

(6) a. QUD2: What if I mow the lawn?
b. Wenn du den Rasen mähst, **{Ø/dann/??$dann_F$}** wirst du belohnt.
if you the lawn mow **{Ø/then/??$then_F$}** get you rewarded

(P1), by contrast, is only partially borne out. Despite QUD1, $then_F$ is still slightly odd out of the blue:

(7) a. QUD1: Under which conditions do I get a reward?
b. Wenn du den Rasen mähst, **{Ø/dann/?$dann_F$}** wirst du belohnt.
if you the lawn mow **{Ø/then/?$then_F$}** get you rewarded

One may conclude from (7) that QUD1 is just necessary, not sufficient, for $then_F$ to be licensed. Inspired by Bassi et al. (2021) [BDPS], we will argue in this paper that the missing requirement is an *exhaustive presupposition* triggered by focus on *then*.

The paper is organized as follows. Section 2 lays out the main idea and discusses further data in its support. Section 3 is an attempt at a compositional implementation of the exhaustive presupposition, using a silent exhaustive operator proposed by BDPS. Section 4 discusses open issues, and section 5 concludes.

2. Focus on conditional *then*

What in addition to a CP-favoring QUD1 must hold in order for $then_F$ to be licensed? On our intuitions, a conditional like *if you mow the lawn, $then_F$ you'll get a reward* presupposes that some action other than mowing the lawn – say, washing the dishes – has been previously

considered and **rejected** as a truthful answer to the QUD1 *under which conditions do I get a reward?*. This amounts to a rejection of the alternative antecedent *that you wash the dishes* as insufficient for the consequent *that you get a reward*. A bit more precisely, conditionals of the form *if p, then$_F$ q* are taken by us to come with an **exhaustive presupposition** that each previously considered antecedent p′ (unless it entails p) must have been rejected as insufficient for the consequent q to be true. This presupposition explains why *then*$_{\text{F}}$ does not merely relate to the already CP-favoring QUD1, but comes with the additional 'rejection-requirement' just outlined: at least one possible answer must have been brought up and rejected as false. These are *anaphoric* uses of *then*$_{\text{F}}$, which we are largely concerned with in this paper. The same presupposition does not seem to be triggered by *cataphoric then*$_{\text{F}}$; see section 4.3 for an illustration.

With *then*$_{\text{F}}$, we do seem to have a form of CP, but its two components, sufficiency and necessity, are located at two different levels of meaning: *if p, q* (p's sufficiency for q) is *asserted*, but the exclusion of alternatives of the form *if p′, q* (roughly: p's necessity for q) is *presupposed*. Taking the alternatives at play to be alternative conditional antecedents rather than entire conditionals, one may put this division of labor between presupposition and assertion as follows:

(8) *if p, then$_F$ q*
   a. **asserted:**
      if p, q
   b. **presupposed:** (there is a previously considered p′ &) **[∃-component]**
      for each such p′: if p′, <u>not</u>-q **[EXH-component]**

The presupposition in (8b) comes in two parts. The exhaustive rejection of all previously considered p′ is preceded by the 'existential' part in brackets, according to which there are such p′ to begin with. One might think of this as the presupposition of the 'actual' presupposition, which quantifies over all these p′. As far as we can see, the existential requirement follows from a *non-triviality* principle proposed by (Schlenker, 2004), to be brought into play in section 4.1.

We illustrate our presuppositional claim with the stretch of discourse in (9). Anna raises a 'global' QUD1, which sets the goal of the dialogue that follows. Chris's questions are attempts at finding an answer to that QUD, but these questions are of the QUD2-type.[4] In Chris's second question (9b), *then*$_{\text{F}}$ relates to the preceding rejection, i.e. Benni's negative answer to Chris's first question whether washing the dishes will get him a peach. As indicated by the #, *then*$_{\text{F}}$ is near-obligatory in such a context – it is odd not to 'refer back' to the preceding rejection.

(9) a. Anna: Under which conditions will Chris get a peach? **= (global) QUD1**
   Benni: Let me think.
   Chris: If I wash the dishes, will I get a peach?
   ⇒ **alternative [$_{\text{p}'}$ Chris washes the dishes] activated**
   Benni: I'm afraid not. **= rejection**
   b. Chris: ... (und) wenn ich den Rasen mähe, bekomme ich #(dann$_{\text{F}}$) einen?
   ... (and) if I the lawn mow get I #(then$_{\text{F}}$) one

[4]They obviously don't have the form *what if p?*, but the 'polar' form *if p, q?*, which narrows down the number of possible true answers considerably. Still, they clearly are *antecedent-directed* by virtue of keeping the antecedent stable.

From (9), it can be seen that the exhaustive presupposition of *then*$_{\text{F}}$ *projects* under polar questions like (9b). This observation relativizes a claim about CP that has been made based on examples like (10). Ducrot (1969) and Horn (2000) present this example to show that CP-readings do not survive under polar questions, and are hence implicatures rather than presuppositions. von Fintel (2001) argues that the QUD-approach can explain this lack of CP: the question is of the QUD2-type, hence requires us to consider alternative *consequents*, not *antecedents*.

(10) Est-ce que, si Pierre vient, Jacques partira?
is-this that if Pierre comes Jacques leave-FUT
'If Pierre comes, will Jacques leave?' cf. Ducrot (1969: 35)
$\not\rightarrow$ if Pierre doesn't come, Jacques won't leave

With *then*$_{\text{F}}$ in (9b), however, one might argue the exhaustive component of CP to be present in a polar question, but at the level of presupposition: Chris presupposes the insufficiency of all other conditions mentioned in the context so far, which is the single condition [$_{\text{p}'}$ you wash the dishes]. As a result of this presupposed insufficiency, would an affirmative answer to (9b) identify mowing the lawn as *necessary* for Chris to get a peach? On the one hand, we are hesitant to say so, since such an answer doesn't preclude other sufficient conditions from being named in the further course of the conversation; see section 4.2 for an illustration. On the other hand, we may have necessity in a weaker 'scalar' sense: every salient p′ *scalarly lower* than p is presupposed to falsify q.

The context in (9a) raises a global QUD1 asking for the antecedent(s) making [$_{\text{q}}$ Chris gets a peach] true. It also provides a **rejection** of an alternative antecedent ($_{\text{p}'}$ Chris washes the dishes) as insufficient for q. By virtue of this rejection, *then*$_{\text{F}}$'s exhaustive presupposition as stated in (8b) is satisfied, and it is even infelicitous *not* to use it, cf. (9b). This infelicity is predicted under the pragmatic maxim *Maximize Presupposition* [MP] originating with Heim (1991) and elaborated on in much subsequent work. MP roughly says that when a presupposition trigger *can* be used in a given context, it *must* be.[5]

In the remainder of this section, we look at further examples, and try to explain them in terms of the analysis just sketched. We start with what looks like the *accommodation* of the exhaustive presupposition triggered by *then*$_{\text{F}}$, and then turn to the interaction of *then*$_{\text{F}}$ with additive particles.

2.1. Accommodation

As seen in (6) and (7) above, it is infelicitous to use (anaphoric) *then*$_{\text{F}}$ without having brought at least one alternative condition p′ into play. Under the present view, this infelicity can be ascribed to the fact that the more basic existential part of the presupposition stated in (8b) is not satisfied. But as we are going to see now, the second part of the presupposition, p′'s 'exhaustive' rejection as insufficient for the consequent, need not have been established in the preceding discourse, but can actually be contributed by *then*$_{\text{F}}$ itself: in other words, this rejection can be *accommodated*.

[5]Heim's (1991) idea is based on the contrast between definite and indefinite noun phrases. We thus have {a, the} as (lexical) alternatives (Sauerland, 2008). What are the alternatives for focused *then*? Is it (just) unfocused *then* or (also) a 'zero-alternative' (Ø), whose existence is assumed by some MP-based theories reviewed in Bade (2016)? How do these alternatives vary cross-linguistically?

In the discourse in (9), Benni need not explicitly state that for Chris to get a peach, washing the dishes is insufficient. The *then*$_{\text{F}}$-conditional is enough to convey this message. This can be seen in (11), which differs from (9) only in the absence of the explicit rejection.

(11) a. Chris: Under which conditions will I get a peach? = (global) QUD1
Benni: Let me think.
Chris: If I wash the dishes(, will I get a peach)?
⇒ **alternative [$_{\text{p}'}$ Chris washes the dishes] activated**
~~Benni: I'm afraid not.~~ **= ~~rejection~~**

b. Wenn du den Rasen mähst, dann$_{\text{F}}$ bekommst du einen Pfirsich.
if you the lawn mow then$_{\text{F}}$ get you a peach
⇝ if [$_{\text{p}'}$ Chris washes the dishes], you won't get a peach

Asking the dishwashing-(sub)question, Chris brings an alternative antecedent p′ into play, in satisfaction of the exhaustive presupposition's existential component. By uttering (11b), Benni gives two answers at the same time: not only to the global QUD1 – naming a condition sufficient for Chris to get a peach –, but also to the dishwashing-subquestion, which is answered negatively. Under the present account, the first answer is *asserted*, but the second one is *presupposed*. The presupposition is that all salient alternatives p′ to [$_{\text{p}}$ Chris mows the lawn] are insufficient for [$_{\text{q}}$ Chris gets a peach] to be true. The only such p′ being the dishwashing-alternative, Benni thus presupposes washing the dishes to be insufficient for getting a reward.[6] Since p′ is not explicitly rejected in the previous discourse – (11b) immediately follows the dishwashing-question after all – Benni must (and can) count on Chris to *accommodate* this presupposition, thus need not say 'no' explicitly, nor separately from giving the (only) true answer to QUD1.

In short: anaphoric *then*$_{\text{F}}$'s exhaustive presupposition – the rejection of a salient p′ – can be accommodated, hence need not be contextually given. What cannot be accommodated, hence must be contextually provided, is the existential requirement that p′ was made salient in the first place.

2.2. Additive particles

In this subsection, we look at one case in which *then*$_{\text{F}}$'s exhaustive presupposition is kept from being triggered, hence revealed to be a *pragmatic default*, perhaps in the sense of Stalnaker (1999): the possibility for *then*$_{\text{F}}$ to serve as the focus associate of an additive particle like *too*. *Then*'s compatibility with additives has long been observed in the literature. Izvorski (1996) and Schlenker (2004) discuss (12). There is what can be called an 'unconditional' context (as soccer will be played no matter what), which violates even a weakly exhaustive implication for *then*. Interestingly, 'bare' *then* is observed to be infelicitous in this context, but combined with the additive *too*, *then* is fine.

(12) We will definitely play soccer. If the sun shines we will. If it is cloudy and cold we will.

[6] Put a little more technically, the conditional alternative with the dishwashing-antecedent is presupposed to be excluded from the *question set*, the set of true answers to QUD1.

a. And if it rains, (#then) we will.
b. And if it rains, then too we will.
cf. Izvorski (1996): ex. (28) [based on von Fintel (1994): 99]

Such examples cast strong doubt on an analysis that incorporates exhaustivity into the semantics of *then*. Parallel observations can be made for *then*$_{\text{F}}$ in German:[7]

(13) a. We will definitely go for a hike. If it's cloudy, we will. If it drizzles, we will.
b. Und wenn es Katzen hagelt, #(selbst/auch) dann$_{\text{F}}$ gehen wir wandern.
and if it cats hails #(even/also) then$_{\text{F}}$ go we hike
'And if it rains [lit. hails] cats and dogs, {even then/then too} we'll go for a hike.'

The oddity of *then*$_{\text{F}}$ in the absence of an additive can again be taken to show that exhaustivity arises per default, but remains a pragmatic inference. This is not in conflict with the view that it is presupposed, as long as we allow some presuppositions to be pragmatic (Stalnaker, 1999). Since exhaustivity is pragmatic, it is also expected to be *cancelable*, which is something we witness in (13b). Additivity clashes with exhaustivity, at least under a perhaps too narrow construal of the latter as exclusive: a conflict discussed, among possible others, in Crnič (2012), Bade (2016) and Wimmer (2022). We have semantic additivity (contributed by the additive), but pragmatic exhaustivity (qua *then*$_{\text{F}}$). Only the latter is cancelable, so it must 'give way'.

Why is it odd not to use the additive in (13b)? The additive-containing version of (13b) requires a context in which some condition p′ other than [$_{\text{p}}$ it rains cats and dogs] has been established to suffice for [$_{\text{q}}$ we go hiking]. Such an 'additive' context necessitates the insertion of an additive. This is explained under *Maximize Presupposition* [MP].[8] It is also explained, however, under the competing theory *Obligatory Implicatures* (Bade 2016 a.o.), according to which the obligatory insertion of additive presupposition triggers comes from a contextual pressure to keep an obligatory exhaustivity implicature from arising: such an implicature would be inconsistent with an additive context like the one just described. The slight extension that *Obligatory Implicatures* receives in the case at hand is that the exhaustivity-inference to be canceled is pragmatically *presupposed* rather than implicated.

What do sentences like (13b) mean for the claimed connection between *then*$_{\text{F}}$ and a CP-favoring QUD1 (*under which conditions q?*)? We observe that this connection is weakened in the sense that QUD1 is no longer necessary for *then*$_{\text{F}}$ to be licensed. For one thing, (13b) is licensed in the following dialogue, in which only two CP-neutral QUD2s (*what if p?*) have been asked, but no QUD1:[9]

(14) a. – What (happens) if I wash the dishes? = QUD2
– If you wash the dishes, you'll get a peach.
– And what if I mow the lawn? = QUD2

[7] An even more natural way of expressing (13b) would be to have the consequent containing *then*$_{\text{F}}$ to the left of the antecedent, making *then*$_{\text{F}}$ *cataphoric*. This is illustrated in section 4.3.

[8] The additive could then be seen as having a lexical zero-alternative Ø. This relates to the discussion in footnote 5.

[9] There is a slightly more natural way to express (14b): focus is shifted from *then* to the additive, which now precedes the direct object, rather than forming a constituent with *then*:
(i) (Wenn du den Rasen mähst,) dann bekommst du auch$_{\text{F}}$ einen.
(if you the lawn mow) then get you also$_{\text{F}}$ one

b. (Wenn du den Rasen mähst,) auch (?)dann$_{F}$ bekommst du einen.
(if you the lawn mow) also (?)then$_{F}$ get you one

At the same time though, (13b) remains compatible with a QUD1:

(15) a. – Under which circumstances will I get a peach? = QUD1 If I wash the dishes? = QUD2
– Yes.
– And what if I mow the lawn? = QUD2
b. (Wenn du den Rasen mähst,) (?)auch dann$_{F}$ bekommst du einen.
(if you the lawn mow) (?)also then$_{F}$ get you one

Under the QUD-approach to CP, the weakened connection between QUD1 and *then*$_{F}$ is not unexpected: QUD1 was classified as CP-favoring. As long as *then*$_{F}$ comes with the special kind of CP proposed here, it needs a QUD1. As an associate of an additive particle, *then*$_{F}$ no longer comes with CP, so it no longer needs a QUD1.

2.3. Interim conclusion

In this section, we proposed *if p, then*$_{F}$ *q* to come with p's asserted sufficiency for q, but any previously mentioned p′'s pragmatically presupposed *in*sufficiency for q. Together, assertion and presupposition add up to a special kind of CP. The presupposition – its exhaustive component, to be precise – can be accommodated as well as canceled by an additive particle, in confirmation of its pragmatic status.

3. Towards a compositional implementation

In this section, we take steps towards a compositional implementation of the ideas outlined in the preceding section. Two ingredients will be crucial: Schlenker's (2004) treatment of conditional *then* as a world pronoun, as well as the silent presuppositional exhaustifier pex, which Bassi et al. (2021) propose as a twist to the grammatical approach to scalar implicatures (Chierchia et al. 2012 a.m.o.). Based on these ingredients, we will analyze two simple cases involving (anaphoric) conditional *then*$_{F}$, once with and once without an additive particle.

Ingredient 1: *then* as a world pronoun (Schlenker, 2004)

Schlenker (2004) develops his analysis of conditional *then* in the context of his treatment of *conditionals as definite descriptions*, a view inspired by previous work including Stalnaker (1968).[10] If-clauses are treated as the unique plurality of closest antecedent-worlds – worlds in which the antecedent holds true, and which come closest to (or differ minimally from) the actual world. The meaning of the conditional as a whole arises via collective predication of the consequent q to (each member of) that unique plurality. With Kaufmann (2017), we schematize

[10]We hope to do justice to more recent work in this vein, including Muyi Yang's, on a future occasion (Yang, 2020, 2022, 2023).

this predication as in (16), where the consequent q (a world predicate) takes the if-clause as its argument:[11]

(16) ⟦ if p, q ⟧ = q(⟦if p⟧)
q holds true of the unique plurality of closest p-worlds

Schlenker argues this analysis to be supported by the referential nature of conditional *then*. He treats conditional *then* as a world pronoun which refers to the very same world-plurality he takes the if-clause to denote. The if-clause is thus represented within the consequent, so to speak. In the following, coindexation between the if-clause and *then* reflects coreference of the two. In the case at hand, *then* anaphorically relates back to the if-clause, which hence becomes an *antecedent* in the double sense of the word.

(17) $[\text{if p}]_i\ \text{then}_i\ \text{q}$

Under this view as far as we understand it, a compositional interpretation of a *then*-conditional ignores the if-clause, and boils down to a collective ascription of the consequent proposition q to the plurality referred to by *then*:[12]

(18) ⟦ $[\text{if p}]_i\ \text{then}_i$ q ⟧
= q(⟦then_i⟧)

Of course, the if-clause remains crucial in that it acts as the 'referential source' for *then*. To do some justice to this dependence (and still oversimplifying matters), we are going to endow *then* with 'p' as a subscript, which is meant to reflect the fact that the antecedent p defines the unique plurality that conditional *then* refers (back) to:

(19) ⟦ $[\text{if p}]_i\ \text{then}_i$ q ⟧
= q(⟦then_p⟧)

Ingredient 2: `pex` (Bassi et al. (2021))

The second main ingredient to the analysis is the silent exhaustifier `pex` proposed by Bassi et al. (2021). `pex` is a variant of the exhaustivity-operator `exh`, a silent kind of *only* which figures in many works that take a grammatical rather than a pragmatic approach to scalar implicatures. Applied to a proposition p, `exh` entails (i) p and (ii) the negation of p's (excludable) alternatives. Call (i) the prejacent-implication and (ii) the exclusive implication. The crucial twist `pex` comes with is that (i) and (ii) are split across two different levels of meaning. The prejacent-implication remains entailed, but the exclusive implication becomes *presupposed*. A strongly simplified entry for `pex` in the notation of Heim and Kratzer (1998) thus looks as in (20). `pex` is indexed with a contextual variable C: a set of contextually salient alternatives to

[11] This seems to presuppose a treatment of the world-plurality denoted by the if-clause as one single, yet internally complex world, rather than a set of worlds. In contrast with the perhaps more conservative *restrictor approach* developed in work by David Lewis and Angelika Kratzer, there is no covert necessity modal *must* restricted by the antecedent. However, Kaufmann (2017) hypothesizes a silent distributive operator to be involved in certain cases.
[12] As far as we can tell, the view sketched by Izvorski (1996) is different in that *then*, being a wh-like element, acts more like an *abstractor*, perhaps over propositions. At a semantic level, it is thus closely related to the composition rule *predicate modification* in Heim and Kratzer (1998).

the prejacent p, including p itself.[13]

(20) $[\![\text{pex}_C]\!] = \lambda p$: each q in C that is not entailed by p is false.
p

cf. Bassi et al. (2021) [simplified]

What makes pex promising for given purposes might seem obvious: it comes as a tool to compositionally derive the exhaustive presupposition taken by us to be triggered by anaphoric *then*$_F$. The restriction of excluded alternatives to ones that are not entailed by p is quite common in work on exhaustivity, including overt *only*. Entailment is also evoked in Cariani and Rips's (2023) characterization of the alternatives excluded qua CP. This is in line with our view of the exhaustive presupposition as having a 'perfectioning' effect.

Putting the ingredients together

We now want to put the two ingredients together, and insert pex into the LF of a conditional featuring anaphoric *then*$_F$. Under the above assumption that in a conditional of the form *if p, then q*, it is just the consequent clause that enters compositional interpretation. It seems hence reasonable to assume that it is the consequent clause that pex attaches to. More concretely, a *then*$_F$-conditional of the form in (21a) gets an LF like (21b), with the if-clause surrounded by round brackets being ignored in the interpretation process.[14]

(21) a. if p, then$_F$ q
b. ([if p]) pex$_C$ [$_\phi$ then$_{p,F}$ q]

We concretize this analysis, including some elaboration on the alternatives for pex, by directly applying it to a simple example from above.

3.1. Application to a simple example

In the example in question, there was just a single alternative to be rejected by the *then*$_F$-conditional repeated in (22b) – an alternative consisting in (or at least involving) the antecedent proposition [$_{p'}$ 'you' wash the dishes]. This p′ was referred to as the dishwashing-alternative.[15]

(22) a. – Will you give me a peach if I wash the dishes?

[13]Under the chosen notation, colons introduce presuppositions. A period separates the presuppositions from content that is entailed/asserted.

[14]Strictly speaking, there is a *type mismatch* in (21b) in that pex wants a propositional argument (type *s,t*), but the constituent ϕ it attaches to denotes a truth-value (type *t*). There is, however, a standard solution to this issue, involving abstraction over a world-variable w, which in this case stands for the world that each p-world referred to by the if-clause comes closest to.

[15]The reduced setup in (22) appears to falsify the above claim that a *then*$_F$-conditional requires a QUD1, which would be of the form *under which conditions do 'you' get a peach?*. However, this QUD1 can be taken to be implicitly present in (22), given the (obligatory) focus structure of the overt question in (22). For (22b) to be felicitous, focus must be on the antecedent clause, and this in turn is only compatible with an implicit QUD1; see von Fintel (1994) and references cited therein.

b. – (Nein.) Wenn du den Rasen$_{(F)}$ mähst, dann$_{F}$ gebe ich dir einen Pfirsich.
– (no) if you the lawn$_{(F)}$ mow then$_{F}$ give I you a peach

Based on the analysis sketched above, the conditional in (22b) gets the LF in (23). The if-clause refers to a plurality of closest worlds in which the addressee mows the lawn, abbreviated as 'mow.lawn'. This same plurality is anaphorically picked up by *then*. The presuppositional exhaustifier pex applies directly to the consequent clause, which amounts to the proposition that the consequent proposition *that you get a peach* holds true throughout the plurality of closest lawnmowing-worlds.

(23) ([if mow.lawn]) pex$_{C}$ [$_{\phi}$ peach(then$_{mow.lawn,F}$)]
a. mow.lawn = the proposition that you mow the lawn
b. peach = the proposition that you get a peach

What are the alternatives for pex? It is intuitively clear that there are alternative antecedents at play. In our case, this translates into different anaphoric resolutions for *then*. In the scenario provided above, the only salient alternative is *that you wash the dishes*. So we have two alternatives in C: the prejacent with *then* referring to a plurality of closest lawnmowing-worlds, and a second one with *then* referring to a plurality of closest dishwashing-worlds:

(24) C = { **peach(then$_{mow.lawn}$)**, peach(then$_{wash.dishes}$) }

With these alternatives and the way pex was defined above, the LF in (23) is interpreted as in (25). The assertion is given in (25a): since pex is 'assertorically inert', all we have at the assertive level is the denotation of the proposition labeled ϕ in (23) – essentially mowing the lawn being *sufficient* for getting a peach. The presupposition in (25b) excludes ϕ's only alternative in C: washing the dishes is thus presupposed to be *insufficient* for getting a peach.

(25) ⟦ (23) ⟧ is
a. true iff peach(then$_{mow.lawn}$) is true;
b. defined iff each q in { **peach(then$_{mow.lawn}$)**, peach(then$_{wash.dishes}$) } that is not entailed by peach(then$_{mow.lawn}$) is false
⇒ **peach(then$_{wash.dishes}$) is presupposed to be false**

The single other alternative 'peach(then$_{wash.dishes}$)' is not entailed by the prejacent of pex [$_{\phi}$ peach(then$_{mow.lawn}$)]: getting a peach in all closest lawnmowing-worlds does not entail also getting a peach in all closest dishwashing-worlds. Since pex as defined above excludes all alternatives not entailed by its prejacent, the single alternative is therefore presupposed to be false. This, we believe, derives what we informally described as the presuppositional *rejection* of salient alternatives above.

We now turn to a case in which pex is obligatorily absent, and *then*$_{F}$ serves as the focus associate of an additive particle.

3.2. Adding additive particles

As seen in section 2.2 above, it can be perfectly fine, and even obligatory, for an additive particle to associate with *then*$_{F}$. The example provided above is repeated in (26b), subtracting *selbst*

'even', and preceded by an utterance by the same speaker stating that washing the dishes is sufficient for getting a peach. Without the additive, the sentence is infelicitous in this context.[16]

(26) a. If you wash the dishes, you'll get a peach.
b. Und wenn du den Rasen mähst, #(auch) dann$_F$ bekommst du einen Pfirsich.
and if you the lawn mow #(also) then$_F$ get you a peach

As a possible explanation for the obligatoriness of the additive particle *auch* 'also', we considered *Obligatory Implicatures* (Bade, 2016): *then*$_F$'s exhaustive presupposition, which comes as a mere pragmatic default, would be in conflict with the context. The insertion of an additive effectively cancels this presupposition, so no conflict arises. Our task in this subsection is to outline in some more detail in how far an additive has this canceling effect. Again, this heavily relies on previous work cited in section 2.2, not only Bade (2016).

Under the present analysis, the exhaustive presupposition being a default amounts to a default-insertion of the silent exhaustifier pex at LF; so if an additive particle keeps the presupposition from being triggered, it rules out pex's presence at LF. The contribution of an additive contradicts that of exclusive operators like pex or overt *only*, granted both have access to the same alternatives. This is sketched in (27), where add stands for (the operator spelled out by) an additive particle. Put simply, while additives presuppose (at least) *some* alternative to the prejacent ϕ to be true (27a), pex presupposes *none* of them to be true (27b). The additive in (26b) is overt, so its contribution cannot be ignored at LF; in this sense, it 'wins' over pex, which would trigger a conflicting presupposition.

(27) (if ...) (#pex$_C$) add$_C$ [$_\phi$ ...]
a. add $\rightsquigarrow$ *some* C-alternative not entailed by ϕ is true
b. pex $\rightsquigarrow$ *no* C-alternative not entailed by ϕ is true

A fairly standard entry for add is given in (28). Little surprisingly, the additive presupposition is the exact opposite of the one ascribed to pex above. This opposition is presuppositional: pex and add share an assertoric 'inertia', returning their prejacents on condition that their respective presuppositions are met.

(28) $[\![\text{add}_C]\!] = \lambda$p: some q in C that is not entailed by p is true.
p

With this definition in place, and (again) taking 'peach(then$_{\text{wash.dishes}}$)' to be the only salient alternative, we derive the following interpretation for (27). The assertion remains the same as if the additive were absent, and pex present: mowing the lawn is asserted to be sufficient for getting a peach (29a). The presupposition crucially changes, and amounts to washing the dishes being equally sufficient for getting the peach, (29b).

(29) $[\![$ (27) $]\!]$ is
a. true iff peach(then$_{\text{mow.lawn}}$) is true;
b. defined iff *some* q in { peach(then$_{\text{mow.lawn}}$), peach(then$_{\text{wash.dishes}}$) } that is not entailed by peach(then$_{\text{mow.lawn}}$) is *true*
$\Rightarrow$ **peach(then$_{\text{wash.dishes}}$) is presupposed to be true**

[16] As pointed out in footnote 7, the sentence even improves when *then*$_F$ is used cataphorically. See section 4.3 for an illustration.

As seen above, pex, if present, would presuppose washing the dishes to be *in*sufficient for getting the peach. This would clash not only with the presupposition triggered by add, but also with the context given for (26b) above.

3.3. Interim conclusion

In this section, we sketched a compositional analysis of two kinds of *then*$_{\text{F}}$-conditionals, the first one lacking and the second one containing an additive particle associating with focus on *then*: cases without the additive were treated as having the silent exhaustifier pex at LF, which captures what we argued to be a *then*$_{\text{F}}$-conditional's exhaustive presupposition. In cases with the additive, pex was taken to be absent, as its contribution conflicts with that made by the additive. The next section addresses some open issues pertaining to focused conditional *then* and its 'perfectioning' effect.

4. Open issues

In this section, we discuss three open issues for the view developed in this paper.

4.1. Non-triviality

In (7), repeated in a modified form in (30), the insufficiency of QUD1 to license *then*$_{\text{F}}$ was observed.

(30) a. QUD1: Under which conditions do I get a reward?
b. Wenn du den Rasen mähst, (?dann$_{\text{F}}$) wirst du belohnt.
if you the lawn mow (?then$_{\text{F}}$}) get you rewarded

This motivated our core claim that a conditional of the form *if p, then*$_F$ *q* triggers an exhaustive presupposition that all previously considered conditions p′ be insufficient for q. However, we also endowed such conditionals with a more basic existential presupposition that such p′s have been made contextually salient to begin with:

(31) *if p, then*$_F$ *q*
a. **asserted:**
if p, q
b. **presupposed:** (there is a previously considered p′ &) **[∃-component]**
for each such p′: if p′, not-q **[EXH-component]**
repeated from (8b)

In section 2.1, we further saw that the EXH-component can be accommodated, but the ∃-component cannot. This might be taken as an indication of the even more basic status of the latter, which apparently comes as the 'presupposition of a presupposition'. The ∃-component was no longer involved in the compositional analysis put forth in section 3. So one may wonder whether this analysis falls short of capturing the subtlety of the data, and whether the semantics

of the presuppositional exhaustifier pex has to be revised accordingly.

This question can be answered negatively: there is no need to put the ∃-component into the analysis, as it is independently guaranteed by a 'non-triviality' principle put forth in Schlenker (2004). The principle is formulated as a felicity condition for (obligatory) scalar implicatures, but may be rooted in a more general ban on vacuous quantification in natural language:[17]

(32) **Non-triviality**, Schlenker (2004): 443
Some element of the focus value should not be entailed by the asserted sentence.

Schlenker observes that one type of cases in which non-triviality is (trivially) violated are cases in which no focus alternatives have been made salient to begin with. With the asserted sentence S being the single alternative to itself, there clearly are no alternatives that do not entail S, hence none to be excluded by a scalar implicature. This is clearly the case in (30), where no alternative antecedent p′ was previously considered as a possible verifier of the consequent [$_{q}$ you get rewarded]. There is hence no salient conditional proposition involving a p′ sufficient for q. But such a proposition is needed for the exhaustive presupposition triggered by pex to apply non-vacuously.

A non-trivial way to violate non-triviality would be to make salient a conditional with an 'entailing' antecedent, i.e. one that is logically stronger than the *then*$_{F}$-conditional's antecedent. Conditional antecedents are (Strawson) downward-entailing von Fintel (1999); to strengthen a conditional antecedent is hence to weaken the conditional as a whole. So the single alternative having been raised prior to the *then*$_{F}$-conditional is entailed by the asserted conditional, in violation of non-triviality. We indeed find a *then*$_{F}$-conditional to be quite odd in such a context. Mowing the lawn *with nail scissors* entails mowing the lawn (as atypical of a lawnmowing-instrument nail scissors may seem), so (33b) entails its single alternative, the proposition that mowing the lawn with the scissors suffices for being rewarded.

(33) a. Under which conditions do I get a reward?
If I mow the lawn with these nail scissors?
b. Wenn du den Rasen mähst, (#dann$_{F}$) wirst du belohnt.
if you the lawn mow (#then$_{F}$) get you rewarded

We find a conditional with unfocused *then* or even no *then* at all to be considerably less deviant in such a context. Given the scale of CP from (5) repeated in (34), this seems expected: *then*$_{F}$ is the most strongly CP-favoring variant among the three conditional options. The less a given conditional form favors CP, the weaker the underlying exhaustive implication should be, be it an implicature or a presupposition; and the weaker this implication is, the less should an assertion of the corresponding conditional be subject to non-triviality.

(34) *then*$_{F}$ $>_{CP}$ *then* $>_{CP}$ Ø repeated from (5)

Admittedly though, in postulating (34), we were a little vague about the underlying notion of implicational strength: is this a matter of quantificational strength, of cancelability, or of both? The view that unfocused *then* is more weakly CP-favoring than focused *then* was mainly moti-

[17] Another area in which this ban potentially comes to the surface are indicative conditionals and a *compatibility presupposition* that von Fintel (1998) proposes for them; thanks to Frank Sode (pc) for discussion of this presupposition in a different context.

vated by apparent differences in quantificational strength. But even under a weak form of CP – the 'existential' implication that *some* alternative antecedent does not verify the consequent –, we could assume non-triviality to apply, i.e. a conditional *if p, then q* to be infelicitous without any alternative p′ having been made contextually salient. It hence seems that the difference between focused and unfocused *then* cannot be reduced to a difference in quantificational strength between the two.

4.2. Alternatives to be excluded[18]

It has become clear that conditional *then*$_{\text{F}}$ comes with the exclusion of alternatives having been made salient *before* the time of utterance. It does not seem to come with the exclusion of alternatives potentially mentioned *later on*. To our ears, the following sequence of sentences (the first one being preceded by a suitable context) sounds coherent if uttered by the same speaker:[19]

(35) a. Wenn du den Rasen mähst, dann$_{\text{F}}$ wirst du belohnt.
if you the lawn mow then$_{\text{F}}$ get you rewarded
b. Aber auch, wenn du stattdessen Pilze sammelst.
but also if you instead mushrooms collect

The *then*$_{\text{F}}$-conditional in (35a) asserts the sufficiency of mowing the lawn, but presupposes the insufficiency of *previously considered* actions for getting a reward. It does not rule out the *subsequent* identification of collecting mushrooms, an action that doesn't entail mowing the lawn, as sufficient for being rewarded. By contrast, this follow-up becomes quite infelicitous if the preceding *then*$_{\text{F}}$-conditional is replaced by an *only if* conditional:

(36) a. Nur wenn du den Rasen mähst, wirst du belohnt.
only if you the lawn mow get you rewarded
b. ??Aber auch, wenn du stattdessen Pilze sammelst.
??but also if you instead mushrooms collect

There is an apparent contrast between (35) and (36). *then*$_{\text{F}}$, despite coming with strong CP, allows for other sufficient conditions to be mentioned later on in the discourse. An overt exhaustifier like *only* doesn't seem to allow this, at least not to the same degree. A possible take on this contrast could be the respective status of the exhaustive inference: with *then*$_{\text{F}}$, the insufficiency of other conditions is *presupposed*, but it is *asserted* with *only*. The term *presupposition* itself appears to suggest a limited attention to the discourse *preceding* the utterance, a limitation clearly not shared with assertions – but one that (in the case at hand) should come

[18]We thank Muyi Yang for comments on the topic discussed in this section.

[19]A potentially related observation is that one can probably come up with a context in which the following example featuring *then*$_{\text{F}}$ and *beispielsweise* 'for example' sounds natural:

(i) Wenn du beispielsweise den Rasen$_{\text{(F)}}$ mähst, dann$_{\text{F}}$ wirst du belohnt.
if you for.example the lawn$_{\text{(F)}}$ mow then$_{\text{F}}$ get you rewarded

Manfred Krifka (pc) suggests to us that *beispielsweise* [BSPW] may cancel a CP-implicature. This requires BSPW to take narrow scope. In that case, *if* BSPW *p, q* conveys p to be one condition *among possible others* that makes q true. We don't see how BSPW could have a wide-scope reading in this case. So one might predict (i) to be inherently odd, given a clash between *then*$_{\text{F}}$ and BSPW. But on our intuitions, (i) exhibits no such oddity.

with a restriction on C, the set of contextually salient alternatives. We have to leave this matter to future research, unless it has already been addressed somewhere else.[20]

4.3. Ana- vs. cataphoricity

Up to this point, we have been concerned with *anaphoric* uses of conditional *then*$_F$: uses in which *then*$_F$ follows the if-clause it refers to. But German also has *cataphoric* uses, in which *then*$_F$ precedes, i.e. 'anticipates' the if-clause.[21] The two uses differ in at least two respects. First, the cataphoric variant sounds slightly more natural than the anaphoric one when it serves as the associate of a focus-sensitive particle, as illustrated by the contrast between (37a) and (37b).

(37) a. Du bekommst { nur / auch / selbst } dann$_F$ ein Eis, wenn du den Rasen mähst.
you get { only / also / even } then$_F$ an ice if you the lawn mow
b. Wenn du den Rasen mähst, { ?nur / ?auch / ?selbst } dann$_F$ bekommst du ein Eis.
if you the lawn mow { ?only / ?also / ?even } then$_F$ get you an ice

What is more, cataphoric *then*$_F$ does not seem to come with the same presuppositional requirements as its anaphoric counterpart. With the cataphoric variant, no alternative to the asserted conditional's antecedent must have been made salient, and the 'consequent-directed' QUD1 suffices for cataphoric *then*$_F$ to be licensed, see (38b). This slightly contrasts with the anaphoric variant, as can (again) be seen in (38c).

(38) a. – Under which condition(s) will I get a doughnut?
b. – Du bekommst dann$_F$ einen Doughnut, wenn du den Rasen mähst.
– you get then$_F$ a doughnut if you the lawn mow
c. – ?Wenn du den Rasen mähst, dann$_F$ bekommst du einen Doughnut.
– ?if you the lawn mow then$_F$ get you a doughnut

What further complicates the picture is the sequence of questions in (39), intended to be uttered by the same speaker. (39b) is a polar question containing cataphoric *then*$_F$, but it strikes us as slightly infelicitous following the QUD1 in (39a): cataphoric *then*$_F$ now appears to come with the same presuppositional requirements as its anaphoric counterpart.

(39) a. Under which condition(s) will I get a doughnut?
b. ?Bekomme ich dann$_F$ einen, wenn ich den Rasen mähe?
?get I then$_F$ one if I the lawn mow

[20] At least this 'attentional limitation' of presupposed content to the discourse preceding the presupposing sentence doesn't strike us as unparalleled. The unlikelihood-presupposition of *even* might be a case in point: *even* is widely taken to presuppose its prejacent to be the least likely among all contextually salient alternatives. But with the sentence containing *even*, that same prejacent is asserted to be true. With this factuality (which doesn't survive under embedding), the prejacent's unlikelihood is presupposed to hold *before the time of utterance*. With conditional *then*$_F$, the rejection of alternative condition(al)s seems temporally restricted in a similar way.

[21] Cataphoric uses of *then*-like particles are more restricted in languages like English (Schlenker, 2004) or Chinese (Pan and Paul, 2018); thanks also to Johan van der Auwera (p.c.) for discussion.

If these intuitions are correct, we are facing a partial contrast between cataphoric and anaphoric *then*$_{\text{F}}$: at least in non-interrogative environments, only the anaphoric variant requires alternatives to the antecedent of the asserted conditional to have been considered (if not rejected, given the possibility of accommodation). How can this contrast and its apparent absence in (39b) be explained?

We start by observing that anaphoric *then* can be left unfocused, but cataphoric *then* cannot.[22] Anaphoric *then* is only sometimes focused, but then comes with the exhaustive presupposition. What in the structure could contribute to this presupposition? It seems intuitive to regard the *if*-clause preceding anaphoric *then*$_{\text{F}}$ as a kind of *contrastive topic* (in a rather atheoretical, literal sense of the term, ignoring for a moment the vast literature there is on this topic): after all, there is something contrastive about the anaphoric cases in that the asserted conditional's antecedent is asserted to verify the consequent, *in contrast to* all previously considered antecedents. It remains to be seen whether this is a viable way of dealing with the subtle contrast observed in (38); but even if so, this would still leave unexplained (39b), where cataphoric *then*$_{\text{F}}$ surprisingly comes with the exhaustive presupposition it didn't come with in (38b).

5. Conclusion

Since its emergence in the linguistic literature, conditional perfection (CP) has received various accounts with revived interests in more recent years in linguistics and cognitive science. However, the empirical picture remains puzzling as to the precise roles of grammar and pragmatics. The theoretical starting point of the present study was a QUD-approach to CP developed by von Fintel (2001). Generalizing this approach, the type of *question under discussion* (QUD) constitutes an overarching pragmatic factor: all other CP-favoring factors are indicative of what Cariani and Rips (2023) call a *consequent-directed* QUD, referred by us as QUD1, which keeps the consequent q stable (*under which conditions q?*). It focuses on conditional *then*, aiming to serve as a window into the grammatical factors favoring CP inferences. The study adds pieces to a whole battery of factors, which can be roughly divided into grammatical and pragmatic factors, and sheds light on their interplay.

Crucially, we proposed the CP of *then*$_{\text{F}}$ to be special in that the exclusion of alternative condition(al)s is (pragmatically) *presupposed* rather than implicated. The presence of a QUD1 was identified as necessary, but not sufficient, for *then*$_{\text{F}}$ to be licensed: in addition, at least one potential answer to that QUD is presupposed to have been rejected as false in the preceding discourse. This amounts to the presupposition that at least one alternative antecedent is insufficient to make the consequent true. These observations strike us as supportive of the recent view by Bassi et al. (2021), according to which silent exhaustification is presupposed rather than asserted.

Some issues left open by our account were identified in the preceding section, the most puzzling of which might be the differences between anaphoric and cataphoric uses of *then*$_{\text{F}}$. With the aim of a more general view of CP in mind, other potentially CP-favoring or -disfavoring factors need

[22] Obligatory focus on cataphoric *then* may have to do with a strongly exhaustive interpretation that would also arise in its absence: conditionals with right-adjoined antecedents appear to be more readily perfected than conditionals with left-adjoined antecedents, an observation that van der Auwera (1997) ascribes to Bolinger (1952).

to be looked into, and the crosslinguistic picture to be taken into account as well. What is more, the more subtle linguistic judgments reported in this paper deserve to be tested experimentally.

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