Temporal *noch/still* and further-to readings of German *noch*

Sigrid Beck - Universität Tübingen

Abstract: In this paper I propose an analysis of temporal *still* and its German counterpart *noch*. The proposal unifies earlier analyses e.g. of 'it is still raining', 'it is still 8am'. It is then applied to so-called further-to *noch* in German as in 'Ich gehe noch einkaufen' (lit.: 'I still go shopping' = 'I will just quickly go shopping'). The proposal highlights the interesting interaction of syntactic structure, presupposition, implicature and focus in such sentences.

Keywords: *noch*, focus, scalar implicatures, presupposition

1. Introduction

This paper presents an analysis of the so-called 'further-to' reading of the German scalar particle *noch* 'still' according to which it is an instance of a normal temporal reading of the particle. An example of temporal *noch/still* is given in (1). Its interpretation is sketched informally in (1'). The English particle *still* and its German counterpart *noch* share this interpretation.

(1) Martin schläft noch. (temporal *noch/still*)
Martin sleeps still
'Martin is still asleep.'

(1') (i) Martin is asleep.
(ii) Martin has been asleep earlier.
(iii) Martin might not be asleep later.

In (2) I provide an example of further-to *noch*. The term comes from Klein (2007/2015). This use of the German particle is not shared by English *still*. The contribution of the particle is hard to pin down; (2') suggests an appropriate context.

(2) Ich gehe noch (eben) einkaufen. (further-to *noch*)
I go still (just) shopping
'I will just quickly go shopping (before...)'

(2') I will go shopping now, and then we can move on from doing chores to some fun activity.

My goal is to present a compositional semantic analysis of the further-to reading. This analysis will use the same semantics of the particle as (1). The interpretive effect of *noch* is quite different

in (2) than in (1) because in (2), *noch* does not modify the main predicate of the clause. Instead, I argue that it is an instance of subconstituent modifying *noch*, similar to (3).

(3) Lynn Hill hat noch am 23. den Gipfel erreicht.
Lynn Hill has still on the 23rd the summit reached
? 'Lynn Hill reached the summit still on the 23rd.'

(3') (i) Lynn Hill reached the summit on the 23rd.
(ii) There are earlier times that are on the 23rd.
(iii) Later times might not be on the 23rd.

This is not immediately obvious in (2) because the subconstituent in further-to uses of *noch* may be silent. The further-to reading arises when *noch* combines with an overt or covert time adverbial denoting an interval surrounding the topic time of the sentence.

The following sections spell out this idea. In section 2 I introduce the analysis of normal temporal *noch/still* that I adopt. In section 3 I discuss the interpretation of sentences in which the particle modifies a subconstituent instead of the main predicate of the sentence. I extend this analysis to further-to *noch* in section 4. Effects of focus in such sentences are discussed in section 5. Section 6 wraps up the paper.

2. Temporal *noch/still*

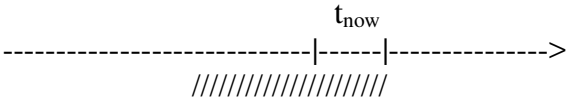
We begin with fairly straightforward and well-described continuative uses of *noch/still*; another example is given below. Where English and German are the same, I present the data simply as a pair, as in (4), for convenience. Intuitively (4) contributes the meaning components in (4').

(4) Es regnet noch.
It is still raining.

(4') (i) Assertion: It is raining.
(ii) Presupposition: It rained at the relevant preceding time.
(iii) Implicature: It might stop raining./It will stop raining.

Let's begin with the first two, the presupposition (ii) and assertion (i). Their combined interpretive impact is sketched in (5).

(5) 'rain' is true of the utterance time, and 'rain' was true of an earlier abutting time interval.



In my analysis of temporal *noch/still*, I use the lexical entry in (6) for the scalar particle. See e.g. Löbner (1990) and Ippolito (2007) for predecessors and discussion. The interpretation resulting from this semantics is sketched in general terms in (7). I refer to P as the predicate, to t as the argument and to t* as the anaphoric element. The scalar alternatives become relevant below.

(6) $[[\textit{noch/still}_{<}]] = \lambda t^*.\lambda t.\lambda P_{<i,t>}: t^* \propto t \;\&\; P(t^*).P(t)$ (type <i,<i,<<i,t>,t>>>)

(7) The scale is temporal order "<" (type <<i,<i,t>>).

(i) Assertion: P(t) - P is true of t
(ii) PSP: $t^* \propto t \;\&\; P(t^*)$ - the relevant other time t* left-abuts (immediately precedes) t and P is true of t*
(iii) Scalar alternatives: $\{P(t') \mid t' \in Alt(t)\}$
"What times t' is P true of?"

I associate the example with the LF in (8). I assume (quite standardly; see e.g. von Stechow & Beck (2015) and the literature cited there) that an Aspect Phrase AspP dominates VP, which denotes a set of eventualities. *Noch/still* is adjoined to that, and below tense. English tells us that the aspect is imperfective. The AspP hence has the denotation in (9). (For ease of exposition, the analysis is presented for English where it is not specifically concerned with German.)

(8) $[_{TP}$ PRES $[\lambda t[\phi$ [still$_{<}$ t* t] $[_{AspP}$ ipf $[_{VP}\ \lambda e$ rain e]]]]

(9) $[[AspP]] = \lambda t.\exists e[t \subseteq \tau(e) \;\&\; rain(e)]$
time intervals included in the run time of a rain event

In order to simplify the composition, let us suppose that the present tense is referential, referring to t_{now} (see e.g. Kratzer (1998) for such an analysis of tense). We can then consider a simplified structure (skipping the variable binding in (8)) as in (10), where *noch/still*'s second argument is t_{now}. The interpretation of this structure, applying *noch/still* to (9), is given in (11). As desired, it says that a period of rain began before now and continues into the present.

(10) Assume that PRES is simply t_{now}. Simplified structure:
[ϕ [still$_<$ t* t_{now}] [$_{AspP}$ ipf [$_{VP}$ λe rain e]]]

(11) [[(10)]] is only defined if t*∝ t_{now} & ∃e[t*⊆τ(e) & rain(e)]]
i.e. (10) presupposes that there was rain at a time immediately before now. Then:
[[(10)]] = 1 iff ∃e[t_{now} ⊆τ(e) & rain(e)]
i.e. (10) asserts that it is raining.

This is the interpretation standardly associated with this type of example. Let us examine some aspects of it in more detail. First, it is uncontroversial that *noch/still* adds a presupposition about an earlier time. (12a) and (12b) both presuppose that it rained earlier. Notice that I have left the earlier time, *noch/still*'s first argument, as a free temporal variable in (10). The motivation for this comes from data like (13) (constructed after examples in Heim (1990); see also Ippolito (2007)).

(12) a. Is it still raining?
b. If it is still raining, we should take an umbrella.

(13) John was cooking yesterday at 6pm. He is still cooking now.

We intuitively take (13) to talk about one long cooking event, i.e. the 6pm cooking is continued. If the presupposition were existential, there would be no reason to do so - John could have stopped and resumed cooking an hour ago. But if the presupposition is about a particular salient time, and the only time mentioned is yesterday 6pm, there must be continuous cooking. Let's next examine the example in more detail:

(14) a. [still$_<$ t* t][ipf [λe John cook e]]
b. [[(14a)]] is only defined if t*∝ t_{now} & ∃e[t*⊆τ(e) & cook(e)(J)]]
Then: [[(14a)]] = 1 iff ∃e[t_{now} ⊆τ(e) & cook(e)(J)]

If t* were the time actually mentioned - 6pm, i.e. some interval surrounding 6pm -, then t* wouldn't plausibly be abutting now. I am going to assume that by virtue of mentioning 6pm, the interval from 6pm to now becomes salient, and this is the value for t*.[1]

[1] Alternatively, we could change the lexical entry for *noch/still* thus:
(i) [[*noch/still*$_<$]] = λt*.λt.λP$_{<i,t>}$: P([t*,t)).P(t)
That is, the interval including the salient earlier time up to t is a P interval. I go with the presentationally simpler version in the text, which also provides a clearer connection to marginal uses of *noch/still*. Thanks to Ede Zimmermann, Michela Ippolito and Irene Heim for discussion of this point.

The two examples analysed above happened to be present tense, where we took the argument to be simply t_{now}. More generally, I am going to follow Klein (2007/2015) in taking the argument to be the topic time t_{topic}. In a past tense sentence, this is going to be a past time.
Next, let's turn to the third meaning component of (4). The sentence may give rise to an implicature about the future, i.e. that it may/will stop raining. I suggest that *noch/still*'s argument t introduces alternatives; the time variable is the trigger that creates the alternative set. In the example, they are the ones in (15a). Since presupposition and assertion combine to ensure that it has rained in the past and is raining now, the pragmatically open alternatives concern the future, as indicated in (15b). (All this plausibly concerns some contextually restricted time span, for example this afternoon. I will not make this explicit in the representation.)

(15) Scalar alternatives:
a. $[[\phi]]_{Alt} = \{\exists e[t' \subseteq \tau(e) \,\&\, rain(e)] \mid t' \in Alt(t)\}$ (Alt-trigger: time variable)
"when is it raining?"
b. $\{\exists e[t' \subseteq \tau(e) \,\&\, rain(e)] \mid t_{now} < t'\}$ (pragm. 'open' alternatives)
"when after now is it raining?"

I further suggest that there are appropriateness constraints on alternative sets. This is most easily seen in the case of questions. The question in (16a) is only appropriate if both true and false answers are possible; i.e. (16b) is odd. More generally, the relevant condition is as in (17).

(16) a. Who passed?
b. # I know that either everyone passed or everyone failed. Who passed?

(17) Appropriateness condition on the use of a question:
Let Q $<s,<<s,t>,t>>$ be a Hamblin question intension. Q is only appropriate in w if $\exists w'[R(w,w') \,\&\, \exists p[Q(w)(p) \,\&\, p(w')]] \,\&\, \exists w'[R(w,w') \,\&\, \exists p[Q(w)(p) \,\&\, \neg p(w')]]$
'It is possible that there is a true answer and it is possible that there is a false answer.'

There is some discussion of presuppositions of questions in the literature, though not exactly (17) as far as I know. Truckenbrodt (2013) discusses the PSP that there is a true answer to the question. Relatedly, Abusch (2002) discusses a PSP on focus-triggered alternative sets that some element of the set of alternatives is true. The difference is that (17) is modalized and concerns both true and false alternatives. My idea here is that this appropriateness condition applies to alternative sets in general, in particular the set of alternatives triggered by *noch/still*. The result is a weak PSP regarding future times. Applied to (4) this yields (18):

(18) It is possible that there is a time after now at which it is raining &
it is possible there is a time after now at which it is not raining.
'It might stop raining.'

This accounts for the oddness of sentences like (19), which has been observed in the literature. Intuitively, there has to be a question regarding future developments for the appropriate use of *noch/still*. The oddness of (19) is precisely because it suggests that John's deadness might change in the future. This means that *noch/still*'s interpretive impact is not limited to meaning components (i) and (ii) about the present and the past.

(19) ? John is still dead. .
'John is dead and he's been dead for some time.' (i) + (ii)
'What later times is he dead?' (iii)

(19) shows that there is an obligatory meaning component regarding future times. However, many examples with *noch/still* give rise to a stronger expectation about the future. In our example, this is the possible implicature that it will stop raining. I propose to analyse this as a scalar implicature. I implement this proposal in terms of a covert operator EXH defined (in a simplified version) in (20). According to recent analyses, this operator can be adjoined in the LF. Our example thus optionally has the LF in (21a) in addition to the one in (10). (21b) is the scalar implicature that is generated by this LF.

(20) $[[\text{EXH } \phi]] = 1$ iff $[[\phi]]=1 \;\&\; \forall q[q \in [[\phi]]_{Alt} \;\&\; \neg([[\phi]] \Rightarrow q) \rightarrow \neg q]$
"all alternatives that are not entailed are false."
(see e.g. Krifka (1995), Chierchia, Fox & Spector (2011))

(21) a. $[\text{EXH } [\phi\ [\text{noch}_{<}\ t^*\ t_{now}]\ [_{AspP}\ \text{ipf}\ [_{VP}\ \lambda e\ \text{rain}\ e]]]]$
b. $\forall q[q \in \{\exists e[t' \subseteq \tau(e) \;\&\; \text{rain}(e)] \mid t' \in Alt(t_{now})\} \;\&\; \neg([[\phi]] \Rightarrow q) \rightarrow \neg q]$
$= \forall t'[t_{now} < t' \rightarrow \neg\exists e[t' \subseteq \tau(e) \;\&\; \text{rain}(e)]]$
"it doesn't rain after now./It will stop raining."

Generally speaking, this proposal results in possible implicatures $\neg P(t')\ (t' > t_{now})$. The relevant meaning component should be analysed as an implicature because it does not always arise, and it is cancellable:

(22) a. It is still raining, and it looks like it will continue to rain. (cancellable)
b. Es regnet immer noch. (no scalar impl.)
it rains always still
'It is raining STILL.'

This concludes the analysis of the most basic type of use of *noch/still*. Before we turn to structurally more complex data, we take a look at examples in which the predicate in the *noch/still* sentence is naturally part of an ordered sequence. Then, a somewhat richer interpretation can arise. (23) illustrates.

(23) a. Es ist noch Vormittag (Sommer,...)
It is still morning (summer,...)
b. % It is still 8am. (Ippolito (2007))

There is an entailment relation between the predicate in the sentence and other predicates, and such examples invite entailments about 'later' predicates, e.g. afternoon, autumn. Expectedly, this could be implicatures like 'it will be afternoon/autumn later'. Maybe less expectedly, e.g. (23a) may convey that it is not afternoon/autumn yet - i.e. that it is, perhaps, earlier than expected. How does this effect come about? The analysis from above is applied to (23a) below:

(24) a. $[\phi\ [\text{still}_{<}\ t^*\ t_{now}]\ [\lambda t\ [\text{morning}(t)]]$
(i) Assertion: $\text{morning}(t_{now})$
(ii) PSP: $t^* \propto t_{now}$ & $\text{morning}(t^*)$
(iii) Alternatives: $\{\text{morning}(t') \mid t' \in \text{Alt}(t_{now})\}$
b. $[\text{EXH}\ [\phi\ [\text{still}_{<}\ t^*\ t_{now}]\ [\lambda t\ [\text{morning}(t)]]]$
Scalar implicature: $\forall t'[t_{now} < t' \rightarrow \neg\text{morning}(t')]$
times after t_{now} are not in the morning.
inference: times after t_{now} are in the afternoon.

So far, nothing in this analysis introduces a meaning component that it is earlier than expected. Now, focus can be added to the picture. Focus on *morning* suggests a contrast with *afternoon*, and this seems to be responsible for the 'early' intuition. Below, I add a Roothian (Rooth (1992)) focus semantics to the analysis. Focus is evaluated by the operator ~. The operator comes with the focus anaphor C, which has to pick up a value from the context. The ~ constrains this value to alternative semantic values of its sister. The rest of the interpretation is the same as in (24) above. Suppose that the value of C is $\{\lambda t.\text{afternoon}(t)\}$. The value of C, the focus anaphor, has to be given in the context. Thus (25) would be appropriate in a context in which the proposition that it is afternoon is around. Focus is interpreted as contrast and the alternative is rejected. Thus contrast can account for the intuition that (25) may convey that it is earlier than expected.

(25) It is still morning$_F$. 'early'

(26) a. [EXH [ϕ [still$_<$ t* t_{now}] [~C [ψ λt [morning$_F$(t)]]]]]
b. $[[\psi]]_o$ = λt.morning(t)
$[[\psi]]_{Alt}$ = { λt.morning(t), λt.afternoon(t) }

More generally, if the predicate P in a *noch*-sentence is a member of a sequence, the implicature that the predicate is not true of later times (¬P(t')) allows the inference that a 'later' predicate applies instead (e.g. summer - fall; morning - afternoon - P'(t'); cf. Krifka's (2000)). A suggestion of earlyness may arise if the predicate is focused: focus can create a contrast to a 'later' predicate (e.g. it is not yet afternoon - ¬P'(t_{now})), which is around as an alternative (e.g. expected,...). This is different with predicates like 'rain' which are not ordered by entailment. I conclude that the 'earlyness' effect is circumstantial. Nothing new needs to be said about *noch/still*. We notice, however, that the interpretation of sentences with *noch/still* is affected by focus.

3. Subconstituent readings

3.1. Basic analysis: particle modifies adjunct

We are now prepared for the following type of example, which involves a new structural factor:

(27) Lydia ist noch am Vormittag abgereist.
Lydia is still in the morning left
% 'Lydia left still in the morning.'

In such sentences, *noch* modifies the temporal adverbial PP. In (28) I apply a standard constituency test for German, movement to the prefield (see e.g. von Stechow/Sternefeld 1988). The relevant reading of (27) emerges in (28a), when the *noch*-modified PP is moved to the prefield. When *noch* alone is moved, the resulting sentence only has the slightly odd interpretation that it is still true that Lydia left in the morning. This is the same interpretation as (28c) without the temporal PP.

(28) a. Noch am Vormittag ist Lydia abgereist.
still in the morning is Lydia left
'It was still morning when Lydia left.'
b. # Noch ist Lydia am Vormittag abgereist.
still is Lydia in the morning left
'Lydia still left in the morning.'

c. # Noch ist Lydia abgereist.
still is Lydia left
'Lydia still left.'

The interpretive problem with (28b,c) is easily explained: the predicate *abreisen/leave* does not have a temporal extension, but this is required by the semantics *noch/still*. Hence such 'punctual' verbs or VPs do not straightforwardly combine with temporal *noch/still*. The German sentence (27) is fine under an analysis in which *noch* modifies not the VP but the adverbial PP. Many English speakers do not seem to accept such structures. I call this a subconstituent reading: not the main predicate, but an adjunct is targeted by the particle. (Note that a temporal subconstituent reading is semantically possible only when the adjunct denotes a property of times, type <i,t>.). (29) presents an analysis according to this reasoning:

(29) $[_{TP}$ PAST [$[\lambda t\ [still_{<}\ t^*\ t$ [in the morning]]] $[_{AspP}$ pf $[_{VP}$ Lydia leave]]]]

$[[AspP]] = \lambda t.\exists e[\tau(e) \subseteq t \ \&$ leave(e)(L)]
[[in the morning]] = $\lambda t.$ morning (t)
$[[\lambda t\ [still_{<}\ t^*\ t$ [in the morning]]]] = $\lambda t{:}t^* \propto t \ \&$ morning(t*). morning(t)
[[$[\lambda t\ [still_{<}\ t^*\ t$ [in the morning]]] [AspP pf [VP Lydia leave]]]]] =
$\lambda t{:}t^* \propto t \ \&$ morning(t*). morning(t) $\& \exists e[\tau(e) \subseteq t \ \&$ leave(e)(L)]
$[[PAST]] = t_{topic}$

[[TP]] is defined only if $t^* \propto t_{topic} \ \&$ morning(t*).
Then, it is true iff morning(t_{topic}) $\& \exists e[\tau(e) \subseteq t_{topic} \ \&$ leave(e)(L)]

alternatives: { morning(t') | t'∈Alt(t) } "What (later) times are in the morning?"

(30) (i) Assertion: Lydia left before noon.
(ii) PSP: a relevant earlier time is also before noon. (weak)
(iii) scalar implicature (local): later times are not before noon. (weak)

I think that this is a plausible analysis of the example. But I think that here, too, additional interpretive components may arise in interaction with focus. I will consider two possible focus related effects. First, focus on the temporal adverbial can be evaluated as contrast, similar to (25). Second, focus alternatives may play a role in the implicatures that *noch*-sentences give rise to.

3.2. Contrast focus on adverbial

(31) with focus on the adverbial is a plausible example for the first kind of effect - let's call it the contrast interpretation of *noch*-Adv ("~>" indicates an implicature or inference plausibly arising from an example). A contrast analysis is presented below. The ~ operator evaluates focus on *morning*, (32a). Its accompanying focus anaphor C needs to get its value from the alternative semantic value of the sentence, (32b). Let us zoom in on 'Lydia left in the afternoon' as the relevant alternative. A plausible way to interpret this focus is as contrast: the alternative is not true. The sentence asserts that Lydia left in the morning, so a context-available alternative like 'Lydia left in the afternoon' is rejected. But for this alternative to be available means it has to be around, e.g. expected. Possibly, though not necessarily, the overall interpretation is that Lydia left earlier than expected.[2]

(31) Noch am Vormittag$_F$ ist Lydia abgereist
still in the morning is Lydia left
'Lydia left still in the morning.'
~> Lydia didn't leave in the afternoon.

(32) a. [~C [ϕ [still$_<$ t* t_{topic} [in the morning$_F$]] [[$_{AspP}$ pf Lydia leave]]]]
b. $[[\phi]]_o$ is as before.
$[[\phi]]_{Alt} = \{\exists e[\tau(e) \subseteq t_{topic} \,\&\, leave(e)(L)] \,\&\, Q(t_{topic}) \mid Q \in Alt(morning)\}$
c. $g(C) = \{\exists e[\tau(e) \subseteq t_{topic} \,\&\, leave(e)(L)] \,\&\, afternoon(t_{topic})\}$
contrast: $\neg(\exists e[\tau(e) \subseteq t_{topic} \,\&\, leave(e)(L)] \,\&\, afternoon(t_{topic}))$
asserted: $\exists e[\tau(e) \subseteq t_{topic} \,\&\, leave(e)(L)]$
~> Lydia's leaving wasn't in the afternoon.

The type of interpretation that will arise from this combination of ingredients is sketched more generally in (33). This is a plausible interpretation of *noch*-sentences in particular with predicates that occur just once (in the relevant time frame). (34) provides another example.

(33) contrast interpretation of *noch*-Adv:
a. [~C [ϕ [still$_<$ t* t Adv_F] P]]
b. contrast: $\neg(P(t_{topic}) \,\&\, Q(t_{topic}))$
assertion: $P(t_{topic}) \,\&\, Adv(t_{topic})$
inference: $\neg Q(t_{topic})$ "It wasn't in Q that P occured"

[2] If scalar implicatures are calculated at the level of the PP, as hinted at in (30), then the EXH operator responsible for creating those has to be able to pass on alternatives to higher alternative evaluating operators like the ~ in (32). See also Fn. 4.

(34) Lydia kam noch am 27. zur Welt.
Lydia came still on the 27th to the world
% 'Lydia was born still on the 27th.'
~> Lydia wasn't born on the 28th.

3.3. Exhaustive interpretations of Adv

Let's next consider a good example for the second way focus may affect the interpretation of *noch*-sentences, (35):

(35) Noch 1967_F schlossen die Kneipen in Neuseeland um 18 Uhr.
still 1967 closed the pubs in New Zealand at 6pm
'In 1967, closing time for pubs in NZ was still 6pm.'
~> after 1967, pubs in NZ didn't close at 6pm.

I will call this type of interpretation an exhaustive interpretation of *noch*-Adv. There is no suggestion that 1967 is unexpectedly early for a 6pm closing time. The sentence may implicate that after 1967, pubs did not close at 6pm. Thus we see a different interpretive effect of focus on the time adverbial: We need to consider the possibility that the alternatives triggered by focus may feature in the scalar implicatures. Below is an analysis to this effect, which generates the desired implicature.

(36) [[$\text{still}_<$ t* t_{topic} 1967_F] [pubs close at 6pm]]
(i) Assertion: $\leq 1967(t_{topic})$ & pubs_close_at_6pm(t_{topic})
Pubs closed at 6pm in 1967.
(ii) PSP: $t^* \propto t_{topic}$ & $\leq 1967(t^*)$
A relevant earlier time is no later than 1967.
(iii) Alternatives: { pubs_close_6pm(t') & Q(t') | $t' \in Alt(t_{topic})$ & $Q \in Alt(1967)$}
'In what later years did pubs close at 6pm?'

(37) [EXH [[$\text{still}_<$ t* t t_{topic} 1967_F] [pubs close at 6pm]]]
$\forall t'[t_{topic} < t'$ & 1968ff(t') -> $\neg$ pubs_close_6pm (t')]
possible implicature: Pubs didn't close at 6pm after 1967.

(38) ////////// ≤1967 ////////// || \\\\\\\\\\\ 1968ff \\\\\\\\\
-------- t*--------t_{topic}---------->
t'

In this analysis, the focus-triggered alternatives are part of the alternative set for the scalar implicature and negated by the EXH associated with *noch*. *Noch*'s scalar alternatives are evaluated together with the focus alternatives at sentence level; they are not evaluated at the adjunction site of *noch*. This gets us the desired implicature. (39a) and (39b) represent attempts to not figure in focus alternatives; both are too weak to give us the desired implicature.

(39) a. *noch*-alternatives only, local evaluation:
$\forall t'[t_{topic} < t' \rightarrow \neg(1967(t'))]$
'Later times are not in 1967'
b. *noch*-alternatives only, sentential evaluation:
$\forall t'[t_{topic} < t' \rightarrow \neg(1967(t') \& pubs\_close\_6pm\ (t'))]$
'Later times are either not in 1967 or not 6pm-closing times.'

(40) is the general schema for this type of interpretation. I suggest that this is generally possible. *Noch*-sentences with predicates that occur more than once (in the relevant time frame) or are ongoing bring out this interpretation.

(40) exhaustive interpretation of *noch*-Adv:
a. $[\ EXH\ [\phi\ [still_{<}\ t^*\ t\ Adv_F]\ P]]$
b. assertion: $P(t_{topic}) \& Adv(t_{topic})$
implicature: $\forall t'[t_{topic} < t' \& Q(t') \rightarrow \neg P(t')]$
'In later time periods, not P.'

(41) Noch am 27. Dezember haben wir draussen gefrühstückt.
still on the 27th december have we outside breakfasted
'We still had breakfast outside on December 27.'
~> We didn't have breakfast outside after December 27.

The above discussion relates to Löbner's (1990) observation that the interpretation of *noch*-sentences is affected by the presence of a temporal adverbial, by focus and by properties of the predicate. But I utilize syntax and independent mechanisms of alternative evaluation to analyse these effects.

4. Further-to readings of *noch*

4.1. A closer look at the data

Let us first develop a clearer understanding of what happens in the uses of *noch* that Klein calls further-to uses. Example (42), in addition to the continuative reading (he has been showering for some time), has a non-continuative reading that is hard to translate well into English.

(42) Er duscht **noch**. (further-to)
he showers still
'He is taking a shower (**before** doing something else).'

The sentence on such a non-continuative reading can be used in two slightly different circumstances, (43). In (44), (45) I provide plausible contexts for the intended interpretations.

(43) a. Er duscht noch heute.
he showers still today.
(Er duscht nicht erst morgen.) (not P later)
(He showers not only tomorrow.)
'He is going to take a shower tonight rather than waiting until tomorrow.'
b. Er duscht noch eben. (Dann kommt er.) (not P' now)
he showers still just. (Then comes he.)
'He will take a shower quickly before joining us.'

(44) context for 'not P later':
Thilo and I have just come home from climbing. It is very late.
Thilo: Duschst Du noch?
shower you still
'Are you going to take a shower before you go to bed?'
Sigrid: Auf jeden Fall.
in any case / 'absolutely'.
'I am taking a shower now. I am not going to wait until tomorrow morning.'

(45) context for 'not P' now':
We have guests. I have just come home from soccer practice. It is fairly late.
Sigrid: Ich dusch noch. Dann gibt's Abendessen.
I showerstill. Then there is dinner
'I am just taking a quick shower. Dinner will be just after.'
'We will have dinner in a little while rather than right now.'

These examples have a weak PSP. The interpretive effect of *noch* seems to concern mostly the future; it can be described as 'before something else happens'. The literature (Umbach (2009), Klein (2007/15)) observes that for this type of example, there is an interesting interaction with focus. To see this, we consider syntactically more complex predicates like (46). Depending on focus, the sentence has the readings in the English translations. I return to this in section 5.

(46) Bruckner hat noch drei Bier getrunken. (Klein)
Bruckner has still three beer drunk
'Bruckner had (**another/also/then**) three glasses of beer.'

For the further-to reading, I only know of one analysis: Klein (2007/15). His proposal (translated into the general framework used here) is sketched in (47).

(47) [[noch]] = $\lambda t^*.\lambda t.\lambda x.\lambda P_{<x,t>}$: $t^* \propto t$ & **P'**(x)(t^*)].P(x)(t)
possible 'future' propositions: {P(x)(t') | t'>t}

Note that Klein divides the sentence into topic and a predicate attributed to the topic (x and P above). I do not follow him in this. But even apart from that, (47) is not compatible with the structural compositional analysis of *noch* 'still': I have assumed throughout that the predicate in the presupposition is the same as the predicate in the assertion. The weak presupposition in further-to readings hence has to have a different source.

4.2. Proposal: subconstituent reading with silent adverbial

How can the analysis of *noch/still* from the preceding sections be extended to further-to *noch*? I propose that the further-to reading is a temporal subconstituent reading, along the lines of section 3. Subconstituent readings, remember, lead to weak presuppositions. This is going to account for the fact that the meaning component concerning earlier times is weak in the further-to examples. It is not immediately obvious that we are dealing with a subconstituent reading because the subconstituent in question may be phonologically empty. Empty or overt, it is a temporal adverbial with a meaning amounting to 'now', 'just'. I spell out this idea first for an example with overt 'now', 'just'. I then extend it to covert occurences of the time adverbial.
Let's first see an analysis of an example with an overt temporal adverbial 'now' as in (48a,b). (48a) can be used in the context in (49). It conveys on the relevant reading that Thilo will prune the tree before we go on holiday - now - rather than later. The analysis developed above predicts this. We assume the structure in (50) where *noch* modifies *now*. The interpretation is (51).

(48) a. Thilo schneidet jetzt noch den Apfelbaum.
Thilo prunes now still the apple tree
'Thilo will prune the apple tree now.'
~> Thilo won't prune the apple tree later.
b. Ich gehe noch eben einkaufen.
I go still just shopping
'I will go shopping quickly.'
~> I won't join you just yet.

(49) context: We go on holiday for two weeks on March 11. Apple trees have to be pruned in the early spring, i.e. before March 15.

(50) [[noch t* t_{topic} now]] [λt[Thilo prune the apple tree at t]]]

(51) (i) Assertion: Thilo prunes the apple tree at t_{topic} and now(t_{topic})
(ii) PSP: t*< t_{topic} and now(t*)
(iii) alternatives: {now(t') | t'> t_{topic} }
possible implicature: later times are not in 'now'.

A plausible interpretation is as a contrast interpretation of *noch*-Adv. This implies that the alternative is rejected, i.e. Thilo doesn't prune the apple tree later.

(52) [~C [[noch t* t_{topic} now_F]] [λt[Thilo prune the apple tree at t]]]]

g(C) = {that Thilo prunes the apple tree later}

Note that the example is parallel to the 'Lydia left still in the morning' example. The example is appropriate if 'now' is contrasted with 'later', which is given in the context. We divide the time scale into 'now' vs. 'later' as indicated in (53).

(53) ////////////now////////// || \\\\\\\\later\\\\\\\\\
------- t*-------- t_{topic} ---------->
t'

Let us now return to the shower example. The further-to examples from above have the same meaning with or without a time adverbial denoting the topic time, for example (54a) and (54b) are identical in meaning. Both have the two subtly different interpretations described in (55).

(54) a. Er duscht noch eben.
he showers still just
'He is just taking a shower.'
b. Er duscht noch.
he showers still
'He is just taking a shower.'

(55) a. He is taking a shower now rather than taking a shower later.
(e.g. in the morning). (not P later)
b. He is taking a shower now rather than
e.g. coming immediately to the meeting. (not P' now)

I propose the analysis in (56) - (58). *Noch* modifies an overt or covert time adverbial, where I write the covert version as <now>.

(56) a. covert <now>, *eben* 'now', 'just':
a short period of time overlaping with the topic time t_{topic}.
b. [[<now>]] = $\lambda t.now(t)$

(57) [[noch t* t_{topic} <now>]] [λt[he take a shower at t]]]

(58) (i) Assertion: He takes a shower at t_{topic} & $now(t_{topic})$
(ii) PSP: $t^* < t_{topic}$ and $now(t^*)$ (weak)
(iii) alternatives: $\{now(t') \mid t' > t_{topic}\}$
possible implicature: later times do not fall within 'now'.

One interpretive effect of adding the scalar particle is the division of the relevant time period into 'now' vs. 'later'. Another interesting aspect of the interpretation concerns the alternatives. If in the alternatives the time adverbial varies, we get the first type of interpretation 'not P later'. This is parallel to the apple tree example, a contrast interpretation of *noch*-Adv. Alternatively, an interpretation can arise from contrast in the predicate: he doesn't come to the meeting now.

(59) [~C [[noch t* t_{topic} <now>]] [λt[he take a shower at t]]]]

(60) a. interpretation 'not P later' - analysis:
g(C): {he take a shower Q |$Q \in$ Alt(now)}
contrast: he doesn't take a shower later, e.g. in the morning.

b. interpretation 'not P' now' - analysis:
g(C): {he Q now | Q∈Alt(take a shower)}
contrast: he doesn't come to the meeting now (he might come later).
c. both interpretations: something else happens after t_{topic} ('before...')

The idea is applied to (48b), with overt or covert 'now', 'just'. Focus on the predicate leads to a plausible 'not P' now' interpretation via contrast.

(61) a. Ich geh noch (eben) einkaufen.
I go still (just) shopping
'I will quickly go shopping (before ...).'
b. [[noch t* t_{topic} <now>]] [λt[I go shopping at t]]]
c. Assertion: I go shopping now.
PSP: t*< t_{topic} and now(t*)
possible implicature: ∀t'[t_{topic} <t' -> ¬now(t')]
'Later times do not fall within 'now'.
d. [~C [[EXH [noch t* t_{topic} <now>]]] [λt[I go shopping at t]]]]
contrast: {I Q now | Q∈Alt(go shopping)}
e.g. I'm not done with my chores just yet, but after shopping I will be.

In any case, the temporal perspective added by *noch/still* divides the series of activities into the ones that happen 'now' vs. the ones that happen 'later', as noted in Klein (2007/2015). This is the main contribution of the particle.[3]

5. Focus effects and further-to *noch*

Next, let's take a more careful look at the role of focus in the syntactically more complex cases, cf. Klein's example below. Different information structures are appropriate in different contexts.

[3] The further-to examples in this section have so far all been analysed as contrast. Note that an exhaustive interpretation of *noch*-Adv with 'now' as the Adv (analogous to the 1967 example) is not readily distinguishable from a regular continuous interpretation with scalar implicature:

(i) a. (jetzt) noch schliessen die Kneipen um 18:00.
(now) still close the pubs at 6pm
'Pubs still close at 6pm.'
b. [EXH [[still t* t_{now} <now>$_F$] [pubs close at 6pm]]
{pubs_close_6pm(t') & Q(t') | t'∈Alt(t_{now}) & Q∈Alt(now)}
∀t'[t_{now}<t' -> ∀Q[Q≠now -> ¬pubs_close_6pm(t') & Q(t')]]
c. ∀t'[t_{now}<t' -> ¬pubs_close_6pm(t')]

Hence we have not seen a clear example of an exhaustive interpretation of *noch*-Adv (akin to the 1967 example) in this section. But see the Bruckner examples below for plausible candidates.

(62) Bruckner hat noch drei Bier getrunken. (Klein 2007/2015)
Bruckner has still three beer drunk
'Bruckner had (another/also/then) three glasses of beer.'

a. Bruckner hat einen Germknödel gegessen.
Bruckner has a dumpling eaten
'Bruckner first ate a dumpling.'
Dann hat er noch drei BIER getrunken.
Then has he still three BEER drunk.
'Then he had three glasses of beer.'

b. Bruckner hat einen Schnaps getrunken.
Bruckner has a schnaps drunk
'Bruckner drank a schnaps.'
Dann hat er noch drei BIER getrunken.
Then has he still three BEER drunk.
'Then he drank three glasses of beer.'

c. Bruckner hat drei Bier ausgeschüttet.
Bruckner has three beer spilled
'Bruckner spilled three glasses of beer.'
Dann hat er noch drei Bier geTRUNken.
Then has he still three beer DRUNK.
'Then he drank three glasses of beer.'

d. Bruckner hat drei Bier getrunken.
Bruckner had three beer drunk
'Bruckner drank three glasses of beer.'
Dann hat er NOCH drei Bier getrunken.
Then has he STILL three beer drunk
'Then he had another three glasses of beer.'

Let's begin with an analysis of (62a). The structure we interpret is (63), i.e. this is a further-to reading with a covert <now>. There is a weak *noch* PSP that some relevant earlier time t* falls into now. There is also a PSP triggered by focus that Bruckner did something else. Since no further context is given, it is natural to assume that this something else happened at the relevant earlier time t*. The combined effect is a PSP that Bruckner did something alternative to drinking beer earlier. This explains that the sentence is appropriate in a discourse context like (62a).

(63) [noch t* t_{topic} <now>] [Bruckner [drei Bier trinkt]$_F$] ~C

PSP *noch*: t*< t_{topic} and now(t*)
PSP focus: g(C) = that Bruckner Q at t" : Q ∈Alt(drink three beers) & t"∈Alt(t_{topic})
inference: t" =t* and g(C) is entailed (focus antecedent is entailed, not just given)
=> Bruckner Q at t* & now(t*): Q ∈Alt(drink three beers)
"Bruckner did something else (like eating a G.) earlier."

(64) and (65) are parallel analyses of (62b) and (62c). We simply combine the analysis of *noch* and the analysis of focus to get the desired interpretation. Proceeding in a parallel way with the example with stressed *noch* yields an interesting effect. Since the rest of the clause is deaccented, it has to be given. This leads to an additive sentence interpretation. The general idea is that focus, as always, is anaphoric. In the above analysis, this is independent of *noch*. The overall interpretation arises from the combined effects of *noch* and focus.

(64) [noch t* t_{topic} <now>] [Bruckner [drei Bier]$_F$ trinkt] ~C

PSP *noch*: t*< t_{topic} and now(t*)
PSP focus: g(C) = that Bruckner drinks x at t" : x ∈Alt(three beers) & t"∈Alt(t_{topic})
inference: t" =t* and g(C) is entailed
=> Bruckner drank x at t* & now(t*): x ∈Alt(three beers)
"Bruckner drank something else (e.g. a schnaps) earlier."

(65) [noch t* t_{topic} <now>] [Bruckner drei Bier [trinkt]$_F$] ~C

PSP *noch*: t*< t_{topic} and now(t*)
PSP focus: g(C) = that Bruckner R three beers at t" : R ∈Alt(drink) & t"∈Alt(t_{topic})
inference: t" =t* and g(C) is entailed
=> Bruckner R three beers at t* & now(t*): R ∈Alt(drink)
"Bruckner did something else with 3 beers (e.g. spill) earlier."

(66) [NOCH t* t_{topic} <now>] [Bruckner drei Bier trinkt] ~C

PSP *noch*: t*< t_{topic} and now(t*)
PSP focus: g(C) = that Bruckner drink three beers at t" : t"∈Alt(t_{topic})
inference: t" =t* and g(C) is entailed
=> Bruckner drink three beers at t* & now(t*)
"Bruckner drank 3 beers earlier."

Let's also take a look at the implicatures of these sentences. Intuitively, the alternatives are: when will Bruckner stop consuming things (drinking, doing things to beer, ...) ("now") and move on to some new activity ("later") ((67a,b) for (62b,c))? Constructing scalar implicatures from these sets will lead to implicatures given in (68) and illustrated by the expected continuations:

(67) a. {Bruckner drink x at t' & Q(t') | t'> t_{topic} & Q∈Alt(now) & x∈Alt(3 beer)}
b. {Bruckner R three beers at t' & Q(t') | t'> t_{topic} & Q∈Alt(now) & R∈Alt(drink)}

(68) a. ∀t',Q,x[t_{topic}<t' & Q∈Alt(now) & x∈Alt(3 beer)->
¬[Bruckner drink x at t' & Q(t')]]
'... Then, Bruckner stopped drinking.'

b. ∀t',R,x[t_{topic}<t' & Q∈Alt(now) & R∈Alt(drink)->
¬[Bruckner Red 3beer at t' & Q(t')]]
'... Then, Bruckner stopped doing things to beer.'

These implicatures can be derived with EXH as before.[4] LFs including EXH for the two examples are given below. They yield 'not P' later' interpretations where P' is defined by focus alternatives. These examples are exhaustive interpretations of *noch*-Adv with an added focus in the predicate (similar to the 1967 example in section 3). Just as before, part of the interpretive effect is to divide the time period under consideration into 'now' and 'later'.

(69) a. [[noch t* t_{topic} <now>] [Bruckner [drei Bier]$_F$ trinkt] EXH] ~C
b. [[noch t* t_{topic} <now>] [Bruckner drei Bier [trinkt]$_F$] EXH] ~C

This analysis of further-to *noch* looks plausible enough to me, with one remaining issue: I believe that for additive *noch*, the analysis in (66) has the wrong constituency. The additive reading is one in which *noch* forms a constituent with the NP, as (70) below shows. This means that the structure in (66) is at least not the only possibility for an additive sentence interpretation. See Umbach (2009) for a proposal.

[4] The analysis will work out the way described if EXH passes on focus alternatives, so that the ~ can access them:
(i) $[[EXH\ \phi]]_o = 1$ iff $[[\phi]]=1$ & $\forall q[q \in [[\phi]]_{Alt}$ & $\neg([[\phi]] \Rightarrow q)$ ->$\neg q]$
$[[EXH\ \phi]]_{Alt} = [[\phi]]_{Alt}$
This is an interesting aspect of the analysis of an alternative evaluating operator, cf. Beck (2016) for discussion. The same point can be made for more detailed LFs of some earlier examples, e.g. the Lydia example.

(70) NOCH drei Bier hat Bruckner getrunken.
STILL three beers has Bruckner drunk
'Bruckner had another three beers.'

6. Conclusions

This paper is part of a larger plot to reduce the various uses of the scalar particles *noch/still* to one underlying semantics. At first glance, this doesn't seem particularly promising for further-to *noch*. My proposal uses the combined effects of syntactic structure, presupposition, implicature and focus to derive a further-to interpretation of the *noch*-sentence on the basis of regular *noch/still*. In addition to deriving the reading of these particular sentences, it highlights a difference between German and English: (un-) availability of adjunction to modifiers. Furthermore, it brings an interesting case of alternative generation to our attention: the time argument of *noch/still*. And finally, the evaluation of focus in *noch*-sentences permits several possibilities, yielding different interpretive effects. This last point draws our attention to the unresolved issue of the focus semantics of the widely used EXH operator.

References

Abusch, Dorit (2002). Lexical Alternatives as a Source of Pragmatic Presuppositions, in B. Jackson (ed.), *Proceedings of SALT 12*, 2002. Cornell University, CLC Publications.

Beck, Sigrid (2016). Focus evaluating operators. Handbook of Information structure, eds. Fery & Ishihara. Oxford University Press.

Chierchia, Gennaro, Danny Fox & Benjamin Spector (2011). 'The Grammatical View of Scalar Implicatures and the Relationship between Semantics and Pragmatics'. In C. Maienborn, P. Portner, and K. von Heusinger (eds.), *Handbook of Semantics*. Mouton de Gruyter.

Heim, Irene (1990). Presupposition Projection. In R. van der Sandt (ed.) *Reader for Nijmegen Workshop on Presupposition*, University of Nijmegen, 1990.

Ippolito, Michela (2007). On the meaning of some focus-sensitive particles. *Natural Language Semantics* 15:1–34.

Klein, Wolfgang (2007/2015). Über die Partikeln *schon* und *noch*. Talk given at the U. Tübingen based on Klein (ms., 2007: About the German particles *schon* and *noch*).

Kratzer, Angelika (1998). More structural analogies between pronouns and tenses. In Proceedings of SALT 8, 92-110.

Krifka, Manfred (1995). The semantics and pragmatics of polarity items. Linguistic Analysis 25, 1-49.

Krifka, Manfred (2000). Alternatives for aspectual particles: Semantics of *still* and *already*. Paper presented at the Barkeley Linguistics Society.

Löbner, Sebastian (1990). Wahr neben Falsch. Niemeyer.

Rooth , Mats (1992). 'A Theory of Focus Interpretation', *Natural Language Semantics 1*: 75-116.

von Stechow, Arnim & Wolfgang Sternefeld (1988). Bausteine syntaktischen Wissens. Opladen, Westdeutscher Verlag.

von Stechow, Arnim & Sigrid Beck (2015). Events, Times and Worlds - An LF Architecture. C. Fortmann (ed.): Situationsargumente im Nominalbereich. Linguistische Arbeiten Bd. 562, Berlin: De Gruyter, 2015, 13-46.

Truckenbrodt, Hubert. 2013. An analysis of prosodic F-effects in interrogatives: prosody, syntax and semantics. Lingua 124. 131-175.

Umbach, Carla (2009). Additive noch under stress. Proceedings of Lola 10.