Additive particles with a built-in Gricean pragmatics: The semantics of German *noch*, Chinese *hái* and Hungarian *még*

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Abstract. NOCH-type additive particles (e.g., German *noch*, Chinese *hái*, Hungarian *még*) have a widespread distribution that roughly covers the uses of English *still*, *also*, and *even*. We propose that with a built-in Gricean Maxim of Quantity *Be Informative* in its lexical semantics, a NOCH-type particle explicitly requires that the discourse be incremental, and the NOCH-marked sentence add new information and further narrow down the context set, making the whole discourse even more informative. We also show that the cross-linguistic widespread distribution of NOCH-type particles is not arbitrary: there are three ways to build an incremental discourse structure, and these three implementations give rise to the three major uses of NOCH-type particles.

Keywords. semantics; pragmatics; additive particles; discourse particles; presupposition triggers, German *noch*, Chinese *hái*, Hungarian *még*, Gricean Maxims.

1. Introduction. In natural language, there is a group of particles that sometimes behave interchangeably with cross-linguistic siblings of English *also*, but in addition, have other uses reminiscent of the meaning contributed by English *still* and English *even*. Typical representatives of this group include: German *noch*, Chinese *hái*, and Hungarian *még*. To facilitate our discussion, hereafter, we will refer to these particles as **NOCH-type additive particles**. Moreover, along our discussion, we will refer to cross-linguistic siblings of English *also* (which include German *auch*, Chinese *yě*, and Hungarian *is*) as **AUCH-type additive particles** (see (1)).

(1) Two subsets of additive particles in natural language:
   a. NOCH-type particles: German ***noch***, Chinese ***hái***, Hungarian ***még***, etc.
   b. AUCH-type particles: German ***auch***, Chinese ***yě***, Hungarian ***is***, English ***also***, etc.

Our goal is threefold. First, we show that these NOCH-type particles form a cross-linguistic natural class that is distinct from the group of AUCH-type particles. Second, since it is highly improbable that the widespread, yet similar, distribution of NOCH-type particles in different languages is due to some coincidental polysemy, we propose that there is a fundamental semantic contribution underlying their various uses. Third, we argue that their widespread distribution is not arbitrary, and provide a principled account for this distribution.

We start in Section 2 with a presentation of three major uses and an extended interpretation shared by NOCH-type particles cross-linguistically. Then we show in Section 3 the essential semantic contribution of NOCH- and AUCH-type particles respectively (see the summary in (2)).

(2) a. NOCH-type additive particles: they require a discourse be **incremental**.
   b. AUCH-type additive particles: they indicate **parallelism** in a discourse.

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As shown in (2), in a nutshell, the use of NOCH-type particles explicitly requires that a discourse be incremental, i.e., become more and more informative from one (potentially silent) proposition to the next, while the use of AUCH-type particles indicates that there is some kind of similarity (i.e., parallelism) among distinct events in a discourse.

Given that NOCH brings the incremental discourse requirement, in Section 4, we propose a principled account for the generation of the three major uses of NOCH-type particles introduced in Sections 2.1–2.3. We argue that there are two parameters modulating discourse structure: (i) entailment relation among propositions, and (ii) order among propositions. When working together, these two parameters give rise to three distinct types of incremental discourses.

In Section 5, we further discuss the extended interpretation introduced in Section 2.4: sometimes, NOCH suggests interlocutors' expectation. We show how a mechanism similar to scalar implicature computation gives rise to expectation-related readings of NOCH-marked sentences.

We briefly discuss two other approaches to the semantics of NOCH-type particles in Section 6. Section 7 concludes the whole paper and suggests avenues for future research.

2. Three uses of *noch*-type additive particles: cross-linguistic data. Umbach (2009a,b, 2012)'s work has discussed four uses of German *noch*: the temporal use (see also König 1977, Löbner 1989, Krifka 2000, Ippolito 2007), the additive use (see also Ippolito 2007), the marginality use (see also Ippolito 2007), and the comparative use (see also König 1977, Bierwisch 1989).

Here we merge the comparative use and the marginality use, and present data showing three major uses of German *noch*, Chinese *hái*, and Hungarian *még*: **the temporal use**, **the additive use**, and **the scalar use**. In addition, we discuss an extended interpretation of temporal or scalar uses, and show how these uses of NOCH-type particles can reflect the expectation of interlocutors.

2.1. TEMPORAL USE. The examples shown in (3) – (5) illustrate the temporal use of NOCH-type particles. Here the semantic contribution of German *noch*, Chinese *hái* and Hungarian *még* is similar to that of English *still*.

With the temporal use of these NOCH-type additive particles, (3) – (5) not only assert that it is raining at the moment that serves as the reference time (say t_0), but also convey the meaning that it has been raining for a while, i.e., raining, a stative event, began at a certain (contextually relevant) moment previous to t_0 (for example, t' such that t' is earlier than t_0, or $t' \prec t_0$), and this raining state has been constant from the moment t' to the reference time t_0 (see (6)).

(3) Es regnet **noch**.
3SG.N rain.3SG.PRS NOCH
'It is still raining.' German

(4) **hái** zài xià-yǔ.
NOCH at fall-rain
'It is still raining.' Mandarin Chinese

(5) **Még** (mindig) esik az eső.
NOCH always fall.3SG.PRS DET.DEF rain.NOM
'It is still raining.' Hungarian

(6) The temporal use of NOCH-type additive particles in [[NOCH q (at t_0)]]:
Assertion: q is true at t_0.
Inferred meaning: $\forall t''[t' \preceq t'' \prec t_0 \rightarrow q$ is true at $t'']$.

2.2. ADDITIVE USE. The examples shown in (7) – (9) illustrate the additive use of NOCH-type particles. As shown in (10), with the additive use of NOCH-type particles, the latter sentence in (7) – (9), i.e., 'NOCH q', asserts that q is true while presupposing some contextually relevant proposition p is also true. p can be uttered prior to the utterance of 'NOCH q', but it can also be silently accommodated when the content of p is evident in a context. The additive use of German *noch*, Chinese *hái* and Hungarian *még* is very similar to the use of AUCH-type additive particles, and we will compare and contrast NOCH- and AUCH-type particles in greater detail in Section 3.

(7) (Er hat ein Bier getrunken.) Er hat **noch**
3SG.M have.3SG.PRS one.ACC.N beer drink.PST.PTCP 3SG.M have.3SG.PRS NOCH
einen Wein getrunken.
one.ACC.N wine drink.PST.PTCP
'(He had a beer.) He also had a wine.' German

(8) (tā hē-le yī-bēi pí-jiǔ,) **hái** hē-le yī-bēi pútáo-jiǔ.
3SG drink-PRF one-cup.CLC beer-alcohol NOCH drink-PRF one-cup.CLC grape-alcohol
'(He had a beer.) He also had a wine.' Mandarin Chinese

(9) (Egy sört ivott.) Ezen kívül **még** egy bort ivott.
one beer.ACC drink.3SG.PST on-this outside NOCH one wine.ACC drink.3SG.PST
'(He had a beer.) Moreover, he also had a wine.' Hungarian

(10) The additive use of NOCH-type additive particles in $[[(p)$ NOCH $q]]$:
Assertion: q is true.
Presupposition: p is true. (p can be either (i) uttered prior to q or (ii) accommodated.)

2.3. SCALAR USE.[1] Both the marginality use and the so-called comparative use of German *noch*, as discussed in Umbach (2009a,b, 2012), involve a set of alternatives that form a scale. Therefore, here we merge these two uses and present the third major use of NOCH-type particles: the scalar use. To a certain extent, this use is reminiscent of the semantics of English *even*.

Sentences (11) – (13) convey this idea: Osnabrück is inside Lower Saxony area (this is the assertion part), **not to mention** those other cities in the contextually relevant set of alternatives (i.e., Alt(Osnabrück)) in the geographic configuration under discussion (this is the inferred part).

Our intuition is that, when compared with Osnabrück, it is just too evidently true that those other cities are inside Lower Saxony area, and claims that are too evidently true seem to have little worth of mention: we feel that they are already entailed by the asserted part.

Thus, we can consider that items in Alt(Osnabrück) form a **scale of informativeness** in which Osnabrück (the focused part) is ranked in such a position that the asserted proposition 'Osnabrück is inside Lower Saxony area' is more informative than (i.e., entails) alternative propositions '$[\lambda x.x$ is inside Lower Saxony area$](x)$ $(x \in Alt(\text{Osnabrück}) \wedge x \neq \text{Osnabrück})$'.

(11) Osnabrück liegt (gerade) **noch** in Niedersachsen.
Osnabrück lie.3SG.PRS just NOCH in Lower-Saxony
'(Even) Osnabrück is still in Lower Saxony.' German (see Umbach 2009b)

[1] Though prosody, especially stress, is important in the scalar use, in general, we do not discuss prosody in the current paper. Underlining in the examples here marks the focused parts used in constructing alternative sets.

(12) (lián) Osnabrück (dōu) **hái** zài xià-Sachsen jìng-nèi.
(even) Osnabrück (all) NOCH at Lower-Saxony boundary-inside
'(Even) Osnabrück is still in Lower Saxony.' Mandarin Chinese

(13) Osnabrück **még** (mindig) Alsó-Szászországban van.
Osnabrück NOCH always Lower-Saxony-in be.3SG.PRS
'(Even) Osnabrück is still in Lower Saxony.' Hungarian

Similarly, in (14) – (16), the scalar use of NOCH suggests that the asserted part 'Berta is taller than Adam' is more worthy of mention than 'Berta is taller than X ($X \in Alt(\text{Adam}) \wedge X \neq \text{Adam}$)'. Or we can consider that items in $Alt(\text{Adam})$ form a scale such that the property '$\lambda x.\text{height}(x) > \text{height}(\text{Adam})$' entails alternative properties '$[\lambda y.\lambda x.\text{height}(x) > \text{height}(y)](y)$ ($y \in Alt(\text{Adam}) \wedge y \neq \text{Adam}$)'. Thus (14) – (16) suggest that Adam is probably already pretty tall.

(14) Berta ist **noch** großer als Adam.
Berta be.3SG.PRS NOCH taller than Adam
'Berta is taller even than Adam.' German

(15) Berta bǐ Adam **hái** gāo.
Berta than Adam NOCH tall
'Berta is taller even than Adam.' Mandarin Chinese

(16) Berta **még** magasabb mint Ádám.
Berta NOCH taller than Adam
'Berta is taller even than Adam.' Hungarian

On the contrary, in (17) – (19), when *Berta*, instead of *Adam*, is used to construct the alternative set – $Alt(\text{Berta})$, these sentences suggest that the asserted part 'Berta is taller than Adam' is more worthy of mention than 'X is taller than Adam ($X \in Alt(\text{Berta}) \wedge X \neq \text{Berta}$)'. Or in other words, items in $Alt(\text{Berta})$ form a scale such that the property '$\lambda x.\text{height}(\text{Berta}) > \text{height}(x)$' entails alternative properties '$[\lambda y.\lambda x.\text{height}(y) > \text{height}(x)](y)$ ($y \in Alt(\text{Berta}) \wedge y \neq \text{Berta}$)'. Thus (17) – (19) suggest that Berta is probably not very tall, perhaps just taller than Adam.

(17) Berta ist **noch** großer als Adam.
Berta be.3SG.PRS NOCH taller than Adam
'Even Berta is taller than Adam.' German

(18) Berta **hái** bǐ Adam gāo.
Berta NOCH than Adam tall
'Even Berta is taller than Adam.' Mandarin Chinese

(19) Berta **még** (mindig) magasabb mint Ádám.
Berta NOCH always taller than Adam
'Even Berta is taller than Adam.' Hungarian

In sum, (20) characterizes the interpretation of the scalar use: here $x' \prec_Q x$ means that x' ranks lower than x in making the proposition $Q(x)$ ($x \in Alt(x)$) informative or worthy of mention.

(20) The scalar use of NOCH-type additive particles in $[[\text{NOCH } Q(x)]]$:
Assertion: $Q(x)$ is true.
Inferred meaning: $\forall x'[(x' \in Alt(x) \wedge x' \prec_Q x) \rightarrow Q(x')$ is true$]$.

2.4. EXTENSION: THE EXPECTATION OF INTERLOCUTORS. Temporal or scalar uses of NOCH-type particles often reflect the expectation of interlocutors. For example, (21) – (23) assert that he hasn't come. However, the temporal use of NOCH-type particles here cannot be felicitous unless interlocutors have the expectation for his coming: they either expect for him to come at a later time, or just suggest that it is not the case that his coming is totally out of consideration.[2]

(21) Er ist **noch** nicht kommen.
3SG.M be.3SG.PRS NOCH NEG come.PST.PTCP
'He hasn't come yet.' German

(22) tā **hái** méi lái.
3SG NOCH NEG come
'He hasn't come yet.' Mandarin Chinese

(23) **Még** nem jött el.
NOCH NEG come.3SG.PRS
'He hasn't come yet.' Hungarian

Sometimes, as illustrated in (24) – (26), the inferred meaning brought by the temporal use of NOCH-type particles can be totally trivial: if he is young at the reference time, how can he not be young before the reference time? Thus the point of uttering this kind of NOCH-marked sentences is almost entirely about expressing the expectation of interlocutors: they either expect for him to grow up, or express a kind of wish 'How I wish he can be older! But after all, he is just too young'.

(24) Er ist **noch** zu jung.
3SG.M be.3SG.PRS NOCH too young
'He is still too young.' German

(25) tā **hái** tài xiǎo.
3SG NOCH too young
'He is still too young.' Mandarin Chinese

(26) **Még** túl fiatal.
NOCH too young
'He is still too young.' Hungarian

(27) characterizes this extended semantic layer in temporal or scalar uses of NOCH:

(27) The expectation brought by the use of NOCH-type particles:
a. Expectation in the temporal use $[[\text{NOCH } q \text{ (at } t_0)]]$: $\exists t'[t_0 \prec t' \wedge q \text{ is false at } t']$.
b. Expectation In the scalar use $[[\text{NOCH } Q(x)]]$: (cf. Umbach 2009b's marginality use)
(i) $\exists x'[x \prec_Q x' \wedge \neg Q(x')]$, or in a stronger way, (ii) $\forall x'[x \prec_Q x' \rightarrow \neg Q(x')]$
c. In the scalar-flavored use $[[\text{NOCH } q]]$: $\neg q$ is not totally out of consideration.

3. *Auch*- vs. *noch*-type additive particles. In Section 2.2, we have mentioned that the additive use of NOCH-type particles is very similar to the use of AUCH-type particles. Actually, if the NOCH-type particles used in examples (7) – (9) are replaced by AUCH-type particles, both the assertion and the presupposition of the sentences still remain untouched, as shown in (28) – (30).

[2]This '$\neg q$ is within consideration' interpretation will be analyzed as an extension of the scalar use in Section 5.

(28) (Er hat ein Bier getrunken.) Er hat **auch**
3SG.M have.3SG.PRS one.ACC.N beer drink.PST.PTCP 3SG.M have.3SG.PRS also
einen Wein getrunken.
one.ACC.N wine drink.PST.PTCP
'(He had a beer.) He also had a wine.' German

(29) (tā hē-le yī-bēi pí-jiǔ,) **yě** hē-le yī-bēi pútáo-jiǔ.
3SG drink-PRF one-cup.CLC beer-alcohol also drink-PRF one-cup.CLC grape-alcohol
'(He had a beer.) He also had a wine.' Mandarin Chinese

(30) (Egy sört ivott.) Egy bort **is** ivott.
one beer.ACC drink.3SG.PST one wine.ACC also drink.3SG.PST
'(He had a beer.) He also had a wine.' Hungarian[3]

However, beyond these cases, AUCH-type particles and other uses of NOCH-type particles have their own particularities. Section 3.1 shows that the scalar use of NOCH is sensitive to the **order** among sentences in a discourse, while AUCH-type particles (and the additive use of NOCH-type particles) are not. Section 3.2 shows that the use of AUCH-type particles requires the existence of **distinct** events, which is not always required by NOCH.

3.1. ORDER-SENSITIVITY IN THE SCALAR USE OF NOCH-TYPE PARTICLES. We focus on Chinese data to demonstrate the order-sensitivity in the scalar use of NOCH-type particles. In Chinese comparative sentences, the comparative standard has to be stressed and focused when it precedes *hái* (see (32)). Thus only the scalar reading of *hái* is available here, and the comparative standard is used in building an alternative set for interpreting the non-asserted meaning brought by $hái_{\text{scalar}}$.

(31) Context for (32) – (33): the height of Adam < the height of Berta.

(32) Mandarin Chinese: **scalar** use of NOCH-type particle hái

a. Edda bǐ Adam gāo. Edda bǐ Berta **hái** gāo.
Edda than Adam tall Edda than Berta NOCH tall
'Edda is taller than Adam. Edda is taller even than Berta.' ✓ p $hái_{\text{scale}}$ q

b. #Edda bǐ Berta gāo. Edda bǐ Adam **hái** gāo.
Edda than Berta tall Edda than Adam NOCH tall
'Edda is taller than Berta. Edda is taller even than Adam.' # q $hái_{\text{scale}}$ p

(33) Mandarin Chinese: **additive** use of NOCH-type particle hái and AUCH-type particle *yě*

a. Edda bǐ Adam gāo. Edda **hái/yě** bǐ Berta gāo.
Edda than Adam tall Edda NOCH/also than Berta tall
'Edda is taller than Adam. Edda is also taller than Berta.' ✓ p $hái_{\text{additive}}$/yě q

b. Edda bǐ Berta gāo. Edda **hái/yě** bǐ Adam gāo.
Edda than Berta tall Edda NOCH/also than Adam tall
'Edda is taller than Berta. Edda is also taller than Adam.' ✓ q $hái_{\text{additive}}$/yě p

Given the context (31), the property of being taller than Berta asymmetrically entails the property of being taller than Adam. Therefore, 'Edda's being taller than Berta' (shorthanded as q) entails (or is a stronger claim than) 'Edda's being taller than Adam' (shorthanded as p).

[3]Here we ignore the word order difference between (30) and (9): *is* usually follows the item it is associated with.

(33) shows that both 'p, hái$_{\text{additive}}$/yě q' and 'q, hái$_{\text{additive}}$/yě p' are acceptable under the context (31), indicating that with the use of *hái*$_{\text{additive}}$ or *yě*, the order between p and q does not make a difference. In contrast, (32) shows that 'p, hái$_{\text{scalar}}$ q' is acceptable, but 'q, hái$_{\text{scalar}}$ p' is not, indicating that with the use of *hái*$_{\text{scalar}}$, the order between p and q matters: crucially, the latter utterance in a discourse, i.e., the NOCH-marked one, needs to be the semantically stronger one.

3.2. IDENTICAL EVENT SCENARIO.[4] Under the context (34), 'John ate apples' and 'John ate two apples' describe the same event, but 'John ate two apples' is more informative and more worthy of mention.[5] (35) and (36) show that German *noch* and Chinese *hái* can be felicitously used to connect these two propositions that describe the same event (as far as the weaker claim 'John ate apples' precedes the stronger claim 'John ate two apples'), but AUCH-type particles are infelicitous here. Thus, the upshot is that the use of AUCH-type particles requires the existence of distinct events.

(34) Context for (35) and (36): John was forbidden to eat anything sweet, apples surely included, but he violated the ban by eating two apples.

(35) German:

a. John hat Äpfel gegessen. Er hat **noch** zwei (Äpfel) gegessen.
John has apples eat.PST.PTCP 3SG.M has NOCH two apples eat.PST.PTCP
'John not only ate apples, but ate two apples.'

a′. #John hat zwei Äpfel gegessen. Er hat **noch** Äpfel gegessen.
John has two apples eat.PST.PTCP 3SG.M has NOCH apples eat.PST.PTCP

b. #John hat Äpfel gegessen. Er hat **auch** zwei (Äpfel) gegessen.
John has apples eat.PST.PTCP 3SG.M has also two apples eat.PST.PTCP

(36) Mandarin Chinese:

a. John chī-le píng-guǒ, (ér-qiě) **hái** chī-le liǎng-gè (píng-guǒ).
John eat-PRF apple and NOCH eat-PRF two-CLC apple
'John not only ate apples, but ate two apples.'

a′. #John chī-le liǎng-gè píng-guǒ, (ér-qiě) **hái** chī-le píng-guǒ.
John eat-PRF two-CLC apple and NOCH eat-PRF apple

b. #John chī-le píng-guǒ, (ér-qiě) **yě** chī-le liǎng-gè (píng-guǒ).
John eat-PRF apple and also eat-PRF two-CLC apple

3.3. GENERALIZATIONS. Based on Sections 3.1 and 3.2, we have the following generalizations. As shown in (37), NOCH requires that a discourse be incremental: as the discourse progresses, each sentence has to guarantee the increase of information and the decrease of the context set (i.e., the set of possible worlds that make true each relevant proposition in a discourse). In contrast, as shown in (38), AUCH requires the existence of distinct (but somewhat similar) events.[6]

[4]The preferred pattern in Hungarian to describe the scenario in (34) is different from those shown in (35) and (36), so we only use German and Mandarin Chinese data here.

[5]Hongyuan Dong (p.c.) points out that even though 'John ate a little bit of apple' provides **more information** than 'John ate apples', it is infelicitous to say 'John ate apples, NOCH ate a little bit of apple' in our context, because 'John ate a little bit of apple' does not seem worthy of mention. Thus, it seems that **informativeness** and **worth of mention** should be distinct notions, and to use NOCH felicitously, it's rather **worth of mention** that matters. However, we do not further investigate this issue here, and do not make a distinction between these two notions in this paper.

[6]The similarity involved in the interpretation of AUCH-marked sentences can be shown in the following example:

(37) $[[p, \text{NOCH } q]]$ (i) asserts $p \wedge q$, and (ii) requires that $p \wedge q$ asymmetrically entail p (i.e., q is required to add new information).
$[[p, \text{NOCH } q]] \stackrel{\text{def}}{=} p \wedge q^{\underline{(p \wedge q) \subset p}}$ $\rightsquigarrow$ being **incremental** from p to $p \wedge q$

(38) $[[p, \text{AUCH } q]]$ (i) asserts $p \wedge q$, and (ii) indicates that p and q describe distinct events e_p and e_q (that share some kind of similarity).
$[[p, \text{AUCH } q]] \stackrel{\text{def}}{=} p \wedge q^{\underline{e_p \neq e_q \wedge e_p \text{ is not part of } e_q \wedge e_q \text{ is not part of } e_p}} \rightsquigarrow$ **parallelism** between p and q

4. Two parameters modulating discourse structure and three types of incremental discourses. Now we aim to answer this question: what is the relation between the incremental discourse requirement of NOCH-type particles and the three major uses of NOCH? We propose that there are two relevant parameters that modulate discourse structure here, and when working together, they generate three distinct types of incremental discourse structures.

Our proposal is influenced by Schlenker (2008, 2009, 2010)'s pragmatic view of presupposition phenomena. According to Schlenker's work, presupposition projection can be explained by the interaction between two pragmatic principles of manner: (i) *Be Articulate*, and (ii) *Be Brief*. Essentially, we should express a meaning complex with a series of conjunctions (*Be Articulate*), and presupposition arises when some conjuncts go silent (*Be Brief!*) with no meaning loss – it is the presupposition triggers that save meaning loss. Based on their specific lexical semantics, presupposition triggers supply or provide clues to the meaning of those silent conjuncts.

(39) – (41) illustrate the pattern in interpreting NOCH. The interpretation of each NOCH-marked sentence can be considered as a series of conjunctions: the NOCH-marked conjunct is explicitly asserted (and bolded here), while other conjuncts can be explicit (e.g., in additive uses) or silent (e.g., accommodated in additive uses, or inferred in temporal or scalar uses).

(39) The temporal use of NOCH:
$[[\text{NOCH } \textbf{raining at } t_0]] = \text{raining at } t_1 \wedge \text{ raining at } t_2 \wedge \text{ raining at } t_3 \wedge \ldots \wedge \textbf{raining at } t_0$
(Here $t_1 \prec t_2 \prec t_3 \prec \ldots \prec t_0$: this is the temporal order.)

(40) The additive use of NOCH:
$[[(\text{John drank beer,}) \text{ NOCH } \textbf{John drank wine}]] = \text{John drank beer} \wedge \textbf{John drank wine}$

(41) The scalar use of NOCH:
$[[\text{NOCH } \textbf{Osnabrück is in Lower Saxony}]]$
$=$ A is in Lower Saxony $\wedge$ B is in Lower Saxony $\wedge \ldots \wedge$ **Osnabrück is in Lower Saxony**
(Here A $\prec_{\text{in LS}}$ B $\prec_{\text{in LS}} \ldots \prec_{\text{in LS}}$ Osnabrück: this is the order of informativeness (or worth of mention) on the issue of their being inside Lower Saxony.)

(i) Sue is abroad, and her brother is wasting his time, **too**. (see Schlenker 2015)

The use of *too* conveys (probably with a coercion) the meaning that Sue's being abroad is a waste of time.

Cross-linguistically, some AUCH-type particles have both (i) a single use (e.g., 'p, AUCH q') and (ii) a double use (e.g., 'AUCH p, AUCH q'), and these two uses have the same semantics: they assert '$p \wedge q$', and, in addition, convey the idea that there is some similarity between the events described by p and q (see Brasoveanu & Szabolcsi 2013 for a discussion on this double use of AUCH). Here is a Sherpa example for the double use of AUCH:

(ii) nam ŋumbu **ŋaŋ** nok. tsa dʒungiu **ŋaŋ** nok.
sky blue also SENTENCE-FINAL-PARTICLE grass green also SENTENCE-FINAL-PARTICLE
'The sky is blue and the grass is green.' $\rightsquigarrow$ Similarity: the environment is good.

Therefore, we actually need to explain how NOCH recruits the meaning of (potentially silent) non-NOCH-marked conjuncts by providing the information that the discourse is incremental.

(42) shows our definition of **discourse incrementalism**:

(42) Discourse incrementalism:
Discourse D is a sequence of propositions / conjuncts: $p_1, p_2, p_3, ..., p_i, ...$
D is incremental iff for any $i \geq 2$, $(p_1 \wedge p_2 \wedge ... \wedge p_i) \subset (p_1 \wedge p_2 \wedge ... \wedge p_{i-1})$.

In the following, Section 4.1 discusses the parameter of **entailment relation among conjuncts**, which determines how to make a discourse incremental; Section 4.2 discusses the parameter of **order among conjuncts**, which determines whether the meaning of some conjuncts of a discourse can be inferred so that these conjuncts can go silent. Finally, Section 4.3 shows that these two parameters generate three types of incremental discourse structures.

4.1. PARAMETER 1: ENTAILMENT RELATION AMONG CONJUNCTS. Suppose in a discourse composed of p and q, p precedes q (actually p can be considered as the conjunction of all previous conjuncts). As shown in (43), among all the possible entailment relations between p and q, there are only two ways for the latter conjunct q to add new information to the previous discourse p and narrow down the context set: (i) p and q do not entail each other (see (43b)), or (ii) q asymmetrically entails p (see (43c)).

(43) The possible entailment relations between two propositions p and q:

a.	$p \subseteq q$	$\rightarrow p \wedge q \not\subset p$
b.	$p \not\subset q \wedge q \not\subset p$	$\rightarrow p \wedge q \subset p$
c.	$q \subset p$	$\rightarrow p \wedge q \subset p$

4.2. PARAMETER 2: ORDER AMONG CONJUNCTS. Whether there exists a contextually salient order (which should be, of course, independent of the order of utterance) among the conjuncts in a discourse can determine whether it is practically necessary to spell out (i.e., utter) every conjunct.

For a discourse D, if there does exist a contextually salient order among conjuncts, then based on (i) the information of this order and (ii) the meaning of some conjuncts, a pattern can be inferred, and the meaning of other relevant conjuncts can be inferred. As a consequence, these conjuncts don't need to be uttered and can be silent.

As shown in (44), this parameter can have two possible values: for a certain discourse, a contextually salient order among the conjuncts of the discourse either exists or does not exist.

(44) For a discourse D composed of $p_1, p_2, ..., p_n, ...$,
a. There exists a contextually salient scale K independent of the order of utterance such that $\forall p_i, p_j \in D[i < j \leftrightarrow p_i \prec_K p_j]$.
b. No such a scale K exists for the discourse D.

(45) illustrates how the existence of a contextually salient order saves the effort of uttering each conjunct. The interpretation of *faster* in (45) makes use of the existence of a temporal order among years, and the relevant conjuncts here need to be arranged in the temporal order of years.

(45) Every year John bought a faster car. (See Bumford 2015)
Buy (J, a 70-mph car, 2011) $\wedge$ Buy (J, a 80-mph car, 2012) $\wedge$ Buy (J, a 90-mph car, 2013)

4.3. THREE TYPES OF INCREMENTAL DISCOURSES. Based on these two parameters, i.e., (i) the entailment relation among conjuncts and (ii) the order among conjuncts, there can be three types of incremental discourses, as shown in (46).

(46) Three types of incremental discourse structures:

		Order among conjuncts	
		+ order	– order
Entailment relation among conjuncts	– entailment	**Temporal use:** [+ order, – entailment]	**Additive use**: [– order, – entailment]
	+ entailment	**Scalar use:** [+ order, + entailment]	/

The temporal use and the additive use of NOCH-type particles are similar in that there is no entailment relation among conjuncts. For example, in the additive use of NOCH shown in (40), John's drinking beer and John's drinking wine do not entail each other. Similarly, in the temporal use shown in (39), raining at t_i and raining at t_j ($i \neq j$) do not entail each other.

On the other hand, the temporal use and the scalar use of NOCH-type particles are similar in that there is a contextually salient order among conjuncts. For example, in the temporal use, it is the temporal order among events. In the scalar use, based on and due to the entailment relation among conjuncts, it is the informativeness order among conjuncts. As a consequence, given the information of order and the meaning of the NOCH-marked conjunct, the meaning of previous conjuncts in the discourse can be inferred. Therefore, those conjuncts can go silent, and the NOCH-marked conjunct can usually be uttered out of blue. In contrast, since the additive use usually does not involve a contextually salient order among conjuncts, non-NOCH-marked conjuncts in the discourse need to be either uttered or accommodated.

5. The rise of expectation. As we have shown in Section 2.4, temporal or scalar uses of NOCH often suggest the expectation of interlocutors. Here we argue that expectation-related readings of these uses can be accounted for with a mechanism similar to scalar implicature computation.

As shown in (47), uttering the sentence (47a) in most cases communicates the assumption in (47b). According to Gricean pragmatic principles, speakers should try to be as informative as possible, so that if they were in a position to make a stronger statement, they would have; then since the speaker did not, s/he must believe that the stronger statement is not true. In the case of (47), since *some* and *all* form a scale, and 'Bill has got **all** of Chomsky's papers' is stronger than (47a), the fact that this stronger statement is not uttered suggests the speaker's belief of (47b).

(47) Example of scalar implicature:

a. Bill has got **some** of Chomsky's papers.
b. Bill has **not** got **all** of Chomsky's papers.

We propose that a similar mechanism works in interpreting temporal or scalar uses of NOCH and gives rise to expectation-readings. Notice that the hallmark of temporal or scalar uses is the existence of an order among conjuncts, a necessary ingredient in scalar implicature computation.

In the temporal use of NOCH, as illustrated in (48), given that the use of NOCH brings the incremental discourse requirement, if t_0 precedes t_j, then certainly, the statement 'NOCH he is young at t_j' is a stronger statement than 'NOCH he is young at t_0'. Therefore, if interlocutors were in a position to maker a stronger statement, they would have; since they did not, they must believe that the stronger statement 'NOCH he is young at t_j ($t_0 \prec t_j$)' is not true. In other words, they believe that at a certain moment t_j later than the reference time t_0, it is not true that he will be young at t_j. Thus, the sentence (48) conveys the expectation that he will grow up.

(48) [[NOCH he is young (at t_0)]] Temporal use $\rightsquigarrow$ Expectation reading

a. Temporal order: $\ldots \prec t_i \prec \ldots \prec t_0 \prec \ldots \prec t_j \prec \ldots$

b. NOCH he is young (at t_0) What is uttered
Meaning: $\forall t_i[t_i \preceq t_0 \rightarrow$ it is true that he is young at $t_i]$

c. NOCH he is young (at t_j) ($t_0 \prec t_j$) What is stronger but NOT uttered
Meaning: $\forall t_i[t_i \preceq t_j \rightarrow$ it is true that he is young at $t_i]$

d. Implicature: $\exists t_j[t_0 \prec t_j \wedge$ it is **not** true that he is young at $t_j]$ Expectation

Moreover, as illustrated in (49), if interlocutors should be as informative **as possible**, then all statements stronger than the statement they actually utter are believed to be false.

In this example, the statement 'NOCH Osnabrück is in Lower Saxony' suggests that given the geographic configuration in the context, even for a city minimally further away than Osnabrück (say B), the statement 'NOCH B is in Lower Saxony' is believed to be false, and for any city X further away than B, the statement 'NOCH X is in Lower Saxony' is believed to be false as well. Thus, the marginality reading is yielded: Osnabrück is on the brink of being outside Lower Saxony.

(49) [[NOCH Osnabrück is in Lower Saxony]] Scalar use $\rightsquigarrow$ Marginality reading

a. Informativeness order on the issue of being inside Lower Saxony:
$\ldots \prec_{\text{is in LS}}$ A $\prec_{\text{is in LS}} \ldots \prec_{\text{is in LS}}$ Osnabrück $\prec_{\text{is in LS}}$ B $\prec_{\text{is in LS}} \ldots$
The availability of this informativeness order in a given context is in fact based on an order of geographic configuration, which can be written as $\prec_{\text{geo}}$:
$\ldots \prec_{\text{geo}}$ A $\prec_{\text{geo}} \ldots \prec_{\text{geo}}$ Osnabrück $\prec_{\text{geo}}$ B $\prec_{\text{geo}} \ldots$

b. NOCH Osnabrück is in Lower Saxony. What is uttered
Meaning: $\forall X'[X' \prec_{\text{geo}}$ Osnabrück $\rightarrow$ it is true that X' is in Lower Saxony]

c. NOCH X is in LS (B $\preceq_{\text{geo}} X$) **A series of sentences stronger but NOT uttered**
Meaning: $\forall X \forall X'[(\text{B} \preceq_{\text{geo}} X \wedge X' \preceq_{\text{geo}} X) \rightarrow$ it is true that X' is in Lower Saxony]

d. Implicature: Marginality reading
$\forall X'[$Osnabrück $\prec_{\text{geo}} X' \rightarrow$ it is **not** true that X' is in Lower Saxony]

Finally, with the use of NOCH, (50) can be interpreted as '(How I **wish** q is not true!) But **after all / to the best of my knowledge / all I can say truthfully is that**, q is true'.

(50) [[NOCH he is young]]

a. Within the things that interlocutors can truthfully say: he is young.

b. Beyond the things that interlocutors can truthfully say: he is not young.

This interpretation can be considered as a further extension of the marginality reading. There is a scale of knowledge, and what is uttered, i.e., 'NOCH q', is to the limit of interlocutors' belief

or knowledge. In other words, due to the use of NOCH that invokes this scale of knowledge in interpreting the utterance 'NOCH q', '$\neg q$' is certainly within consideration, but beyond the limit of the things believed by or known to interlocutors.

Given the discussion in Section 4 and in this section, it is obvious that when uttered out of blue, a NOCH-marked sentence might be ambiguous among several readings, and the interpretation might involve several layers of meaning. However, in the real life, prosody and contextual information help to disambiguate and facilitate the multi-dimensional interpretation. Specific issues on the processing of NOCH-marked sentences are left for future work.

6. Comparison to related work. In the following, we briefly discuss two other approaches to the meaning of NOCH-type particles in the formal semantics literature: (i) the speech-act-based approach (e.g., Umbach 2009a,b, 2012, Beck 2016), and (ii) the focus-based approach (e.g., Liu 2000). Of course, NOCH-type particles have been a hot topic for decades, so a more comprehensive comparison of theories is beyond what we can do here.

6.1. SPEECH-ACT-BASED ANALYSES. Previous work on *again* (Klein 2001, Sauerland & Yatsushiro 2015) has analyzed *again* as a speech-act-based particle, as illustrated in (51) and (52):

(51) Context: there is a list of numbers: 5, 4, 7, 11, ... (see Klein 2001)
Utterance: 11 is a prime number **again**.
Klein (2001)'s analysis: the use of *again* is justified not by a sequence of eventualities (i.e., n was a prime number at an earlier time), but by what has been **said** before.

(52) Utterance: what is your name **again**? (see Sauerland & Yatsushiro 2015)
Interpretation: you must **make it once more known** what your name is.

Following this line, Umbach (2009a,b, 2012) and Beck (2016) propose that German *noch* is a speech act operator and accounts for the use of German *noch* in (53) with a speech-act-based proposal: the use of *noch* reflects the **order of mention**.

(53) Context: Adam is coming back from the supermarket. He tells Berta what he has bought.
a. Was hast Du **noch** gekauft?
what have.2SG.PRS 2SG NOCH buy.PST.PTCP
'What else have you bought?'
b. Ich hab **noch** Schokolade gekauft.
1SG have.1SG.PRS NOCH cholocate buy.PST.PTCP
'I have also bought cholocate.'

Our proposed theory is similar to Umbach (2009a,b, 2012) and Beck (2016)'s theory in that in both theories, NOCH is analyzed as a discourse-level operator. However, in Beck (2016)'s theory, at least in some uses, NOCH operates on the **act** of speech utterance, while in our current theory, the use of NOCH always operates on the **information content** of speech utterance.

Anna Szabolcsi (p.c.) points out that these two kinds of accounts make different predictions for accommodation.

In information-content-based accounts, operators work as normal presupposition triggers, and accommodation of silent content is not only possible, but independent of any acts. For example, when a kid asks for a doll and says 'I **also** want to have a doll', she does not need to make any additional speech acts or use any silent acts to point out that other kids have their dolls.

Thus, the use of *also* is purely about information itself, and independent of any acts. In terms of accommodation, what needs to be accommodated is just information, and certainly not acts.

However, in speech-act-based accounts, since a speech-act-based operator needs to operate on speech **acts** themselves, when there is silence (i.e., absence of speech acts), accommodation of speech acts is simply impossible. Even if we consider acts in a broader sense, when there is silence and accommodation is needed, what needs to be accommodated is acts.

This prediction is borne out in Klein (2001) and Sauerland & Yatsushiro (2015)'s analysis of *again*: in both (51) and (52), to use *again* felicitously in these cases, some previous speech acts or silent pointing acts are necessary.

However, in the use of NOCH, previous speech acts or silent pointing acts are not necessary. As shown in (54) (to facilitate information accommodation, here the context is slightly different from the context shown in (53)), the interpretation of the additive use of German NOCH is totally independent of any speech acts or silent pointing acts.

(54) Context: Adam is coming back from the supermarket. Usually he only buys necessities, but sometimes, he gives Berta a little surprise.

a. Was hast Du **noch** gekauft heute?
what have.2SG.PRS 2SG NOCH buy.PST.PTCP today
'What else have you bought today?'

b. Ich hab **noch** Schokolade gekauft.
1SG have.1SG.PRS NOCH cholocate buy.PST.PTCP
'I have also bought cholocate.'

Thus, it seems that after all, NOCH-type discourse particles only operate on information content in a discourse, but not on speech acts.

6.2. FOCUS-BASED ANALYSES. Based on Fillmore et al. (1988) and Kay (1990)'s work on the semantics of *even*, Liu (2000) claims that Chinese *hái* indicates discourse persistence and evokes a relation between the text proposition (TP, i.e., the conjunction of all sentences in a discourse) and the context proposition (CP, i.e., the conjunction of non-*hái*-marked sentences): *hái* is analyzed as a focus particle associated with the TP, which should be stronger than the CP. The spirit of Liu (2000)'s and our analyses is the same, but in our account, NOCH is not associated with the whole TP, but the **difference** between the TP and the CP, i.e., the part that makes the discourse stronger.

Our account has three advantages. First, there is no need for us to explain the source of focus in temporal or additive uses of NOCH (because there is no focus), but for Liu (2000), some *ad hoc* tweaks are needed in these cases. Second, our account explains the distribution of NOCH based on its fundamental semantics. Third, in our account, since NOCH is associated with the difference between the CP and the TP, the use of NOCH has to **presuppose** the existence of CP; while in Liu (2000)'s account, it remains unclear why, for example in the German example (55), NOCH can only be used in the second conjunct of the discourse, but not in the first conjunct or in both conjuncts.

(55) Er hat (*noch) ein Bier getrunken. Er hat
3SG.M have.3SG.PRS NOCH one.ACC.N beer drink.PST.PTCP 3SG.M have.3SG.PRS
noch einen Bier getrunken.
NOCH one.ACC.N wine drink.PST.PTCP
'(He had a beer.) He had another beer.' German

(56) Context: John is counting how many beers Mary has had today.

a. Like everyone else, she had a beer during dinner. Oh, she had **another** beer before.

b. Like everyone else, she is now having a beer. **Moreover**, she had a beer during lunch.

In fact, the use of NOCH in (55) is reminiscent of the use of *another* and *moreover* in (56). Thus, it seems that in natural language, there exists a group of morphemes that express the semantics of an increment by marking the difference / differential part (see also Zhang & Ling 2015 for an analysis of English comparative morphemes, i.e., *more* / *-er*, in this line of thought).

7. Concluding remarks. In this paper, we focus on cross-linguistic NOCH-type particles, and analyze them as discourse-level pragmatics-based presupposition triggers. More specifically, we provide an answer to the following three questions:

(57) Three questions on NOCH-type particles:

a. **Q: What do NOCH-type particles do?**
A: They have three uses: the temporal use, the additive use, and the scalar use.

b. **Q: Why do they do what they do?**
A: With a built-in Gricean principle *Be Informative* in their lexical semantics, NOCH-type particles bring the incremental discourse requirement.

c. **Q: How do they do what they do?**
A: Two parameters determine respectively (i) how to make a discourse incremental and (ii) whether some parts of a discourse can go silent. Together, they generate three ways of building incremental discourses, giving rise to the three uses of NOCH.

We have only discussed the triggering problem of NOCH. How is NOCH interpreted when scoping under various kinds of operators? What is the interplay between NOCH and other discourse particles or presupposition triggers? These projection-related issues are left for future research.

More particularly, as pointed out in Umbach (2012), AUCH- and NOCH-type particles seem to have complementary distribution when used in questions, as generalized in (58):

(58) The distribution of AUCH- and NOCH-type particles in questions:

	wh-questions	yes/no-questions
AUCH-type particles	incompatible	compatible
NOCH-type particles	compatible	incompatible

We hope that our current pragmatics-based proposal can be extended to not only account for this pattern, but further shed light on the pragmatics of questions as well as the relation among sentences with different illocutionary force in a discourse.

Finally, we would like to point out that the Gricean Maxim of Quantity *Be Informative*, as used in the current paper, is defined on the base of informativeness, or logical entailment, and throughout our discussion, we assume that worth of mention depends on informativeness and we use these two terms interchangeably. However, as already suggested in Footnote 5, there seems to be a difference between informativeness and worth of mention. Informativeness certainly contributes to worth of mention, but worth of mention might include something beyond. Eventually, we need to rethink what worth of mention is and perhaps recast our current proposal in terms of worth of mention. We also leave this issue for future research.

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