The complex beauty of boundary adverbials: *in years* and *until*

Sabine Iatridou and Hedde Zeijlstra[*]

To appear in Linguistic Inquiry

In this paper we discuss two NPI adverbials: *in years* (and its cousins *in days, in months*, etc.) and *until*. We argue that a lot is to be gained by analyzing the two in juxtaposition. We explore *in years* first, following Iatridou & Zeijlstra (2017), and on the basis of our analysis of this item, we proceed to an analysis of *until*. Our approach will also permit a unified account of *until*, the duality in the behavior of which has led the literature to consider it lexically ambiguous. The commonalities between *in years* and our unified *until* will in the end of the paper also lead us to a rationale for why both these boundary adverbials are strong as opposed to weak NPIs.

0   Outline

An observation that we attribute to Noah Constant is that temporal adverbials such as *in years*, which are known to be (strong) Negative Polarity Items (NPIs), as in (1), come along with a non-cancellable inference that the relevant event indeed took place (2):

As there are many abbreviations about to appear in the paper, we list them here for easy reference:

AI	Actuality Inference
BEI	Beyond Expectation Inference
E-Perfect	Existential Perfect
EXH	Exhaustifier
LB	Left Boundary
NPI	Negative Polarity Item
PTS	Perfect Time Span
RB	Right Boundary
ST	Situation Time
TT	Topic Time
U-Perfect	Universal Perfect
UT	Utterance Time
UTS	Until Time SPan

4

(1)   He hasn't had a seizure in years.

(2)   a.   … [#]I don't know about earlier

        b.   … [#]In fact, he has never had one.

In this sense, these adverbials differ from their polarity-insensitive counterparts, such as *in (the last) 5 years*, where such an inference is cancellable:

(3)   He hasn't had a seizure in the last 5 years …

(4)   a.   … I don't know about earlier

        b.   … In fact, he has never had one.

These facts are reminiscent of the two usages of *until* in English. One usage of *until*, known as punctual *until*, may only appear in a negative context (5) and comes along with a non-cancellable actuality inference (6), while another usage of *until*, known as durative *until*, can be used in both positive (7) and negative contexts (8) and lacks a non-cancellable actuality inference (9) when it is negated:

(5)   She did*(n't) leave until 5pm

(6)   a.   #… I don't know about earlier

        b.   #… In fact, she has never had one

(7)   She was working until 5pm (...I don't know what happened after 5pm)

(8)   She wasn't working until 5pm

(9)   a.   ... I don't know about later

        b.   ... in fact, she didn't work at all.

In this paper we provide a unified account for these striking correspondences between *in years* (and *in weeks*, *in days*, etc.) and punctual *until*. In short we will argue that the special properties that render *in years* an NPI also extend to punctual *until* and help us understand why *in years* and punctual *until* come along with this non-cancellable actuality inference. We do so by first examining all relevant properties of *in years* and showing how the patterns in (1)-(3) follow

accordingly in sections 1-4. Then, in sections 5-6, we discuss the two usages of *until* and argue that even though these two usages prima facie differ even more than often thought, existing analyses for the two *until*s in terms of lexical ambiguity face some serious problems. In section 7, we present a unified account for the two *until*s, arguing that the same mechanism that underlies the NPI-hood of *in years*, also renders *until* an NPI, but only when it combines with a perfective predicate. When combined with a positive or negative imperfective predicate, it remains polarity-insensitive. In sections 8-10, we discuss some further consequences of our analysis, including a potential counterexample to the observations about punctual *until* that at closer inspection turns out not to be one. In section 11, we argue that both punctual *until* and *in years* are strong NPIs, because the time intervals they introduce are presupposed and not asserted. In the final section we summarize our conclusions.

1   Constant's Observation

Consider sentences with a negated Perfect, as in (10):

(10)   a.   The patient hasn't had a seizure in (the last) 5 years.

       b.   The patient hasn't had a seizure since 2015.

Iatridou (2014) notes that (10) comes with an inference that the patient had a seizure 5 years ago or in 2015 (the "actuality inference", AI henceforward) but that this inference is cancellable:

(11)   A: Has the patient ever had a seizure?

       B: She hasn't had one in the five years that I have been here. I don't know about

           earlier.

       B':   She hasn't had one since 2015. I don't know about earlier.

(12)   She hasn't had a seizure in the last five years / since 2015. In fact, she has never had one.

In the negated Perfect, the existence of the event is a conversational implicature and can be cancelled. Iatridou (2014) attributes this implicature to the semantics of the Perfect. Iatridou, Anagnostopoulou & Izvorski (2001), describe a Perfect like (13) as in (14)-(15):[1]

(13)   I have visited Cape Cod twice since 1990.

(14)   a.   There is a time span (the Perfect Time Span/PTS);

         b.   The Right Boundary (RB) of the PTS is manipulated by Tense and since (13) is a
                 Present Perfect, RB is the time of utterance (UT);

         c.   The Left Boundary (LB) of the PTS is the argument of *since*: (some time in) 1990;

         d.   In the PTS there are 2 (non-overlapping) subintervals at which the speaker visits
                 Cape Cod.

         e. $\exists t$: RB(UT, t) and LB (1990, t) & $\exists t'$, $t'' \subseteq t$: I visit Cape Cod at t', t'' [2]

(15)   1990   UT

         LB   ✔   ✔   ✔   RB

         |…………………………………………………………………...............|
                            (the Perfect Time Span/PTS)
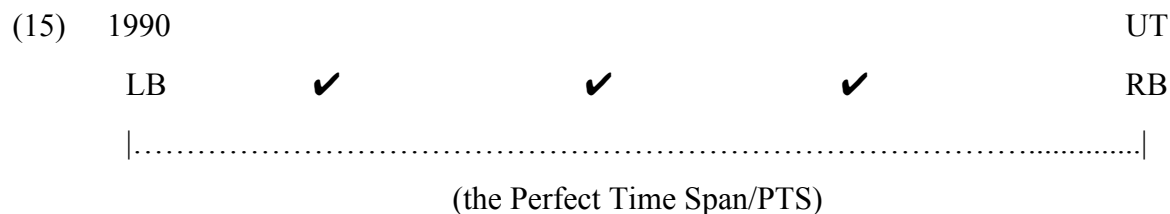
        Note that the existence of the PTS is presupposed the way it is presupposed with any temporal adverbial (*I saw her three days ago* does not assert the existence of a day, three days ago). In (15), the first part of the interpretation is actually presupposed ($\exists t$: RB(UT, t) and LB (1990, t)); the second part is asserted.[3]

        The LB of the PTS can be set by an adverbial ("LB-adverbs" or the superset "PTS-adverbs"), as in (13)-(15), or, in the absence of an adverbial, contextually:

(16)   I have visited Cape Cod three times (= since the beginning of my life, or since I entered
        the US).

---

[1] See von Fintel and Iatridou 2019 for an implementation of Iatridou et al. (2001) in a more formal context.
[2] We leave implicit the condition that t' and t'' have to be distinct, i.e. do not overlap.
[3] Whenever it is not relevant for the dicussion which part of the meaning is presupposed and which part is asserted, we will present the entire meaning in a single Logical Form. When the distinction is relevant, we will represent the two types of meaning contributions separately.

Note that the part $\exists t', t'' \subseteq t$ in (15) is due to the perfect here being a perfect of a perfective. Following Klein (1994), Kratzer (1998) and many others, we assume that the contribution of the Perfective and Imperfective are the following relationships between Situation Time (ST) and Topic Time (TT):

(17) a. $ST \subseteq TT$ (Perfective aspect)

   b. $TT \subseteq ST$ (Imperfective aspect)

or, more formally:

(18) a. $[[PRF\ \phi]]^t = 1$ iff $\exists t' \subseteq t$: $[[\phi]]^{t'} = 1$

   b. $[[IMPF\ \phi]]^t = 1$ iff $\exists t' \supseteq t$: $[[\phi]]^{t'} = 1$

Moroever, we follow von Fintel and Iatridou (2019) that in the perfect, the PTS relates to (im)perfective as the Topic Time does, and since the perfective conveys that the ST is included in the TT, the perfect of the perfective conveys that the event is included in the PTS/TT, as in (14). This yields the result discussed in Iatridou et al. (2001), whereby the perfect of the perfective yields the Existential Perfect (E-perfect).

The perfect of the imperfective contains the opposite relationship (PTS/TT included in ST), yielding the Universal perfect (U-perfect). The role of the perfective/imperfective distinction under the perfect will play a crucial role later in the paper. We refer the reader to von Fintel and Iatridou (2019) for the composition details.

Now consider a negated Perfect:

(19) I haven't visited Cape Cod since 1990/in the last 3 years.

Everything in (14)a-c still holds, but negation shows up and the existence of the relevant event(s) inside the PTS is negated. So, for (19), in addition to (14)a-c, we have (20)-(21) instead of (14)d-e:

(20) It is not the case that in the PTS there is a subinterval at which I visit the Cape.

= there is no event of my visiting the Cape in the PTS.

(21) Given a PTS τ, such that RB(UT, τ) and LB (1990, τ): $\neg\exists t' \subseteq \tau$ & I visit Cape Cod at t'

In short, in the Perfect, the existence of the event in the PTS is part of the assertion. When the Perfect is negated, the assertion is that there is no relevant event in the PTS. If there is a LB-adverbial like *since 1990* or *in the last 5 years*, a conversational implicature arises that conveys that a visiting event took place prior to 1990 or three years before UT. The reason is that the cooperative hearer will infer that while there is no relevant event in the PTS, there may be one outside the PTS. Otherwise, why would the speaker bother to point out the non-existence of an event in a specific time span? But as we saw in (11)-(12), and as expected, this conversational implicature is cancellable.

Noah Constant (p.c.) made the striking observation that unlike in (10)-(12), in (22) the AI is not cancellable, as shown in (22).

(22) a. He hasn't had a seizure in years …

… [#]I don't know about earlier

b. He hasn't had a seizure in years. …

… [#]In fact, he has never had one.

In other words, with *in years*, there is a non-cancelable inference that sets it apart from other LB-adverbials. This is quite surprising, if the cancellability of the AI, as shown in (11)-(12), follows from the combination of a negated perfect with a LB-adverbial as layed out in the beginning of the paper, in summary of Iatridou 2014.

Moreover, this non-cancelable AI has a further consequence that sets the adverbial *in years* apart from other LB-adverbials. Unlike with *in years*, with other LB-adverbials, the (cancellably) inferred event does not have to be exactly at the LB of the PTS. For example, consider the italicized context and the utterance in (23) in it:

6

(23)   *There is a law according to which one cannot apply for a pilot license if one has had a*
        seizure in the last 5 years. That is, in order to apply, one must be 5 years seizure-free. It is
        now 2016. Sue had a seizure for the last time in 2007. That is, Sue is 9 years seizure-free.
        Sue has not had a seizure in (the last) 5 years, so she is eligible to apply

The LB in (23) is set 5 years ago, yet the last seizure was 9 years ago. This "disparity" is not possible with *in years*, as we are about to see. With *in years*, it is not just that there has to be a previous occurence of the event (the non-cancellable AI), the last occurence of the event has to be at LB.

In order to show that with *in years* the time of the event has to be at the LB of the PTS, we attempt to set up two contextual alternatives to the LB and show that this does not work (unlike in (23)), though the examples are a bit complicated due to a number of factors that need to be controlled for.

Imagine that 25 years ago, Fred caused a car accident that was so severe that his license was suspended for 10 years. This means that he was not allowed to drive for the 10 years following the car accident he caused. Then right on the day when the period of suspension was over, he falls off a ladder and is paralyzed from the neck down, and so has been unable drive ever since. The ladder accident happened 15 years ago. In this context, consider the following utterances:

(24)   a.   Fred has not driven for/in 15 years because of the ladder accident
        b.   Fred has not driven for/in many years because of the ladder accident
        c.   #Fred has not driven in years because of the ladder accident

In this complicated and unfortunate scenario, (24)a-b are true: indeed the last 15 years are driving-free because of the ladder accident ((24)a) and certainly fifteen years qualify as 'many years' and so (24)b is true too. On the other hand, (24)c is false, because it conveys that Fred was driving at about the time that the ladder accident happened. This shows that *in years* is not capable of setting the LB at a contextual event/time, as was possible in (23).

Similarly, the subject's lifetime does not provide an insurmountable limit for the PTS. That is, the LB is not required to be set at the time of the subject's birth with any LB-adverbial. As a PTS is not necessarily restricted to lifetimes, the subject's lifetime is at most a contextual

restriction. To see this, suppose that some environmental organization has decided to reward everybody who has not driven a car in the last 40 years. Then, Fred, who is 30 years old and who has never driven a car, would still be eligible for a reward. That means that the PTS in (25) exceeds Fred's lifetime, which shows that the PTS does not have to be set at the subject's birth.

(25)   Fred has not driven a car in the last 40 years (so he is also entitled to a reward)

So in (25), it is clear that the LB of the PTS is blind to the beginning of the subject's life, as it precedes it by 10 years, and yet the sentence is acceptable.

We can draw a similar conclusion in the following related scenario: Imagine that Fred is, in fact, 40 years old and that again, he has never driven a car. In that case, (25) can still be truthfully uttered. However, (26), though perfectly grammatical, would be out, due to the non-cancellable AI.[4]

(26)   Fred has not driven a car in years (so he is also entitled to a reward)

In other words, LB-adverbials (*in years* among them) do not set the LB by the subject's birth. LB-adverbials other than *in years* can locate the LB of the PTS before or after the subject's birth. The LB-adverbial *in years* has to set it at the last occurence of the relevant event, which per force is after the subject's birth. We will see later in the paper the reasons why *in* years cannot be sensitive to contextual restrictions.

In summary, the role of the event described in the VP in sentences with *in years* is different from the role it plays in sentences with adverbials like *in (the last) 5 years*, or *since*-adverbials. The difference between these two classes of adverbials does not just lie in the cancellability of the AI. With *in years*, the time of the inferred event is the LB.

We refer to the non-cancellable AI observation with *in years* as 'Constant's observation'. Constant's observation holds for all *in*+Bare-Plural-Temporal-Noun combinations: *in days*, *in*

---

[4] Lest the reader believe that the problem with (26) is that *in years* requires a certain vagueness or ignorance regarding the exact time, we refer to footnote 8.

months, *in ages*, *in weeks*, *in hours*. When using *in years*, we will be referring to this entire class of adverbs.[5]

As a final note in this section, an anonymous reviewer observes that in certain cases the AI appears to be cancellable. Their examples are:

(27) a. I think he's never read a book. He definitely hasn't read one in years.

   b. I don't remember if I've ever seen a nightingale here. I certainly haven't seen one in many many years.

These examples involve the expressions *definitely* and *certainly*, without which the discourses above would be a contradiction. Christopher Baron (personal communication) points out that the examples (27) are most likely cases of modal subordination. Modal subordination permits a polarity shift (von Fintel and Iatridou 2017):

(28) a. Don't park there. You will be towed = Don't park there. [If you do] you will be towed

   b. Conserve your energy. You will run out of breath = Conserve your energy. [If you don't] you will run out of breath.

Similarly, (27) would be as in (29) and thus not be counter examples to Constant's observation:[6]

(29) a. I think he's never read a book. [If he has] he definitely hasn't read one in years.

   b. I don't remember if I've ever seen a nightingale here. [If I have] I certainly haven't seen one in many many years.

---

[5] Note that if somebody hasn't seen Miranda in 10 years, that person can utter *I haven't seen Miranda in years*. This person could also have truth-fully uttered *I have not seen her in weeks*, since 10 years is about 520 weeks. But by convention the largest unit of measure possible is chosen. We assume this convention throughout the entire paper.
[6] This leaves the role of *definitely* and *certainly* unspoken for. Why would these items be necessary for modal subordination and polarity switch in (27), but not (28)? We would like to suggest that these adverbs presuppose the existence in the discourse of something the speaker isn't certain about (a context which is absent in (28)). Note that (i)-(ii) are much better with *definitely* than without:
i. He went to the store. I'm not sure what all he bought but he definitely bought some stroopwafels and carrots.
ii. I don't think he has read any Tolstoy. He definitely hasn't read War and Peace.
On the contrary, when certainty is involved, *definitely* is degraded:
iii. He went to the store. I know exactly what he bought. He (#definitely) bought some stroopwafels and carrots.

The question now arises as to why the AI with *in years* is not a cancellable conversational implicature. It is this question that we address in the first part of this paper. On the basis of the conclusions reached about Constant's observation, we will examine adverbials headed by *until* in the second part, and explore the larger significance of our findings. However, before doing so, we will see that there is another inference that is again non-cancellable when the negated Perfect contains *in years*.

2   Another non-cancellable inference

We saw that the AI is not cancellable when the negated Perfect contains *in years*. Now we will see that there is another non-cancellable inference that arises when the negated Perfects contains *in years*, and not other LB-adverbials. To see this, take (30):

(30)   John hasn't had a seizure in (the last) 5 years

In examples like (30) nothing is said about whether the speaker is surprised about the length of the PTS, that is, the length of the interval in which John did not have a seizure. This sentence can be uttered in a context where John used to have a seizure very often, so that the speaker is surprised that it has not happened in the last 5 years. It can also be uttered in a situation where due to a medication that John had been taking for the last 10 years, the speaker had expected there to be no seizure at all in the last 10 years. Finally, (30) can be also uttered if the speaker has no expectation at all. If the doctor would ask whether John has had a seizure in the last 5 years, the speaker could simply answer with (30) as well, without indicating any surprise or other expectations.

This is not the case with *in years*. This adverbial conveys that the event took place earlier than the speaker had expected or hoped for. For instance, (31) shows that when uttering a sentence containing *in years / in months / in days*, the speaker conveys that the visiting event was expected to have taken place more recently than it did. That is, the expectation is that the event-free PTS would have been shorter:

10

(31)   I know Mary does not like to visit our common aunt Trudy. So when I visited aunt Trudy myself, I expected to hear that Mary had not been there in the last few weeks. But, it was …

        a.   … worse than I thought. She had not been there in months.

        b.   …#better than I thought. She had not been there in days.

        (compare to …*better than I thought. She had been there just the day before/very recently/She had not been there in only two days*)

We refer to this second inference as the "Beyond Expectation Inference", henceforward BEI. BEI states that the event took place beyond a contextually set expectation: The PTS is larger than a contextually salient interval. The same can be seen for *in minutes* in the examples below. In minutes conveys that the PTS is larger than a contextually salient amount of minutes, etc., as the following examples show:[7]

(32)   a.   He hasn't drunk anything in 5 minutes

        b.   #He hasn't drunk anything in minutes

        c.   He hasn't drunk anything in days

(33)   a.   He hasn't taken a breath in minutes

        b.   #He hasn't taken a breath in seconds

These facts confirm the BEI of *in years / in minutes*, etc.: the event took place earlier than expected. Earlier than expected means that the PTS is longer than expected.[8]

---

[7] That a BEI is involved becomes also clear in an example like (i).

i.   He hasn't submitted a report in weeks. In fact, I don't think he's submitted one all year.

Here the first sentence says that he didn't submit a report with an unexpectedly large amount of weeks; the second sentence states that this amount of weeks exceeds a year. We thank a reviewer for bringing this example to our attention.

[8] One reviewer suggests that "the whole point of modification with "in years" is to communicate that the speaker cannot locate the left boundary in any exact way". To show this, the reviewer provides the following nice example, consisting of two other temporal in-adverbials that are NPIs:

i.   I haven't had a real fig in God knows how long / I don't know how long.

However, these in-adverbials crucially behave differently from *in years*, as they obligatorily bring in an ignorance effect; *in years* however, does not have to convey ignorance as the example below shows.

ii.   The last time I was in Paris was on Bastille day in 1989. So I have not been in Paris in years / # in God knows how long / # I don't know how long

Hence, the inferences that *in years* gives rise to cannot follow from just ignorance. So the BEI does not come from ignorance itself.

In total, then, *in years* comes with two non-cancellable inferences that *in (the last) 5 years* lacks: an AI (which states that the relevant event took place at the LB), and a BEI. We will try to see now how these properties can follow from the formal semantic properties of this type of adverbial.

3 Formal properties of the *in years* class

The *in years* class has two formal properties that distinguish it from other adverbials and that will turn out to form the source of its unexpected behavior. First, *in years* is a so-called LB-adverbial. Second, it is a (strong) NPI. Let's look at each property in some detail.

3.1 In years *as a LB-adverbial*

In the Perfect, the RB of the PTS is manipulated by Tense: in the Present Perfect, RB is at Utterance Time (UT), in the Past Perfect, RB is before UT, and in the Future Perfect, RB is after UT (See Iatridou et al. 2001, Iatridou 2014, von Fintel and Iatridou 2019). The LB of the PTS, on the other hand, can be set by adverbials, or as we saw above in example (16), in the absence of an adverbial, contextually. LB-adverbials set the LB either by specifically naming it, like the *since*-adverbial in (34), or by counting backwards from the RB, like *in (the last) 5 years*, which we have already seen, or *for*-adverbials in (35), (see Iatridou et al. 2001 and references therein):

(34)   I have visited Cape Cod three times since 1990
(35)   For 5 days he has been sick with the flu

The PTS-adverbial *in years* also stretches backwards from RB. In (36)a, it stretches backwards from the UT, which is the RB because we are dealing with a Present Perfect. In (36)b, it stretches backwards from an RB that precedes UT because of the Past Perfect. In (36)c, it stretches backwards from an RB that follows UT:

(36)   a.   He hasn't shaved in days

12

b.   I saw him last week. He had not shaved in days

c.   I will visit him next year. That will be very magnanimous of me because by then he will not have visited me in years.

However, unlike *for*-adverbials, which can be either PTS- (specifically LB-) or VP-level adverbials (Dowty 1979), *in years* is *only* a PTS-adverbial, that is, it cannot appear in sentences without the perfect:[9]

(37)   *He didn't go to the movies in years   (vs. He hasn't been to the movies in years)

(38)   *I didn't exercise in years   (vs. He hasn't exercised in years)

(39)   *I didn't eat bananas in years   (vs. I haven't eaten bananas in years)

In short, *in years* is only a PTS-adverb, not a VP-level adverb, and it sets the LB by stretching backwards from RB until it finds the first (i.e. the most recent) event of the VP-sort. We also saw that *in (the last) 5 years* and *since*-adverbs do not behave this way. However, these are also PTS-adverbs. So it can't be the case that the non-cancellability of the AI with *in years* is due to it being a PTS adverbial, nor does the BEI inference follow from it. Hence, another property of *in years* must be relevant too.

3.2   **In years *as a (strong) NPI***

---

[9] *For*-adverbials are both PTS-adverbials (i.e., adverbials that set the (left) boundary of the Perfect Time Span) and VP-level adverbials (i.e., adverbials that (temporally) modify the event-description of the VP); Dowty 1979, Iatridou et al. (2001). Similarly, unlike *in years*, which is only a PTS adverbial, *in 5 years* can appear both in the perfect, as already seen, as well as in simple past sentences, in which case it is a VP-level adverbial:
i.   He wrote 5 books in 5 years
In simple past sentences *in 5 years*, as a VP-level adverbial, measures out the time of the culmination of a telic event:
ii.   He walked to the park in 5 hours (=It took him 5 hours to walk to the park)
iii.   #He walked in the park in 5 hours
When it is a PTS-adverbial, *in 5 years* sets the LB of the PTS, and the requirement for telicity, which holds only when it is a VP-level adverbial, goes away:
iv.   In 5 years, he has only been sick for two months.
So *in 5 years* can function either as a PTS- or a VP-level adverbial. It measures out the time of culmination when it is a VP-level adverbial (i-ii). When it functions as a PTS-adverbial (iv), it measures the PTS. The sentence-intial position of the adverbial is compatible only with the PTS-reading of adverbials that can in principle be either PTS-adverbials or VP-level adverbials (cf. Dowty 1979, Iatridou et al. 2001; see Rouillard (in progress) for an interesting attempt to unification).

Another important characteristic of *in years* (and *in minutes*, *in days* etc.) is that it is an NPI (Horn 1971, Zwarts 1989, Hoeksema 2006):

(40)   a.   He hasn't had a seizure in years

         b.   *He has had a seizure in years

         c.   Nobody has had a seizure in years

         d.   *Somebody has had a seizure in years

Moreover, *in years* is a so-called strong NPI, that is, it is only licensed by anti-additive contexts (such as *not* or *nobody*) and not by other downward entailing contexts, such as *few* or *at most* (Zwarts 1988). [10,11,12]

(41)   a.   *Few patients have had a seizure in years

         b.   *At most 10 patients have had a seizure in years

By contrast, *since*-adverbials and *in (the last) five years* are not NPIs:

(42)   He has had two seizures in (the last) 5 years/ since 1990

We will see next how the NPI-hood of *in years* opens up the way to explaining Constant's observation.

---

[10] A reviewer points out that *in years* can also be an adnominal, and then it also comes with an AI:
i.   'Letters to Samuel' is his first book in years to return to his childhood in a religious cult.
It is a known fact that other PTS adverbs can modify adverbs as well:
ii.   The years since the war have been difficult
We also note that superlatives are (Strawson) Anti-additive (cf. Gajewski 2011, Herdan & Sharvit 2006). As such it is not surprising that *in years* can be used in examples like (i). The exploration of PTS adverbs as adnominals is, however, beyond the scope of the paper.
[11] As restrictive clauses of universal quantifiers are anti-additive, the question arises as to why *in years* cannot be licensed inside such restrictive clauses (*Every student who has been there in years, …). The reason is that strong NPIs are also strict NPIs, i.e. NPIs that must be licensed locally, (cf. Collins & Postal 2014, Zeijlstra 2018) and therefore cannot be licensed outside the relative clause it appears in.
[12] As a reviewer points out, that *in years* is a strong NPI also can be seen in the following minimal pair (Gajewski 2007):
i.   *Mary didn't claim that Bill had left the country in years.
ii.   Mary doesn't believe Bill has left the country in years.

4 Deriving Constant's observation

For Kadmon & Landman (1993) and others, NPIs extend the contextually restricted domain of quantification. That is, they make the domain of quantification bigger than what would otherwise be contextually expected. This domain-widening property is for them (partly) responsible for NPIs being NPIs. Kadmon & Landman (1993: 360) present the following example to show how *any* behaves as a domain widener:[13]

(43)   YOU: Will there be French fries tonight?

      ME: No, I don't have potatoes.

      YOU: Maybe you have just a couple of potatoes that I could take and fry in my room?

      ME: Sorry, I don't have ANY potatoes

More recent approaches to NPI-hood, most notably Krikfa (1995) and Chierchia (2006, 2013), adopt the basic insight of Kadmon & Landman (1993) in which there is a relationship between NPIs and domain widening but they argue that, contra Kadmon and Landman, the property of domain widening itself does not underlie NPI-hood. Rather, NPI-hood may underlie domain widening.[14]

---

[13] For Kadmon & Landman (1993) domain wideners like *any* are subject to a strengthening requirement (which is not specified as being a lexical requirement) that forces the utterance containing the domain widener to be stronger than its non-domain widening alternatives: the utterance which contains *any potatoes* must be stronger than the utterance which contains just *potatoes*. Since extending the domain of quantification of an existential quantifier in a positive context makes the utterance less informative (*I saw a car* is less informative than *I saw a BMW*), this strengthening requirement can only be met if the existential is embedded in an environment that reverses inferences, i.e. in downward entailing contexts. This, for Kadmon & Landman, is what makes domain wideners NPIs.

[14] Following Krifka (1995), the reasons why Chierchia, whose account of NPI-hood we adopt here, rejects domain widening as the primitive source of NPI-hood are twofold. First, it is argued that the original account by Kadmon & Landman is non-compositional: their strengthening requirement, i.e. the requirement that an utterance containing an NPI can only be used if the utterance with the NPI is stronger than the one with its non-NPI counterpart, is not part of the lexical meaning of any NPI, nor does it follow from the lexical meaning of an NPI. Second, not every NPI is always used as a domain widener. Chierchia points out that out of the blue, a sentence like (ii) can be uttered without any domain widening effect. Only in contrast with an alternative like (i) does the domain widening effect arise.

i.   I don't have eggs

ii.   I don't have any eggs

So while for Kadmon and Landman all NPIs are domain-wideners, for Chierchia, an NPI does not necessarily have a domain widening effect.

Chierchia (2013) argues that the flagship characteristic of NPIs is the fact that NPIs introduce subdomain alternatives and that the sentences they occur in are obligatorily exhaustified. [15] Domain widening comes about when an item which introduces subdomain alternatives is contrastively focussed under negation. In this paper, we will re-emphasize the importance of the connection between NPIs and domain widening. But before doing so, let's first discuss Chierchia's approach in more detail.

In general, exhaustification has the result that all alternatives that are not entailed by the assertion, are made false. This is what happens in this case as well. With indefinites/existentials and other lower scalar endpoints, the result of these requirements is a logical contradiction that is responsible for ungrammaticality when the NPI is not in a downward-entailing context.

To see this, suppose there is a domain of quantification involving three books ($\{b_1, b_2, b_3\}$). Then the denotation of *I have any book* (without the exhaustifier applying) would be that I have at least one of these three books (given that *any* is at base an indefinite / existential). Then, for Chierchia, a sentence like *I have any book* introduces subdomain alternatives, such as 'I have a book that is a member of the set $\{b_1, b_2\}$', or 'I have a book that is a member of the singleton-set $\{b_3\}$'. These alternatives with smaller domains of quantification are logically stronger than the original sentence: for instance, 'I have a book that is a member of the set $\{b_1, b_2\}$', entails 'I have a book that is a member of the set $\{b_1, b_2, b_3\}$', not the other way round. Now, when the sentence *I have any book* is exhaustified, all non-weaker alternatives are negated. In other words, 'I have a book that is a member of the set $\{b_1, b_2\}$' will be false, and 'I have a book that is a member of the singleton-set $\{b_3\}$ will be false, as these are the stronger alternatives.

But then we have arrived at a contradiction: the assertion of *I have any* book is that I have at least one of the books of the set $\{b_1, b_2, b_3\}$, but the exhaustification of such alternatives conveys that I don't have a book of the set $\{b_1, b_2\}$ and that I don't have a book of the set $\{b_3\}$. This is a contradiction. And as Chierchia follows Gajewski (2002) in assuming that logical contradictions trigger ungrammaticality judgements, this renders unacceptable sentences which contain an unlicensed NPI.

---

[15] For Chierchia 2013 those are two separate properties of NPIs. See Zeijlstra 2018 for an attempt to derive the requirement for exhaustification from the sole fact that NPIs introduce domain alternatives.

Once an NPI is embedded under scale-reversing (i.e. downward entailing) operators, before it is exhaustified, the domain alternatives do not yield stronger propositions, as the entailment relations are reverse: 'I don't have a book that is a member of the set $\{b_1, b_2, b_3\}$' entails 'I don't have a book that is a member of the set $\{b_1, b_2,\}$' or 'I don't have a book that is a member of the singleton set $\{b_3,\}$', not the other way round. Under the scope of a downward entailing operator there are no domain alternatives that yield stronger propositions. Therefore, the domain alternatives of a sentence like *I don't have any* book do not yield a contradiction under exhaustification. Exhaustification takes place vacuously. A sentence with an NPI under the scope of a downward entailing operator is no longer contradictory and therefore fine.

Under this approach, NPIs are not domain wideners as such, but elements that introduce domain alternatives. Nothing forbids setting the domain of quantification freely, but as Chierchia points out, whenever NPIs are used contrastively in a Downward Entailing environment against some contextually set domain of quantification, the NPI's domain of quantification must be stretched beyond these contextual restrictions. Once contrastively focussed, NPIs are domain-wideners in the sense of Kadmon & Landman. Or as Chierchia (2013: 36) puts it in discussing *any*: when contrastively focussed, *any* acts as a "domain widener", but when it is not contrastively focussed (in Downward Entailing contexts), it is interchangeable with a plain indefinite.

Chierchia (2013: 217) argues explicitly that the same mechanism applies to temporal *in-*adverbial NPIs, such as *in years*. That is, *in years* is an element that introduces subdomain alternatives and that is subject to an exhaustification requirement. Since Chierchia states that *in years* is in addition (in effect lexically specified to be) contrastively focussed under negation or any other anti-additive environment, it is a domain widener as well. This is exactly the topic of our investigation, so we need to lay out where we agree and where we disagree with Chierchia (2013). More specifically, Chierchia takes utterances containing expressions like *in years* or *in weeks* to have a denotation as follows (after Chierchia: 2013: 218):

(44)   a.   *Joe has met Mary in weeks

      b. $\exists e[\text{met}_w(e, j, m) \wedge \text{cul}(e) \wedge \tau(e) \subset \text{WEEKS}]$

             cul = culminated and $\tau(e)$ = the temporal span of e and $\subset$ stands here for

             temporal inclusion

      c.   There is a culminated event of Joe meeting Mary whose temporal span is included

in a period of one or more weeks long

Once it is assumed that (44)a introduces domain alternatives of the kind as in (45)a, the NPI-hood follows:

(45) a.   Joe has met Mary in D, where D is a time interval smaller than weeks

     b. $\{\exists e.[\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{cul}(e) \land \tau(e) \subset D] \mid D \subseteq \text{WEEKS}\}$

If a culminated event takes place in a subinterval of an interval T, it also takes place in T, whereas the reverse does not hold. That means that all alternatives in (45)b entail (44)b. Exhaustification then has the result that all alternatives that are stronger than the assertion are made false, which means that all the alternatives of the kind in (45)b must be false. Then we reach a logical contradiction. If in no subdomain of T a meeting event took place, it cannot have taken place in T either. This contradiction disappears when the sentence is embedded under negation. Since (46) entails all alternatives in (47), exhaustification takes place vacuously.

(46) a.   Joe hasn't met Mary in weeks

     b. $\neg\exists e[\text{met}_w(e, j, m) \land \text{cul}(e) \land \tau(e) \subset \text{WEEKS}]$

           cul = culminated and $\tau(e)$ = the temporal span of e and $\subset$ stands here for temporal inclusion

     c.   There is no culminated event of Joe meeting Mary whose temporal span is included in a period of one or more weeks long

(47) a.   Joe hasn't met Mary in D, where D is a time interval smaller than weeks

     b. $\{\neg\exists e.[\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{cul}(e) \land \tau(e) \subset D] \mid D \subseteq \text{WEEKS}\}$

Hence, assuming that *in years* introduces subdomain alternatives captures that it is an NPI. When such NPIs are used contrastively under negation, as Chierchia points out, it is further derived that they are domain wideners.

      However, while we adopt Chierchia's general approach towards NPIs, we do not adopt his specific proposal for *in years*. The reason is that in it, there is no reason why *in years* should behave differently from other PTS adverbials. Chierchia takes utterances containing expressions like *in*

years to have a denotation as in (44). But this denotation leaves it as a mystery why with other PTS adverbials, the AI is cancellable, but with *in years* it is not ('Constant's observation'). Therefore, while we will keep to Krifka's and Chierchia's general approach to NPIs, we will go our own way for the *in years* class.

We start by resetting some of (44) in the Iatridou et al. (2001) and von Fintel and Iatridou (2019) frame in (48). Most notably, the culmination referred to in (48)e is the result of the Perfective that is part of the Perfect participle, which contributes the meaning that the time of event/situation (ST) is included in the evaluation time/topic time (TT): $ST \subseteq TT$ (Klein 1994 and many others) (see section 1).

(48)   a.   *Joe has met Mary in weeks

         b.   There is a time span (the Perfect Time Span/PTS)

         c.   The Right Boundary (RB) of the PTS is manipulated by Tense and since (48)a is a Present Perfect, RB is the time of utterance (UT)

         d.   The Left Boundary (LB) is found stretching back weeks from RB.

         e.   In the PTS there is a (culminated) event of Joe meeting Mary

Once it is assumed that because of the presence of *in weeks* domain alternatives to the PTS are introduced that need to be exhaustified, the facts can be explained. Take the assertion and domain alternatives in (49), where Run(e) is the run time of an event e; the ST is thus Run(e) and the PTS is the TT.

(49)   Given a PTS τ, such that RB(UT, τ) and LB (τ - weeks, τ)

        Assertion: $\exists e.[meet(e, Joe, Mary) \wedge Run(e) \subseteq \tau]]$

        Domain alternatives: $\{\exists e.[meet(e, Joe, Mary) \wedge Run(e) \subseteq \tau'] \mid \tau' \subseteq \tau\}$.

The reasoning is the same as before: If an event takes place in a subdomain of the PTS τ' smaller than τ, it also takes place in τ, whereas the reverse does not hold. That means that all alternatives in (49) entail the assertion. Exhaustification results in all alternatives that are stronger than the assertion being made false, which means that apart from the assertion all alternatives of the kind in (49) must be false. Then we reach a logical contradiction again. If in no subdomain of the PTS

a meeting event took place, it cannot have taken place in the PTS either. This contradiction does not arise when the sentence is embedded in a downward entailing context. Since the assertion in (50)a entails all domain alternatives in (50)b, exhaustification takes place vacuously, as there is no non-weaker alternative that is to be negated anymore.

(50)   Given a PTS τ, such that RB(UT, τ) and LB (τ - weeks, τ)

    a.   Assertion: $\neg\exists e.[\text{meet}(e, \text{Joe}, \text{Mary}) \wedge \text{Run}(e) \subseteq \tau]]$

    b.   Domain alternatives: $\{\neg\exists e.[\text{meet}(e, \text{Joe}, \text{Mary}) \wedge \text{Run}(e) \subseteq \tau'] \mid \tau' \subseteq \tau\}$.

Hence, under our revised representation of *in years*, couched within Iatridou et al. (2001), von Fintel & Iatridou (2019), it still follows under the general approach to NPI-hood as formulated by Chierchia, that once *in years* introduces smaller subdomains of the PTS as domain-alternatives and given that it is contrastively focussed (an assumption that Chierchia makes and on which we are happy to follow him), it is a domain widener.[16]

Thus we take *in years* to be a domain widener that stretches its domain of quantification beyond *any* contextual restrictions. Since the domain of quantification in the case of *in years* is the PTS, contextual restrictions that may normally apply to the PTS no longer do so. Thus, *in years*, has to do two jobs: being a PTS-adverb, it has to set the LB of the PTS, and being a domain widener, it has to widen (i.e. extend) the PTS as much as possible. As we already saw, *in years* is like other PTS *in-* or *for*-adverbials in that it sets the PTS not by naming it (like *since*-adverbials do) but by stretching backwards from the RB (which is set by Tense). Putting these properties together, the result is that *in years* stretches backwards as far as possible from the RB.

Then, there are two seemingly conflicting requirements on *in years*. On the one hand, it needs to set the LB; on the other hand, it needs to stretch backwards as far as possible from RB, beyond *any* contextually salient alternatives. How can it satisfy both requirements at the same time? The resolution of the conflict lies in that the *in years*-adverbial stretches backwards as much

---

[16] Naturally, this leads to the question as to how the focus of *in years* must be phonetically encoded. We remain agnostic as to whether that is lexically encoded (i.e., *in years* would be inherently accented or stressed), or whether this follows from the prosodic configuration that *in years* appears in. As Edward Flemming (p.c.), pointed out to us, it does not seem possible to check this phonetically because given that *in years* has to be in the scope of negation, and appears therefore at the right edge of the clause, the stress contour that it receives would be the same regardless of the presence or absence of contrastive focus. However, the fact that empirically *in years* always carries some stress, is consistent with the position that we inherit from Chierchia, that it is always contrastively focussed.

as is *logically* possible. That is, it stretches backwards from RB until the point where the sentence would become false. Where is that point?

The only point in time which *in years* cannot skip over on its stretch-backwards-from-RB path is the point in time where an event of the relevant sort took place. Stretching the PTS any further back would make the sentence false, as the assertion is that no event of the relevant sort occurred in the PTS. In the example at hand, *in years* can stretch the PTS back until the first seizure that it meets, which is effectively the most recent seizure (the example is schematized with the RB at UT, as in a Present Perfect):

(51)   Seizure 1……………Seizure 2………………………… RB: UT
                                    ⟵------------------------------

Stretching the PTS less far than to the relevant event, i.e., to some contextually salient time instead of the time of the event, is problematic as well. By doing so, there would be a bigger PTS in which the event didn't hold as a contextual alternative, but *in years* as a domain widener requires the PTS to be larger than *any* contextual alternative. The only way to resolve this is by stretching the PTS back until its LB reaches the relevant event, as that is the maximal PTS in which no event of the kind holds.

The occurrence of an event of the relevant sort is thus necessary because it is the only way to enable the resolution of conflicting requirements on *in years*, to both set the LB and to set it as far as possible backwards from RB. This explains why with *in years,* there unavoidably is be an event of the relevant sort, why that event unavoidably occurs is at the LB, and why the time of the event is unavoidably earlier than any other contextually salient alternatives (BEI), as the event being earlier, translates into the PTS being bigger, i.e. the domain of quantification is extended. We saw that none of these facts are unavoidable with other PTS adverbials.

It is important to note that in this sense the domain widener *in years* differs from domain widening *any*. With *in years*, there is a limit to the domain widening, since the PTS is presupposed to have an LB. There is no such limit on the domain widening of *any*; there is no external factor that limits its absolute domain widening. In a sentence like Kadmon and Landman's famous *I didn't eat ANY potatoes*, domain widening goes maximal. It is not assumed that it can only stretch only up to leaving one potato uneaten or leaving something other than a potato uneaten. However, with

in years, there is a limit placed by a factor external to its domain-widening nature, namely by its nature as a boundary adverbial.

The above, then, derives Constant's observation, i.e. the non-cancellability of the AI with *in years*, and the BEI. A negated Perfect, like any Perfect, presupposes that the LB of the PTS exists, as the PTS, like any interval can only be defined by virtue of its boundaries. In the case of *in years* the LB can only be set if there is a prior event: no other option is logically possible. Therefore, the unacceptability that arises when there is no prior relevant event, is the result of a presupposition failure. To be precise: the presupposition is not that there be an actual event; the presupposition is that there is a LB to the PTS (see section 10 for more discussion). But with the specific LB-adverbial, only a relevant event can satisfy this presupposition. In this, *in years* is different from *in (the last) five years*, where there is no non-cancellable AI, and where BEI is absent.

Under this analysis, elements that introduce domain alternatives can become polarity-sensitive. A subset thereof are domain wideners. Boundary adverbials that are domain wideners give rise to the AI and BEI.

5   *Until*-adverbials

Next let us look at *until*, the head of an adverbial that looks superficially quite different from *in years*. We will provide arguments that the two should be studied in juxtaposition because despite appearances, they share many properties, including the non-cancellable AI and the BEI. We will explore their similarities and differences and draw larger conclusions.

5.1   *Two types of until*

The lexical item *until* sets up a time span which we will call UTS ('Until Time Span'). The RB of the UTS is the argument of *until*.

There is frequent reference made to 'durative until' (henceforth 'until-d') which appears with statives or progressives (basically predicates with the subinterval property; differently put,

predicates with the imperfective) and which asserts that the predicate holds throughout the UTS.[17] The argument of until-d (the RB of the UTS) can be an NP or a clause:[18]

(52)   He was asleep / composing a sonnet until 5pm/my departure

(53)   He was asleep / composing a sonnet until I left

Unsurprisingly, nothing is said about whether the predicate holds after the time specified by until-d, that is, after the UTS. Examples (52)-(53) may suggest that the sleeping ended at 5pm or at my departure. However, the sentences in (52)-(53) have nothing to say about what goes on beyond that interval, so any Gricean reasoning about that should always be cancellable. This is the case when, for instance, ignorance is expressed (54) or when it is explicitly stated that the predicate holds beyond the RB of the UTS (55).

(54)   He was asleep/ composing a sonnet until 5pm and possibly well beyond that. I'm not sure.

(55)   He was asleep/ composing a sonnet until 5pm and well beyond that.

So until-d sets the RB of the UTS, just as PTS- adverbials like *since* and *in years* set the LB of the PTS.[19] We use the term *boundary adverbial* for all adverbials that set the boundary of an interval, regardless of whether they set the LB or RB. So, *in years*, *since*, *in (the last) 5 years*, *until-d* and others, are boundary adverbials.[20] Until-d is thus a mirror image boundary adverbial compared to *since* and *in years* in the sense that they set opposite boundaries.[21]

When a sentence with until-d and a durative predicate is negated, an ambiguity arises:

---

[17] A predicate P has the subinterval property iff whenever it holds at an interval, it also holds at every one of its subintervals (cf. Dowty 1979).

[18] In the examples we use in this and the next few sections, the arguments of *until* are all points in time, leaving open for now the question of how the RB is set when the argument of *until* refers to a (longer) time interval, as in *I was working in Paris until the nineties*. We will come back to such examples in section 10.

[19] As with the PTS, Tense manipulates RB, which means that Tense tracks the time of the argument of until-d:
i.   She was asleep until 9pm yesterday
ii.   She will be asleep until 9pm tomorrow

[20] This also shows that the term *until-d* is not appropriate, since it is not the adverbial clause that is durative but the predicate it modifies. We will continue using the term, however.

[21] Though *since* and *in years* require the Perfect, *until* does not. We will have nothing to say about this difference here. See McCoard 1978 and Dowty 1979 for an early discussion of which adverbials require which temporal syntax and semantics.

(56)   He was not asleep / composing a sonnet until 5pm/ until I left

The sentence in (56) merely asserts that there was no sleeping or composing that reached the RB of the UTS. It is not specified whether there was no sleeping or composing at all, or whether there was some which terminated before the RB of the UTS. We will use the existing and transparent terms *throughout-not* and *not-throughout* for the two cases respectively. From (56) it is unclear whether we are dealing with vagueness or ambiguity. However, (57) seems to argue in favor of scopal ambiguity, since these sentences have the *throughout-not* reading much more pronounced. (possibly *not-throughout* is marginally acceptable if the sentence is understood as containing meta-linguistic negation):[22]

(57)   Until 5pm/ Until I left, he was not asleep/ composing a sonnet.

The predicates used in connection with *until* so far are all imperfective (*composing a sonnet*) or stative (*asleep*), whose default interpretation is imperfective. Predicates in perfective aspect behave quite differently:[23]

---

[22] Whether the *throughout-not* and *not-throughout* readings are the result of vagueness or structural ambiguty is not at all relevant to our proposals in this paper. However, on the basis of (57), it looks like it is indeed a matter of structural ambiguity and not that the *throughout-not* reading is a special case of *not-throughout*, so we will continue with this assumption until it is proven wrong. In addition to (57), the following examples also point towards a structural ambiguity (the choice of predicate under *until* is so as to exclude an *until-p* parse (see Karttunnen 1974)):
i.   ... and not drink wine until he died, he did (*thoughout-not* only)
ii.   ... and drink wine until he died, he did not (*not-throughout* most dominant)
iii. Q. Were Mary and Bill lazy today? How long were they not working?
      A. ? Mary was not working until 5pm and Bill until 7pm.   (Not perfect for everybody but to the extent that it's good, it's only on the *throughout-not* reading)
iv. Q. Did Bill and Mary miss a lot of the meeting?
      A. Mary was not present at the meeting until 5pm and Bill until 7pm.   (*throughout-not* only)
[23] Activities, which as atelics lack a culmination subinterval even with the perfective, can appear in the perfective with *until* without negation (see already Karttunen 1974 for such examples). See Staniszewski (2019) for the following examples involving perfective atelic:
i.   Bill drank wine until nine
The crucial ingredient for *until* modifying positive predicates is the subinterval property, which can also hold for these examples. What is special about (i) is that it retains the subinterval property despite the perfective due to the absence of a culmination, and it is the subinterval property that is crucial. For expository purposes, we concentrate the discussion on perfective telics when we want to show the significance of the absence of the subinterval property, even though we will not consistently be pointing out in the main text that it is perfective telics that necessarily lack the subinterval property. We thank Frank Staniszewski for discussion of this point. See also Staniszewski for discussion of examples like Karttunen's *Guests arrived until mdnight.*

(58)   *She left / reached the summit until 5pm / I left

One might say that the ungrammaticality of such a sentence is not surprising, if we are dealing with until-d here, which requires a predicate with the subinterval property. However, later on we show that a different approach to the ungrammaticality of (58) is necessary.

Famously, upon the introduction of negation, the sentence becomes grammatical (cf. Karttunen 1974 among many others):

(59)   She didn't leave / reach the summit until 5pm / I left

Equally famously, this sentence has a non-cancellable AI (Karttunen 1974 and many since). That is, it is not possible to deny that she left (and that she did so at the specified time), as evidenced by the contrast between (60) and (61):

(60)   She didn't leave until 5pm / I left
        [#]… I don't know if she left later
        [#]... in fact, she didn't leave at all.
(61)   She didn't leave when I left …
        … I don't know if she left later
        ... in fact, she didn't leave at all.

5.2   *The lexical ambiguity approach to* until

The fact that *until* in (59) comes with a non-cancellable AI has been considered a strong argument in favor of the position that the occurrence of *until* in these sentences is a different lexical item from until-d, which lacks such an AI. And, as we showed above, the AI conveys that the event took place at the RB of the UTS. This differentiates *until* in (59) from until-d. The occurrence of *until* in (59) has been called *punctual until* (until-p), and is considered an NPI, in fact, a strong NPI, as we will see, since it surfaces only in anti-additive contexts.

Karttunnen (1974), Declerck (1995), Giannakidou (2002), Condoravdi (2008), *inter alia*, provide two arguments for lexical ambiguity (until-d and until-p): The first one is that there are languages with different phonetic exponents for the two meanings. The second one concerns the different behavior of the two kinds of *until* with respect to the AI. There are a few difficulties with both arguments, however. In addition, the lexical ambiguity approach faces certain problems of its own. We will explore both types of problems. We start with the alleged arguments for the lexical ambiguity approach.

5.2.1   The cross-linguistic argument

Let us start with the claim that there are languages that have two different items for the two *until*s. Despite prior claims in the literature about such languages, for instance Greek and Czech, we will see that in those languages there is actually no morphological until-p versus until-d distinction.

Greek
Giannakidou (2002) and Condoravdi (2008) argue that until-d in Greek is *mexri*, while until-p is *para mono* (*mono* can be dropped, a fact which we will not keep on indicating). Here is one example of *para mono* from each paper, with the glosses and translations as given by the authors:

(62)   I prigipisa   dhen kimithike   para monon ta mesanixta   Giannakidou (2002)
       The princess   not slept.prf.3s   but   only   the midnight
       'The princess didn't sleep until midnight' =
       It was only at midnight that the princess fell asleep

(63)   Dhen thimose   para mono htes   Condoravdi (2008)
       Neg   get-angry   but for only yesterday
       'He didn't become angry until yesterday'

However, *para mono* is not the Greek version of NPI until-p. First of all, *para mono* has a broader life than until-p, in that it is an NPI exceptive (similar to French *ne… que..*): [24]

---

[24] We will *take para mono* to have the meaning as in (i), after von Fintel and Iatridou 2007:
i.   [[*para monon* tin Miranda]]: $\lambda P. \exists x \, (x =/= $ Miranda $\& \, P(x) = 1)$

26

(64)   Dhen vlepo para mono tin Miranda

       neg   see.1sg para mono the Miranda

       'I see no one except Miranda' / 'I see only Miranda'[25]

(65)   Dhen irthe para mono i Miranda[26]

       Neg   came para mono the Miranda

       'Nobody came except Miranda' / 'Only Miranda came'

(66)   I Miranda dhen taksidhevi para mono   me treno

       the Miranda neg   travels   para mono with train

       'Miranda does not travel except by train' / 'Miranda only travels by train'

(67)   Dhen boris na vris kales tulipes para mono stin Olandia

       neg   can   find good tulips para mono in Holland

       'You cannot find good tulips except in Holland' /

       'You can find good tulips only in Holland'

What we see in (64)-(67) is the exceptive *para mono* on a variety of arguments and adjuncts. Giannakidou's and Condoravdi's examples in (62)-(63) can be analyzed exactly as instances of this exceptive with a temporal adjunct as its argument:[27]

When the meaning in (i) is placed under negation, we derive the meaning for, e.g. (64), as follows:

ii.   [[*dhen… para monon* tin Miranda]]: $\lambda P.\ \forall x\ (x =/= Miranda \rightarrow P(x) = 0)$

The same holds for when the argument of the exceptive is a temporal adjunct (e.g. in (74)):

iii.   [[*dhen… para monon* tin dekaetia tu 60]]: $\lambda P.\ \forall t\ (t =/= 60s \rightarrow P(x) = 0)$

[25] It is important to note the equivalence of the English sentences with *only*, though it is hardly surprising that what some languages do with exceptives, other languages do with *only*. See von Fintel and Iatridou (2007) for another such phenomenon.

[26] Here is a place where Greek *para mono* differs from the French *ne…que…*: the latter cannot in general appear on subjects, but *para mono* can, as long as the subject is post V(P). Maybe this fact reduces to the fact that French does not have post-VP subjects the way Greek, a pro-drop language, does. Stan Zompi (personal communication) points out that in the few contexts where French does allow post-verbal "subjects", i.e. sequences <preverbal expletive — unaccusative — nominal>, it behaves like Greek:

i.   Il n' est arrivé que quatre caravanes très peu considérables   (Cuoq 1981: 871)
    EXPL NE is arrived QUE 4 caravans very little considerable
    `There arrived only four rather unremarkable caravans.'

ii.   Ensuite il n'a été vu que des groupes comportant au maximum 1.000 individus   (Lomont 1950: 243):
    Later EXPL NE has been seen QUE PART groups involving at.the most 1,000 individuals
    'Afterwards only groups of at most 1000 individuals have been witnessed.'

[27] Just as there is exclusive *only* and scalar *only,* there are also scalar and exclusive uses of exceptives: *He is nothing but a soldier* and *I didn't see anybody but/except John* (Kai von Fintel, p.c.). Similarly, *para mono* has not only exclusive bur also scalar uses:

i.   Dhen ine para mono stratiotis

(68)　I prigipisa　dhen kimithike　　para monon ta mesanixta

　　　　The princess　not slept　　　　para mono　the midnight

　　　　'The princess didn't' fall asleep except at midnight' /

　　　　'The princess fell asleep only at midnight'

(69)　dhen thimose　　　para mono htes

　　　　Neg get-angry　　　para mono yesterday

　　　　'He didn't get angry except yesterday' / 'He got angry only yesterday'

We see that if we look at temporal adjuncts within the paradigm of the exceptive uses of *para mono*, we can reproduce exactly Giannakidou's and Condoravdi's alleged until-p sentences. The meanings of (68)-(69) are exactly those described in the until-p narratives: There was no falling asleep/getting angry except at midnight/yesterday. That is, the falling asleep / getting angry is part of the assertion of sentences with *para mono*.

In other words, with the right semantics for the general exceptive applied to the temporal argument, we can create the same meaning as the highly specialized until-p. But this undermines the position that *para monon* is until-p. If we took the position that *para monon* is until-p, we would have to explain why the general exceptive cannot take a temporal argument which would produce the very same meaning. That is, we would have to exclude the derivation of (68)-(69) via the exceptive route. In addition, we would have to explain why Greek until-p has a homophony with an exceptive. And of course the position that *para mono* is ambiguous between an exceptive and until-p is even harder to defend in itself.

The position that *para mono* is until-p becomes even more untenable when we see that *para mono* is compatible also with non-punctual, i.e. imperfective predicates, the domain of until-d. This seems hard to reconcile with the meaning of until-p. On the other hand, compatibility with imperfective predicates is exactly what would be predicted under the view of *para mono* as an exceptive:

---

　　　not　is　para mono solder

　　　'He isn't but a soldier'

We submit that (70) and (71) are similarly scalar uses when BEI is felt to be present. On the other hand, (69) in the main text, would be an example of a non-scalar exceptive. We thank the reviewer for pointing out this prediction to us.

(70) Dhen kimate para mono otan kani krio

  neg sleeps para mono when makes cold

  'He doesn't sleep except when it is cold' /

  'He sleeps only when it is cold'

(71) I sikies dhen epivionun ton ximona para mono otan ine skepazmenes me tsouvali

  the figtrees not survive the winter para mono when are covered with burlap

  'Figtrees don't survive the winter except when they are covered in burlap' /

  'Figtrees survive the winter only when they are covered in burlap'

(72) Dhen itan eftichismeni para mono tin dekaetia tu 60

  neg was happy para mono the decade 60

  'She wasn't happy except in the 60s' / 'She was happy only in the 60s'

(73) I Miranda dhen ine edho para mono tis Trites

  the Miranda neg is here para mono the Tuesdays

  'Miranda isn't here except on Tuesday' / 'Miranda is here only on Tuesdays'

As can be seen in (70)-(73), there is nothing punctual, perfective or inchoative about these sentences. They are sentences containing exceptives with a temporal argument, with imperfective predicates in the matrix and in the exceptive clause.

  Finally, as a reviewer points out, our analysis of *para mono* as an exceptive correctly predicts that (74) should be possible, which it is not with *until*:

(74) Dhen thimose para mono proxthes, xthes to vradhi, ke simera to proi

  NEG got-angry para mono day-before-yesterday, yesterday evening, and today in the morning

  'Se did not get angry except the day before yesterday, yesterday evening, and this morning.'

  'She only got angry the day before yesterday, yesterday evening, and this morning'

  In short, we gain nothing from saying that *para monon* is until-p, given that the existing exceptive use of this item already predicts the correct meaning. Moreover, if we identify *para*

mono with until-p, we have additional things to explain. As for the fact that the falling-asleep and getting-angry events occurred in (62) and (63), this may look like a non-cancellable AI, but it is actually part of the assertion of these sentences.[28] All this means that this particular argument from Greek in favor of the lexical ambiguity of *until*, is not valid.[29]

Moreover, it is not only that *para mono* is until-d, Greek *mexri* is actually not until-d either, contra Condoravdi 2008 and Giannakidou 2002. Indeed, like until-d, mexri can appear with durative/imperfective predicates. But *mexri* is not restricted to those, it can also appear with perfective predicates (75), which until-d cannot do (76):

(75)   a.   Mexri tis 5 to apogevma, o Yanis iche idhi pchi 3 bires

                until 5 the afternoon, the John had already drunk 3 bires

                'By 5pm, John had already drunk 3 beers'

        b.   tha pio 3 bires mexri tis 5 to apojevma

                FUT drink.prf.1sg 3 beers mexri the 5 the afternoon

                'I will drink 3 beers by 5pm'

(76)   a.   *Until 5 in the afternoon, John had already drunk 3 beers

        b.   *John had already drunk 3 beers until 5 pm.

Czech

Giannakidou (2002) mentions that Czech also has two expressions for *until* (via Hana Filip, p.c.) though the actual forms are not provided in the Giannakidou paper. Indeed, Czech has two items

---

[28] Or in one's favorite semantics of how *I didn't see anyone except Miranda* entails that I saw Miranda.

[29] In other words, there is nothing necessary about languages using a lexical item like until-p to express the relevant meaning. Greek uses a general exceptive, as we saw. Dutch and German have *pas* and *erst* respectively, and these also yield sentences with non-cancellable occurences of events. But these items do not co-occur with negation (and so are not NPIs like until-p), and their non-cancellable AI is an expected entailment of the sentence.

i.   Hij is pas gisteren weggegaan
      He is pas yesterday left
      'He left only yesterday'

ii.   Er is erst gestern krank worden
      He is erst yesterday ill become
      'He became ill only yesterday'

Similarly, in the English *Miranda only left yesterday*, there is a non-cancellable AI, but this is no mystery either, as in most accounts of *only*, this sentence presupposes that Miranda left yesterday (cf. Horn 1969).

that can be translated as 'until', *dokud* and *až do*, but they differ in the type of complement they take. They do not differ along the until-d versus until-p dimension.[30]

Dokud can only take a clausal complement, whereas *až do* can only take an NP complement. It is not the case that there is one *until* that functions always as an NPI. This is shown in (77)/(78), where both can appear in affirmative sentences:

(77)   Spal {dokud/*až do} jsem neodešla.
        slept.M.SG.IMP until aux.1sg not-left.F.SG
        'He was asleep until I left.'

(78)   Spal {*dokud/až do} pěti.
        slept.M.SG.IMP to until five
        He was asleep until 5pm

We see that neither item is an NPI, that is, they both don't appear in Downward Entailing environments, and both can accompany an imperfective predicate. These are not the characteristics of the elusive until-p.[31] However, like in English, the perfective in an affirmative sentence cannot be modified by *until* (i.e., by either of the two forms):

(79)   *Napsal dvě básně, dokud jsem neodešla.
        Wrote.pfv two poems until aux.past.1sg neg.left.pfv.f.sg
        He wrote 2 poems until I left.'

(80)   *Napsal dvě básně až do pěti.
        wrote.pfv two poems until five
        'He wrote 2 poems until 5.'

---

[30] Dočekal (2012) explicitly argues in favor of a unified approach regarding *dokud* but the questions as he presents them are differently oriented from the ones we are presenting, and therefore, here we will discuss Czech on the basis of our own explorations of this language. We are very grateful to Ivona Kucerová and Radek Simik for patient discussion of Czech with us. However, we refer the reader to Dočekal (2012) for a detailed discussion of Czech negative concord and other issues.

[31] Notice that *dokud* contains a negative marker in its argument, which, in fact, is obligatory. It does not yield a semantic negation, but is rather an instance of expletive negation or possibly an element establishing a Negative Concord relation with *until*. This does not come up for *až do*, as it cannot take a clausal argument to begin with (see Zeijlstra 2004, 2014, Dočekal 2012 for discussion).

Like in English, such examples become grammatical if negation is included:

(81)   Neodešel, dokud neodešla Marie.

neg.left.pfv.sg.m until neg.left.pfv.sg.f Marie'

'He didn't leave until Marie left. (#in fact, he may not have left at all).'

(82)   Neodešel až do pěti.

neg.left.pfv.sg.m until to five

'He didn't leave until 5pm (in fact, he may not have left at all).'

Here, a difference shows up between *dokud* and *až do*. According to speakers that we asked, (81) has a non-cancellable AI but (82) does not.[32] The tests are the usual ones but we don't include them here for reasons of space.

So it seems that *dokud* is quite like English *until*, in that it shows both until-d and until-p behavior: it is a right boundary adverbial, but its argument must be clausal, unlike English *until*, which can take clauses or NPs. Moreover, like English *until*, in affirmative sentences, *dokud* can go only with imperfective predicates and then lacks any kind of non-cancellable AI, but with negation present in the matrix clause, it can go with a perfective predicate, in which case it has a non-cancellable AI. In addition, *až do* is also a bit like English *until*: it is a right boundary adverbial, but one whose argument can only be an NP. It goes only with imperfective predicates in an affirmative matrix, but with negation, it can go with a perfective predicate, but then still has a cancellable AI. So it seems like *dokud* behaves like English *until*, that is, it has both until-p and until-d behavior. *až do* behaves somewhat differently from *dokud*, but it is definitely not until-p. Hence, Czech is not a language that has a separate lexical item for until-p.

5.2.2   The non-cancellable AI argument

---

[32] Possibly this has to do with the presence of (expletive) negation / Negative Concord inside the *dokud* clause. This negative marker does not induce a semantic negation of its own. This is not a unique property of Czech. Such semantically redundant negative markers can be attested in until-clauses in other languages too, e.g., Hebrew. While in Czech this negative marker is obligatory, in other languages, like Hebrew, it is optional. However, when it is present, there are certain non-cancellable implicatures. See Margulis (2017) and references in there. See also Dočekal (2012) specifically for Czech.

Next we come to the other argument in favor of a lexical ambiguity for *until*, namely that until-p has a non-cancellable AI, as opposed to until-d. As said before, and according to the literature, the following sentences are contradictions, and indeed for the speakers that we have tested, they are:

(83)   [#]She did not leave until 5pm and maybe she didn't leave at all

(84)   [#]She did not leave until I left and maybe she didn't leave at all

Similar tests with until-d do not yield such contradictions, meaning that until-d lacks such an inference:

(85)   She was asleep until 5pm and maybe she was asleep afterwards

(86)   She was asleep until I left and maybe she was asleep afterwards

The fact that until-d and until-p behave differently in this respect has formed a strong argument for the hypothesis that until-d and until-p are different lexical items.

In this section, we discuss the validity and significance of the cancellability test in (83)-(86), as well as the question of how strong an argument it can be for the ambiguity approach.

Here is a first concern. Negation has been argued to create predicates with the subinterval property (Mittwoch 1974, Krifka 1989, De Swart 1996, De Swart and Molendijk 1999, Verkuyl 1993 i.a.). This can also be seen with *for*-adverbials, which require the subinterval property:

(87)   * The plant died for 5 weeks

(88)   *For 5 weeks, the plant died

(89)   For 5 weeks, the plant didn't die. Finally, it succumbed to the extreme draught

(90)   For 5 weeks, no plant died. Finally, they succumbed to the extreme draught

Intuitively it is clear why the application of negation should yield a predicate with the subinterval property: if an interval *I* has no subinterval at which the predicate holds, then none of its subintervals do either. This conclusion is unassailable. However, it raises a problem in the debate around *until*: if negation creates a predicate with the subinterval property, then any negated predicate should be compatible with until-d, on the *throughout-not* reading. But if that is possible,

then (83)-(84) should not have felt like contradictions. (83)-(84) would be predicted to be truth-fully utterable when she did not leave before 5 and the speaker doesn't know what happened after 5. A parse with until-p certainly would predict a contradiction but a parse with until-d should have been possible as well. And as until-d lacks any kind of non-cancellable AI, these sentences should have been just fine, as the mind would look for a grammatical parse (the until-d parse), and find the non-contradictory readings. These sentences should then (on the until-d parse) have been able to mean that the predicate of not-leaving held until 5pm or until the time of my departure, with nothing being said about what happens outside the UTS.[33] But the truth is that (83)-(84) *are* contradictions, which means that the until-d parse is not possible here.

In order to circumvent this problem, one might adopt Giannakidou (2002), also relying on arguments from Karttunnen (1974), who takes issue with the position that negation can create predicates with the subinterval property. But let's look more closely at the arguments that are meant to show that negation does not yield a predicate with the subinterval property.

The first argument, from Karttunen (1974), is the contrast between (91) and (92). If negation could change the telic predicate into a predicate with the subinterval property, (91) and (92) should behave similarly, which they do not:

(91)   #Nancy didn't get married until she died

(92)   Nancy remained a spinster until she died

Indeed, (91) is distinctly odd. If negation could have yielded a predicate with the subinterval property, the sentence would be ambiguous between the reading assigned to until-p (which would be odd) and the *throughout-not* reading of negated until-d (which would be fine, just as in (92)). Karttunen (1974) and Giannakidou (2002) conclude that as the parse with until-d is not available, it must be the case that negation does not alter the aspectual profile of a predicate. However, these sentences do not show that negation does not yield the subinterval property. As we will see later on, it is very well possible that negation does yield the subinterval property and that the reason that (91) is out is that it nevertheless has a non-cancellable AI, which we show is the case in section

---

[33] As a reviewer points out, the problem of blocking durative *until* with negated telic predicates is also raised in Condoravdi (2008: 639-640), but it is left unsolved there.

7.3. This means that (91) bumps into a real-world impossibility, whereas this non-cancellable AI is absent in (92). And this distinction we already know.

Giannakidou (2002) presents a further argument to show that negated perfectives do not have the subinterval property: Imperatives are not good with statives, yet they are good with negated perfectives. Hence, the argument goes, negated perfectives are not statives:

(93)   *Gnorise tin apandisi!
        *Know the answer
(94)   Diavase to grama!
        Read.perf the letter
        'Read the letter'
(95)   Mi diavasis to grama!
        Not read the letter
        'Don't read the letter'

But here there is a confusion between stativity and the subinterval property. The confusion between stativity and the subinterval property is very common, in fact. Predicates that are stative in the Vendler (1957) sense (i.e., +durative, -dynamic, -agentive, like adjectives and verbs like *love*, *know*, etc.) have the subinterval property. But following Dowty (1979), Vlach (1993) and others, any predicate that has the subinterval property is often called "stative". That is, by this criterion sentences like the following, with the progressive, for example, test positive for the subinterval property and are therefore called stative: *He is building a house*, *She is throwing bricks*. It is clear that this notion of "stative" has nothing to do with Vendlerian stativity. What is relevant for us is the question of whether negation yields predicates with the subinterval property. The question is not whether negation yields Vendlerian statives. The reason that imperatives resist statives is not because of their temporal properties (the subinterval property) but because of the fact that statives are typically non-agentive, which violates a condition of use of imperatives that presupposes that they be in the control of the addressee (cf. Kaufmann 2012 among many others). Once stative verbs are understood as being in the control of the hearer, an imperative is fine: *Know the answer by Friday!* So therefore, the fact that imperatives don't readily allow statives is not an argument in

this debate. What is at issue is whether negation yields predicates with the subinterval property, not whether it yields agentless predicates.

Similarly, the progressive yields predicates with the subinterval property, and these are fine in the imperative, showing again that there is no issue combining an imperative with a predicate that has the subinterval property:

(96)   a.   Be saluting as the queen walks in!

b.   *(Stage directions:)* Be talking to the person next to you as Macbeth walks onto the stage!

Giannakidou mentions two more tests from Karttunen (1974) to argue that negation does not yield predicates with the subinterval property. One test relies on *how long* and the other on *while*. Both tests are intended to distinguish statives from negated perfectives.[34] We will look at these two tests, but again, we will cast the discussion in terms of the subinterval property, not stativity.

The first test goes as follows: *how long* requires the subinterval property, and if negated perfectives had the subinterval property, (97)-(98) should both be good, contra to fact (the sentences below are both from Karttunen 1974):

(97)   How long did the princess sleep?

(98)   *How long did the princess not wake up?

The other test is the *while*-test, which is also meant to distinguish predicates with the subinterval property from negated perfectives (examples all from Karttunen 1974):

(99)   I washed the dishes while you slept

(100) I washed the dishes while you were not in the kitchen

---

[34] Giannakidou rightly shows that these tests work the same with appropriate aspectual distinctions in Greek. We will not address the Greek cases here for reasons of space. While her observations introduce interesting points in the debate, a discussion of Greek aspect would take us too far afield. Also, Giannakidou has a more involved discussion about Greek aspect and its interaction with negation. But again, delving into Greek aspect is not possible here, and at any rate, it is English that is relevant since it is the existence of until-p in this language that is at issue. We have already clarified where Greek stands on this matter.

(101) *I washed the dishes while you didn't wake up

Do these two arguments by Kartunnen really force us to the conclusion that negation does not yield predicates with the subinterval property?

Let us focus on the *how long* test and its reliability. Karttunen shows that *how long* is not good with negated perfectives, but what he does not show is that it is also bad with negated statives:

(102) *How long wasn't she asleep?

So if *how long* requires the subinterval property *and* if negation does not change the aspectual character of the underlying predicate, (102) should be just fine. But it is not, which means that something basic about *how long* escapes us. This means that in light of the ungrammaticality of (102), we should not base too much on the ungrammaticality of (98).

A further point of evidence that we do not understand *how long* well enough is that it seems possible with predicates with which bare temporal adverbials are not possible. More specifically, it is not surprising that (103)a is good, given that (103)b is grammatical:

(103) a.   How long did she sleep?
       b.   She slept 3 hours

But then how is it possible that (104)a is good, given the ungrammaticality of (104)b? Similarly for (105)a-b:

(104) a.   How long did she drink beer?
       b.   *She drank beer 3 hours
(105) a.   How long did she build houses? (i.e. how long was she in construction?)
       b.   *She built houses ten years

So our point is that the behavior of *how long* is not well understood and so we should not rely on it to draw conclusions that trump the fact that on the basis of entailments, negated perfectives do test positive for the subinterval property.

Even so, it would still be interesting to explore what the puzzling behavior of *how long* in (98) and (102) is due to (we leave (104)-(105) aside, as they do not involve negation and so are not directly relevant to our main narrative). One possibility that presents itself is the following: one can explain the contrasts above, by postulating that *how long* has to be generated at the v/VP level or AspP, a reasonable assumption, given that this adverb measures the duration of the predicate. This means that it is generated under negation, and not above it, where, by assumption, the subinterval property of the negated sentences is located. As a result, (98) is bad because *how long* is not generated higher than negation, where it would have to be, to see the subinterval property of the negated perfective. And of course generation of *how long* below negation results in ungrammaticality in (98) because *how long* requires a predicate with the subinterval property, which *wake up* lacks. But there is a further reason why generation of the adverb under negation and subsequent movement over it is ruled out, and that is the inner island, which blocks A-bar movement of adjuncts across negation or negative elements in general (Ross 1984, Rizzi 1990, a.o.). The inner island is also responsible for the ungrammaticality of sentences like (102), where *how long* could in principle have been generated under negation as the aspect of the predicate is compatible with it (unlike in (98)), but where the negation-induced inner island blocks movement of the adverb over negation.[35] In other words, the inner island also explains the status of (102), which Karttunen cannot do.

Our point is, then, that a negated perfective may well be a predicate with the subinterval property, and that its incompatibility with *how long* is due to different reasons, as negated statives like (102) also have trouble with this adverbial. In other words, negation may be perfectly capable of creating a predicate with the subinterval property but the predicate may still not be able to contain operators like *how long* because of syntactic properties of the environment.[36]

One might object to this line of reasoning by saying that even though it captures some of the facts, it is not falsifiable and that it does not make any predictions. But this is not true. Recall

---

[35] This is possibly supported by the fact that making the adjunct more referential or discourse-connected, a trick known to overcome an inner island since Kroch 1989, improves the sentences:
i.   *Last week Miranda took naps of all sorts of lengths. On Monday, she slept 3 hours, then 4, and then 2. On Tuesday she slept 1 hour in the morning, 4 in the afternoon, and 1 in the late evening etc.*
    How long did Miranda NOT sleep last week?

[36] Similar, though not identical, explorations are relevant for the *while*-test. But even if we do not have these at our fingertips yet, the *while* test alone cannot carry the burden against the evidence from (110)-(111) and the other points made in this section.

the sentences that showed that negation can yield predicates that are compatible with *for*-adverbials, even though the predicates under negation are not, as in (87)-(90), repeated below:

(106)   * The plant died for 5 weeks
(107)   *For 5 weeks, the plant died
(108)   For 5 weeks, the plant didn't die. Finally, it succumbed to the extreme draught
(109)   For 5 weeks, no plant died. Finally, they succumbed to the extreme draught

By the rationale of our narrative, one would have to conclude that *for*-adverbials *can* be generated above negation, as they are fine with the subinterval property that results from negation[37]. If *for*-adverbials could be generated only under negation, (108)-(109) would have been as bad as the negated perfective sentences with *how long* and *while*. But this also predicts that we should be able to ask a 'how long' question if it is part of a *for*-adverbial set-up. And this is borne out:[38]

(110)   For how long did the princess not wake up?
(111)   For how long did the plants not die?

So in summary, the ambiguity accounts for *until* have to find a way to deny that negation produces a predicate with the subinterval property, even though it clearly does: for an interval during which an event did not take place, it is entailed that the event did not take place during any subinterval either. The reason that the ambiguity approach is forced to do this is, is that otherwise, negated perfectives would be expected to combine with until-d and thereby produce a parse that lacks the non-cancellable AI, contrary to fact. But as we saw, the argument from *how long* is not strong enough to preclude the conclusion that negation yields predicates with the subinterval property.

However, we have now painted ourselves into a corner: if negation does yield the subinterval property, and if a predicate with the subinterval property suffices for until-d, then why are (83)-(84) contradictions? After all, with until-d, there is no non-cancellable AI. What to do

---

[37] We do not explore here why *for how long* has a different behavior for *how long,* or different generation possibilities, but clearly this question merits more attention.
[38] Some of our speakers prefer preposition stranding here, but that is not relevant for us.

then? We will argue that there is no until-d and until-p distinction, and that the question of why until-d can't appear in (83)-(84) is not well-formed because there is no until-d as such. We will derive these sentences as contradictions within a unified approach to *until*.

6   More differences between until-d and until-p

In the previous section, we saw that there have been proposals for a lexical ambiguity of English *until* and that there were basically two arguments for this position in the literature: the fact that Greek (and some other languages) have a separate lexical item for until-p, and the fact that the AI is not cancellable with until-p but is with until-d. We saw that the first argument has not been shown to hold. As for the second, we agree that indeed in the relevant cases, the AI is not cancellable, but this is not straightforwardly predicted by the lexical ambiguity approach, since it is unclear why until-d cannot combine with negated perfective predicates. For that, one would have to prove that negation does not create the subinterval property, which is difficult to do.

However, until-d and until-p differ in various other respects as well. We saw earlier that until-p, unlike until-d, is an NPI. It is even a strong NPI. It needs a local anti-additive environment.[39] Downward Entailing contexts that cannot license strong NPIs, such as *few*, the first argument of a universal quantifier, or the antecedent of an *if*-clause cannot appear in matrix clauses that are modified by until-p:

(112)   a.   Nobody left until 5pm

      b.   Nobody left until I left

(113)   a.   She never left until 5pm

      b.   She never left until I left

(114)   a.   *Few people left until 5pm

      b.   *Few people left until I left

(115)   a.   *Every student who left until 5pm …

      b.   *Every student who left until I left …

(116)   a.   *If she left until 5pm …

      b.   *If she left until I left …

---

[39] For the necessity of the specification "local" see footnote 11.

And there are further differences between until-d and until-p. We saw earlier that until-p and until-d are boundary adverbials, in that they set up the RB of the UTS. Now, consider the following sentences with until-d, which show that when it sets the RB, there is no prior expectation about whether this RB would be later or earlier than it turned out to be:

(117)   a.   I expected her to sleep until 5pm, but she slept until 7pm

      b.   I expected her to sleep until 5pm, but she slept until 3pm.

And the same holds for overtly negated until-d:

(118)   a.   I expected her to sleep until 5pm but she didn't sleep until 5pm. She slept until 7pm.

      b.   I expected her to sleep until 5pm but she didn't sleep until 5pm. She slept until 3pm.

Things are different with until-p:

(119)   a.   I expected her to arrive before 5pm but/and she didn't arrive until 7pm

      b.   #I expected her to arrive before 5pm but/and she didn't arrive until 3pm

(120)   I expected her to arrive before 5pm and she arrived at 3pm

In the contrast between (119)a-b, we see that the temporal argument of until-p can be later than expected, but not earlier than expected. Until-p is subject to the BEI, just like *in years*, but unlike until-d. Given this fact, it is not surprising that (119)b and (120) are not equivalent. That is, *she didn't arrive until 3pm* does not merely mean *she arrived at 3pm*. In other words, until-p does not merely yield a non-cancellable AI. There is a comparison to a contextual alternative, and the argument of until-p is later than that. Put differently, with until-p, the UTS is longer than contextually given or expected alternatives.

The contextual alternative does not have to be a matter of expectation/likelihood. Any other contextual time interval will do, as long as *until* creates a longer, not shorter UTS, by comparison: The argument of until-p is more to the right on the timeline.

(121) a.   The paper was due at 5pm, but she didn't submit it until 6pm

      b.   #The paper was due at 5pm, but she didn't submit it until 4pm

(122) a.   The paper was due at 5pm but it is well-known that nobody submits anything until 6pm.

      b.   #The paper was due at 5pm but it is well-known that nobody submits anything until 4pm.

That the non-cancellably inferred event sets the RB of the UTS (just as with *in years*) is shown in the following example.

(123)   She didn't leave until 6pm. #In fact, she left at 7pm.

This again is not the case for until-d, where the cancellably inferred event does not have to set the RB of the UTS:

(124)   She was asleep until 6pm. In fact, she was asleep until 7pm.

We argue that the properties of until-p that set it apart from until-d are not independent from each other. That is, the fact that until-p is an NPI and the fact that it has a non-cancellable AI, and BEI are not independent properties. This is where the comparison with *in years* becomes relevant. In the first part of this article, we argued that *in years* is a strong NPI with a non-cancellable AI and a BEI. Until-d lacks both an AI and a BEI. For *in years*, we argued that the fact that it comes with a non-cancellable AI and a BEI, is intricately connected to the fact that it is a domain widening NPI (as opposed to most other LB-adverbials). Here, we will develop a similar argument for until-p.

We start by pointing out that the BEI of until-p follows, if we assume, fully analogously to our analysis of *in years*, that until-p is a domain widening NPI that tries to make the UTS larger

42

than the other domain alternatives. That is, by putting the RB later than other contextual alternatives. Both *in years* and until-p make the time span they are related to larger than contextual alternatives but *in years,* being an LB-adverbial, does it by aiming towards the "left" on the timeline, i.e. towards earlier time points, while *until*-p, being a RB-adverbial, does so by aiming towards the "right", i.e. towards later time points. By merely building in references to earlier time points in the semantics of *until*, as for instance Giannakidou 2002 and Condoravdi 2008 have proposed, we miss this larger picture.[40]

Moreover, we argued that *in years* (as opposed to *in 5 years*) stretches the PTS to the left as much as is *logically* possible, which is until an occurrence of the event. This explained why *in years* not only has a BEI, but also a non-cancellable AI. Similarly, assuming that until-p is a domain widening NPI, just like *in years*, explains why until-p also comes with a non-cancellable AI. It stretches the RB of the UTS until it is logically possible, that is until an occurrence of the relevant event. Until-d, by contrast, is not a domain widening NPI, and does not yield a non-cancellable AI, or BEI.

In short, the non-cancellable AI and BEI of until-p are due to the same mechanisms as that of *in years,* and in this they both differ from their non-domain-widening counterparts, which can set their relevant boundary freely, and therefore lack a non-cancellable AI and BEI.[41]

---

[40] Unfortunately, we do not have the space to discuss these two papers in detail.

[41] We argue that with both *in years* and until-p, the time expands until it is not more logically possible to do so, i.e. at the first occurrence of the relevant event. This means that in both cases, the non-cancellable event is at the relevant boundary. This is a difference with other, non-NPI, boundary adverbials, as we saw in the discussion on *in years*. One might think that examples like (i), from Horn 1972, provide a counterexample to this, with (ii) the equivalent potential counterexample of *in years*:

i.　He didn't leave until Sunday, if not later.　　　　　　　　　　　　(Horn 1972)
ii.　I haven't seen him in weeks, if not months

But these are not counterexamples and should be seen as being modified by a covert *at least* (or the pragmatic equivalent). In fact, several speakers have volunteered that they prefer (iii) to (i).

iii.　He didn't leave until at least Sunday, if not later.

The same can be said for (iv), as all numerical and count expressions are known to be able to be understood as a lower bound:

iv.　He has written 5 books, if not more

Moreover, as Horn (1972) points out, pushing the boundary can happen in one direction only:

v.　He didn't leave until Sunday, if not later / #if not earlier　　　　　(Horn 1972)

This also follows from the fact about lower bounds, and has nothing to do with until-p being an NPI, as it can also be shown to hold for numerals, as well as until-d:

vii.　He has written 5 books, if not more / *#if not fewer
viii.　She was asleep until 5pm, if not later / *#if not earlier

We can arrange the same set-up for *in years*, but the legitimate direction is, unsurprisingly the opposite, of *until*:

ix.　I haven't seen him in weeks, if not months /#if not days

To summarize this section, we have seen that there is a lot to be gained if we analyze until-p in parallel terms to *in years*: we take both to be domain wideners (i.e. contrastively stressed NPIs). We can capture a number of similarities, as well as understand the mirror image profile of some differences. However, at this point it also looks like we have reached a paradox. On the one hand, we provided arguments that show that the original motivation for a lexical ambiguity approach is weaker than presented in the literature, if not outright problematic. But at the same time, we introduced a number of other differences between until-d and until-p that at first sight seem to provide further evidence for the ambiguity approach. Specifically, the discussion above provides strong motivation for the assumption that until-p is a domain widener, but until-d is not. The reader may be wondering how we can appear to be setting up for a unification account when at the same time we say that until-p is a domain widener while until-d is not.

In the next section we resolve this paradox and proceed to a unified analysis of *until* that explains why, in the contexts where it has so far been referred to as until-p, *until* is a domain widener, and in the contexts where it has so far been referred to as until-d, it is not a domain widener. The crucial ingredient will be that domain-widening is the result of an element introducing subdomain alternatives finding itself in an environment of contrastive focus (following Chierchia 2013). In the absence of contrastive focus, only the introduced subdomain alternatives are at play. So we will see that the unification account will have *until* always introducing subdomain alternatives (as a lexical property), but the domain widening effect only appears under contrastive focus, in which case we get the constellation of properties that the literature has called "until-p".

7   A unified analysis of until-p and until-d

So far we have argued that until-p behaves exactly like *in years* and for the same reasons. In addition, we have argued that the ambiguity approach for *until* faces some non-trivial problems. This opens up the possibility for a unified analysis of the two *until*s that predicts that both usages of *until* referred to as until-p and until-d follow. Below, we provide a particular proposal for that. However, even if this particular proposal proves to be incorrect, we hope to have shown that what is behind the inferences of *until*-p and *in years* should be analysed in the same way.

7.1   Until-p as an introducer of domain alternatives

To show the workings of until-p, let us apply the same mechanism to it as we applied to *in years*:
Until-p, like *in years*, obligatorily introduces domain alternatives, which have to be exhaustified,
leading to the falsify of all stronger domain alternatives. So let us assign the following (simplified)
semantics of (126) to (125), with t^0 a contextually set LB, 7pm the RB of the UTS τ, and Run(e)
the run time of an event e; in other words, Run(e) and ST are different notations that refer to the
same interval. The UTS is the TT.

(125)   Sue didn't arrive until 7pm

(126)   Given a UTS τ, such that $\tau = [t^0, 7]$

Assertion: $\neg\exists e.[arrive(e, Sue) \wedge Run(e) \subseteq \tau]$

(126) denotes that there is a a UTS τ and there is no arriving event with Sue as the agent in τ. It is
clear that if no such event took place in τ, no such event took place in any subinterval τ' of τ.
Hence, all of the subdomain alternatives of τ in (127) are propositions that are entailed by (126).

(127) $\{\neg\exists e.[arrive(e, Sue) \wedge Run(e) \subseteq \tau'] \mid \tau' \subseteq \tau\}$.

This means that (126) has no stronger subdomain alternatives, and so exhaustification of (126)
takes place vacuously, and no contradiction arises.

A contradiction would arise, though, if the negation was absent. To see this, take the
(ungrammatical) positive counterpart of (126):

(128)   *Sue arrived until 7pm

Given the perfective in the matrix predicate, (128) should have the denotation in :

(129)   Given a UTS τ, such that $\tau = [t^0, 7]$

Assertion: $\exists e.[arrive(e, Sue) \wedge Run(e) \subseteq \tau]$

(129) means that there was an arriving event somewhere in between t^0 and 7. Now, let's see what happens when we try to exhaustify (129). The relevant domain alternatives of (129) are:

(130) $\{\exists e.[\text{arrive}(e, \text{Sue}) \wedge \text{Run}(e) \subseteq \tau'] \mid \tau' \subseteq \tau\}$.

In our case, two concrete domain alternatives are:

(131) a. $\exists e.[\text{arrive}(e, \text{Sue}) \wedge \text{Run}(e) \subseteq [t^0, 6]]$.

b. $\exists e.[\text{arrive}(e, \text{Sue}) \wedge \text{Run}(e) \subseteq [6, 7]]$.

Now if an event took place in between 6pm and 7pm, or in between t^0 and 6pm, it also took place in between t^0 and 7. This means that the alternatives in (130)/(131) are stronger than (129), i.e. they entail (129). This in turn means that they need to be falsified under exhaustification. In other words, this exhaustification makes the following true:

(132) $\neg \exists e.[\text{arrive}(e, \text{Sue}) \wedge \text{Run}(e) \subseteq [t^0, 7]]$.

But, of course, (132) is the negation of (129) and the two cannot both be true: we have arrived at a contradiction. This, again, is the contradiction that under Chierchia's and Gajewski's system, makes the sentence in (128) ungrammatical: the demands that *until-p* brings with it can never be satisfied in this sentence, yielding ungrammaticality. This explains why until-p can only be used with negated predicates.

7.2 *Until-d is until-p*

In the previous section we analysed until-p along the line of our analysis of *in years*. At first blush, until-d looks different from until-p, since unlike the latter, until-d can appear both in positive and in negative sentences:

(133) a. He was reading Anna Karenina until yesterday

b.   He wasn't reading Anna Karenina until yesterday

So one option would be to keep the lexical ambiguity hypothesis "minimal" in some way and postulate that until-d is the polarity-insensitive counterpart of until-p. This would still be a semi-lexical ambiguity of sorts, as *until* would be described as optionally introducing subdomain-alternatives. With the idea that the difference between until-d and until-p is that the latter unlike the former would then be a domain widener (given that domain wideners are required to introduce subdomain alternatives), we do derive certain facts, namely that non-cancellable AI and BEI will only accompany until-p. However, just like the other lexical ambiguity accounts, we do not derive one important fact: that polarity-insensitive *until* can only modify predicates with the subinterval property, while polarity-sensitive *until* can modify predicates without the subinterval property. If polarity-sensitive *until* could appear with predicates without the subinterval property, (134) should be good, with the meaning as in (135), contrary to fact.

(134)   *She broke a glass until 7pm
(135)   Given a UTS τ, such that $\tau = [t^0, 7]$

          Assertion: $\exists e.[\text{break}(e, \text{Sue}, \text{glass}) \wedge \text{Run}(e) \subseteq \tau]$.

If *until-d* was just the polarity-insensitive counterpart of *until-p*, and no further restriction, aspectual or otherwise, set it apart from until-p, nothing would rule (134) out. Even though this hypothesis would correctly predict the absence of the non-cancellable AI or BEI for until-d, it would not capture the aspectual restriction of until-d to predicates with the subinterval property and of until-p to predicates without it. So we conclude that the view of until-d as simply non-polarity *until* cannot be correct and a different path needs to be attempted.

Let's therefore try another path, namely one in which until-d, is exactly like until-p, and thus introduces subdomain alternatives that need to be exhaustified, and any other differences simply derive from the aspectual properties of the matrix predicate that *until* combines with. If the *until*-clause combines with a predicate that has the subinterval property, then the constellation of properties that is called until-d arises. If the *until*-clause combines with a perfective telic predicate, then the constellation of properties that is called 'until-p' arises, including the need for negation, the AI, and the BEI. This would be an ultimate unification account.

On this proposal, then, (134) has the meaning in (136):

(136)   Miranda was reading Anna Karenina until yesterday

(137)   Given a UTS τ, such that $\tau = [t^0,$ yesterday]

Assertion: $\exists e.[\text{read}(e, \text{Miranda}, \text{AK}) \wedge \tau \subseteq \text{Run}(e)]$.

The imperfective contributes that the TT (here, the UTS) is a subset of the ST (the event of reading Anna Karenina). In other words, the imperfective contributes the '$\tau \subseteq \text{Run}(e)$' part. Hence, the UTS is "filled" with Anna Karenina-reading.[42]

Given the fact that now the subinterval property holds of the predicate, it follows that all subdomain alternatives in (136) are actually entailed by the assertion. If Miranda has been reading Anna Karenina throughout the interval whose RB is yesterday, she has also been reading it in all of its subintervals (putting granularity aside). So there are no stronger domain alternatives of the assertion and exhaustification takes place vacuously. In other words, one can actually maintain that for affirmative imperfectives what looks like until-d is actually until-p. This brings us one step closer to a unification analysus.

Now let's look at negated until-d sentences to see whether *until* here can also be analysed under the unified approach. Here is exampe (133)b again:

(138)   He wasn't reading Anna Karenina until yesterday

Recall that such sentences are ambiguous between the *throughout-not* and *not-throughout* readings and that this results from negation taking scope under or over until-d. Recall that in both cases, the

---

[42] For examples with a stative predicte *John has(not) been here until 7* the same considerations apply as the examples with the imperfective. However, lexically stative elements like *be here* raise the question of whether their "imperfective" properties, basically the subinterval property, is the result of their lexical semantics or of the functional layer of the imperfective. For English, it can be, and has been claimed, that the subinterval property is part of its lexical semantics (Dowty 1979). However, if one looks at other languages, it becomes quickly obvious that lexically stative predicates show the subinterval property clearly only when they combine with an overt layer of imperfective. This means that for English, one has to revisit the issue of whether the subinterval property of stative predicates like *be here* is indeed a property of their lexical semantics or of an unpronounced imperfective layer above them. In order to avoid resolving this (orthogonal to us) issue, we use here an example where the "imperfective" properties are clearly due to the functional category of imperfective.

matrix predicate has the subinterval property because the imperfective yields the relationship in which the TT (here the UTS $\tau = [t^0, Yesterday]$) is contained inside the ST.

We saw before that the *throughout-not* reading involves low scope of negation (139):[43,44]

(139)   Given a UTS τ, such that $\tau = [t^0, Yesterday]$

        Assertion: $\exists e.[\neg read(e, Miranda, AK) \wedge \tau \subseteq Run(e)]$.

Wide scope negation, on the other hand, yields, the *not-throughout* reading (140).

(140)   Given a τ, such that $\tau = [t^0, Yesterday]$

        Assertion: $\neg \exists e.[read(e, Miranda, AK) \wedge \tau \subseteq Run(e)]$.

Now, with the semantics in (139), the acceptance of the *throughout-not* reading is predicted to be fine with *until* obligatorily introducing domain alternatives (141).

(141)   Domain alternatives: $\{\exists e.[\neg read(e, Miranda, AK) \wedge \tau' \subseteq Run(e)] \mid \tau' \subseteq \tau\}$

If throughout the entire interval Miranda has not been reading AK, she has not been reading this book in any subinterval either, so no domain alternative in (141) is stronger than the assertion. Exhaustififcation thus applies vacuously, and no contradiction arises.

But how about the *not-throughout* reading in (140)? Here negation takes scope over the existential quantifier over the event variable. Wouldn't this predict that since the predicate has the subinterval property, exhaustifying (140), should yield ungrammaticality? After all, the domain alternatives of (140), presented in (142), are all non-weaker than (140).

---

[43] The reader will notice here that we created a negated eventuality 'not-be-reading AK'. We only talk about negated events in this paper, not negative-events. As a reviewer points out, if we were to include negative-events in our discussion, then we would obtain the negative event of 'not-reading-AK' holding at an interval, which would be too weak a reading, as it would be true of an interval in which I am running a marathon. We omit hereby discussion of negative-events and focus only on negated events.

[44] The order Imperfective>negation>VP may well be a necessary ingredient for anybody for who *throughout-not* is the result of *until* scoping over negation (Condoravdi 2008 and references therein). The details for how to achieve this are not obvious, however. One possibility would be to simply generate negation low, under the imperfective. We leave further exploration of this issue for another occasion.

(142)   Domain alternatives: $\{\neg\, \exists e.[read(e, Miranda, AK) \wedge \tau' \subseteq Run(e)] \mid \tau' \subseteq \tau\}$

If Miranda has not been reading Anna Karenina throughout the day before yesterday, i.e., if that day the reading was interrupted for a while, it is entailed that she has not been reading Anna Karenina throughout in any larger interval either. Negating these stronger alternatives, would entail that in every smaller subinterval of interval $\tau = [t^0, Yesterday]$ Miranda has been reading Anna Karenina throughout, which contradicts the original assertion that Miranda reading AK does not hold throughout in the entire UTS $\tau = [t^0, Yesterday]$.

But there is another parse possible for the *not-throughout* reading that does not give rise to this contradiction. Following the idea, already applied above, that the *not-throughout* reading is the result of negation scoping over *until* instead of scoping below it (which yields the *throughout-not* reading) and the fact that in imperfectives the subunterval property holds of predicates, it is possible to first exhaustify the clause without negation before applying negation itself (see Zeijlstra 2018 for a similar analysis of certain universal quantifiers that behave like Positive Polarity Items, as well as for some discussion on where exhaustifiers may appear in the structure).[45]

The *not-throughout* reading is then derived as follows. First take the assertion (143), which would be the assertion of (140) without the negation:

(143) $\exists e.[read(e, Miranda, AK) \,\&\, \tau \subseteq Run(e)]]$

As a next step have the obligatorily introduced alternatives of (143) (presented in (144)) exhaustified.

(144) $\{\exists e.[read(e, Miranda, AK) \wedge \tau' \subseteq Run(e)] \mid \tau' \subseteq \tau\}$.

As seen before, this exhaustification takes place vacuously. No domain alternative in (144) is stronger than the assetion. Consequently, EXH((143)) is identical to (143). As a final step negation applies to exhaustified (143) and the result is (140).

---

[45] And given that exhaustification after the application of negation yields a contradiction, it is not just possible, but necessary to exhaustify before applying negation.

This way, all instances of *until* are elements that introduce subdomain alternatives that need to be exhaustified. This is one significant step closer to a unification account. However, before moving on, we need to make sure that the scopal construals with negation that we applied to the *throughout-not* and *not-throughout* readings with predicates in the imperfective do not overgeneralize to negated predicates in the perfective. In other words, we need to show that the readings in (146) are not available for (145):

(145)   Sue didn't arrive until 7pm

(146)   a.   Given a τ, such that $\tau = [t^0, 7]$

              EXH($\exists e.[\neg arrive(e, Sue) \wedge Run(e) \subseteq \tau]$)

        b.   Given a τ, such that $\tau = [t^0, 7]$

              $\neg$EXH($\exists e.[arrive(e, Sue) \wedge Run(e) \subseteq \tau]$)

Both alternative scopal construals will yield the contradiction as well, and thus not be available indeed. For (146)a, the domain-alternatives are non-weaker. If there was a non-arriving event in a smaller time interval than $\tau = [t^0, 7]$, then there was a non-arriving event in $\tau = [t^0, 7]$ as well. Hence, the stronger domain alternatives need to be negated, resulting in a reading where the existence of an arriving event in $\tau = [t^0, 7]$ is negated, but not in any smaller subinterval of τ, a clear contradiction. Similarly, as we already saw in the discussion around (128)-(132), exhaustifying the assertion without the negation gives rise to the unwanted contradiction and is therefore ruled out as well.

Hence, in total, there are three possible scope construals involving *until*, exhaustification and negation. Since exhaustification must outscope *until*, these are: (i) NEG>EXH>UNTIL, (ii) EXH>NEG>UNTIL, and (iii) EXH> UNTIL>NEG. As shown above, (i) is the only available scopal construal for *until* modifying a negative perfective predicate, and (ii) and (iii) the only available scopal construals for *until* modifying a negative imperfective predicate. In addition, positive imperfectives can also be modified by *until*. These are indeed the facts we want to derive and that we can derive with our unified alanysis for *until*.

So far so good! The unification approach seems to work. But there is a remaining big question. When we were still talking about until-d and until-p, we showed that the latter has a BEI

and a non-cancellable AI but until-d does not. How can we deal with these differences under our unified semantics for *until*? We address this next.

7.3   *Until, the AI and the BEI*

Following Chierchia (2013), NPIs act as domain wideners only when used contrastively, an argument that we laid out in Section 4. We also saw that the non-cancellability of the AI and other inferences of *in years* follows from the fact that *in years* is a contrastively focussed NPI and therefore a domain-widener. This opens up the following possibility: the fact that *until* sometimes comes with a non-cancellable AI and BEI and sometimes not, despite always introducing domain alternatives, is the result of the fact that sometimes it is contrastively focussed, in which case it functions as a domain widener and the inferences are there, and sometimes it is not contrastively focussed, in which case the inferences are absent. If the usage of *until* that is known as until-p has a domain-widening property, the BEI, and the non-cancellable AI follow from the domain widening. If this *until* is a domain widener that stretches its domain of quantification beyond any contextual restrictions (with t^0 being fixed), fully analogous to our treatment of *in years*, its RB can only be set by the moment the event takes place.

But then we are presented with the following question: why is it that (negated) perfective predicates require until-modification with contrastive focus, whereas imperfective predicates do not do so?

We argue that the answer to this lies in the interaction between negation, the exhaustifier and *until*. The three grammatical examples, repeated in (147), all involve an exhaustifier and the ones in (147)b and (147)c, negation as well.

(147)   a.   He was here until yesterday

       b.   Sue didn't arrive until 7

       c.   He wasn't here until yesterday

Now, let us look again at the relevant scopal construals. As we saw before, given the fact that the exhaustifier must scope over *until*, there are in principle the following possible scopal orders:

(148) a.   EXH>UNTIL

       b.   EXH>NEG>UNTIL

       c1.   EXH>UNTIL>NEG

       c2.   NEG>EXH>UNTIL

We can now map each of these to a meaning, as explained already above:

The order in (148)a is the one the literature calls until-d (in positive sentences), as in (147)a. The order in (148)b is the one the literature calls until-p, as in (147)b. The orders in (148)c1-2 are the ones the literature calls the *throughout-not* reading and the *not-throughout* reading, the two readings (147)c may receive.

We will assume, following Rooth (1985, 1992), Chierchia (2013) and others, that contrastive focus under negation is not possible when EXH intervenes between negation and the focused item. The reason is that contrastive focus requires negation to apply to focus alternatives, and therefore these alternatives cannot be applied to by the exhaustifier first. Then, the only configuration where negation has immediate scope over (unexhaustified) *until* is (148)b. This means that only in (148)b can *until* receive contrastive focus under negation. Only in (148)b can *until* then be a domain widener. *Until* in (148)a and (148)c1-2 can never be a domain widener. The reason is that in (148)a and (148)c1-2, *until* introduces domain alternatives to its UTS, which are to be exhaustified. Since these are not contrastively focused under negation, *until* cannot be a domain widener in these constructions. This way it follows that only those instances of *until* that the literature calls until-p yield the BEI and the non-cancellable AI.

So we have captured why what the literature calls until-p gives rise to the BEI and the non-cancellable AI. It does not capture why it must, though. In other words, it does not yet follow why this *until* must be contrastively focussed when it directly scopes under negation. If it was only optionally contrastively focussed, it would only optionally be a domain widener and the BEI and the non-cancellable AI would not necessarily emerge. Note, however, that the same question arises in the case of *in years*, where we accepted, following Chierchia, that *in years* is always emphatic and therefore always contrastively focussed (see section 4). If we assume that *until* is also always

emphatically used, so that when it appears under the direct scope of negation, it becomes contrastively focussed under negation and therefore a domain widener, everything follows.[46,47]

If this is indeed correct, it does not only follow why only those instances of *until* that the literature calls until-p can yield the BEI and the non-cancellable AI, but also why they must do so. We conclude then, that a unification approach to English *until* is possible and that the duality of its behaviour is due to the scopal ordering of the elements involved, as well as the (resulting) presence/absence of contrastive stress, triggering domain widening effects.

So to be a domain widener à la Chierchia, the item needs to introduce domain alternatives, be contrastively focussed and be in the scope of a downward entailing operator. In our case, *until* in imperfective clauses does not need to be in the scope of a downward entailing operator, since the subinterval property of the imperfective already provides superset-to-subset entailments between intervals akin to those created by downward entailing operators for individuals. As we saw, these are the (affirmative) cases of until-d. Until-d then satisfies only two out of the three of Chierchia's conditions for domain widening, and therefore fails in the end to be one (hence no AI or BEI). Until-p satisfies all three and thus becomes a domain widener.

Note that then the distinction between (91) and (92), discussed in 5.2.2 and repeated below, also follows. These examples were taken to question the fact that negation could trigger the subinterval property. Otherwise, why would (149) be bad and (150) not?

(149)   #Nancy didn't get married until she died
(150)   Nancy remained a spinster until she died

However, (149), given that it is a negated perfective, has the scopal construal in (148)b, where *until* takes scope below negation and the exhaustifier and is therefore a domain widener, yielding a non-cancellable AI. The subinterval property is yielded at a later stage of the derivation after negation has applied and the non-cancelability of the AI is determined. This non-cancellability of

---

[46] As mentioned before, Edward Flemming (p.c.) pointed out that while the assumption that *until* (and *in years*) are always stressed yields the right result, it does not seem possible to verify this phonetically. Given that they have to be in the scope of negation, and appear therefore at the right edge of the clause, the stress contour that they receive would be the same regardless the presence or absence of stress.

[47] Alternatively, as suggested by Yael Greenberg (p.c.), it could also be possibe that *until* is lexically restricted to introduce all contextually salient domain alternatives as its domain alternatives. This would indeed also derive the desired result.

the AI renders the sentence odd. In (150), by contrast, there is no negation, so *until* cannot act as a domain widener and the non-cancellable AI is not be derived.

8   *Comparing in years and until*

Given our assimilation of *until* to *in years*, the question naturally arises as to why *in years* behaves differently from *until* with respect to its appearance in affirmative clauses. If both *in years* and *until* are elements that obligatorily introduce domain alternatives, why couldn't *in years* have the same distribution as both types of *until* instead of only that of until-p?

As a first step we need to explain why *in years* can only appear with negated predicates and not with affirmative predicates with the subinterval property. If (151)a-b are alike, why is there a contrast between (152)a-b?

(151) a.   He didn't break the glass until 7pm   (^{OK}negated predicate plus *until*)

b.   He hasn't broken a glass in years   (^{OK}negated predicate plus *in years*)

(152) a.   He was asleep until 7pm   (^{OK}affirmative predicate plus *until*)

b.   *He has been asleep in years   (*affirmative predicate plus *in years*)

The answer to this question has several components. We have treated the boundary adverbial *in years* as a polarity version of the boundary adverbial *in (the last) 5 years*. This latter class of adverbials is compatible only with E-Perfect, not the U-Perfect (for the definitions of E-Perfect and U-Perfect, please see Section 1):

(153)   He has been sick in the last 5 years   (E-Perfect; *U-Perfect)

We will not try to explain here why the U-Perfect is impossible with *in (the last 5) years* (possibly because of 'in') but it is clearly a fact. This means that *in years* inherits this property as well, and any derivation of *in years* in which a U-Perfect plays a role will thereby be excluded. For starters, this means that (152)b is out as a U-Perfect. However, this is not enough to derive the ungrammaticality of (152)b. For that, we would have to exclude the E-Perfect reading of this

sentence as well. So the next question is why (152)b is out on the E-Perfect reading. The reason for the absence of this reading must be located where *in (the last) 5 years* differs from *in years*: the fact that the latter but not the former introduces domain alternatives and is subject to exhaustification. Since *in years* introduces domain alternatives and is exhaustified, it renders a contradiction on the E-Perfect reading in the very same way in which (134) did. In sum, (152)b is ungrammatical because the existential and the universal readings of the Perfect are independently ruled out.

Then, for a full comparison between *in* years and *until*, we should run through the scopal possibilities of *in years* the way we did for *until* in (148):

(154)　a.　　EXH>IN YEARS

　　　　b.　　EXH>NEG>IN YEARS

　　　　c1.　　EXH>IN YEARS>NEG

　　　　c2.　　NEG>EXH>IN YEARS

The grammatical *in years* is (154)b, in which *in years* is contrastively focussed in the immediate scope of negation.

The order in (154)a we already excluded above: it is ungrammatical because the E-Perfect and U-Perfect readings are independently excluded.

This leaves (154)c1-2. Recall that for *until*, this represents the negated "until-d" readings: *not-throughout* in (148)c1 and *throughout-not* in (148)c2. That is, these were possible scopal configurations for *until*. Do we want to include them as possible scopal configurations for *in years*? The answer is no: recall that these were part of the so-called until-d cases, which lack a non-cancellable AI and BEI. The boundary adverbial *in years* lacks such readings. Its AI is never cancellable. Recall Constant's observation.

So how do we exclude (154)c1-2 for *in years* while permitting the corresponding scopal configurations for *until*? What is it that *until* can do that *in years* cannot? The answer again can be found in (153): *in years* does not permit a U-Perfect reading, but *until* does permit the equivalent reading; only in the case of *until* it is referred to as until-d.

Indeed, the c1 order corresponds to the *throughout-not* reading of *until*, and would for *in years* as well. On the other hand, the c2 order, corresponds to the *not-throughout* readings of the

two adverbials. But neither of these scopal configurations is permissible for *in years*, as this adverbial lacks the *throughout*/U-Perfect reading independently.

What we have derived then is exactly the facts as we want them: *in* years can appear in every scopal configuration in which what was traditionally referred to as 'until-p' may appear. However, *in years* cannot appear in the scopal configurations in which what was traditionally referred to as 'until-d' appears, because of its own, independent aspectual restrictions.[48]

9   A possible counterexample

In the last few sections of the paper we set out to explain the non-cancellable AI of what has been called until-p, and accounted for it under a unified account of *until*. In other words, we followed previous literature and accepted the existence of such a non-cancellable AI.

In this section, we discuss a potential counterexample to the non-cancellable AI of until-p, which is presented in de Swart (1996). De Swart argued that the AI of *until* is actually cancellable and argues for this with the following two examples, both containing *woll*:

(155)   She said she wouldn't come until Friday. In the end, she didn't come at all.

(156)   I won't leave until Friday, if at all.

However, sentence (155), given its embedding and the presence of *would* is not an argument for cancellability. We see the same effect without negation or *until*:

(157)   She said she would come on Friday. In the end, she didn't come at all.

Sentence (156) is more interesting, though, and we believe it sets us on two possible paths. One

---

[48] One wonders whether it is possible to duplicate a set-up for *until* as we did for *in years* in section 1 with *definitely*/*certainly*. It seems that it is harder, as a reviewer points out:
i.   I don't think she ever arrived at the station. [%]She definitely didn't arrive until 7pm
We have actually found a few speakers for who (i) is fine, but we have indeed also found some for whom it is degraded compared to the sentences discussed in section 1. However, these speakers, also did not like (ii), which contains overt subordination and polarity switch:
ii.   I don't think she ever arrived at the station. #If she did, she definitely didn't arrive until 7pm
Given the degraded status of (ii), it is not surprising why (i) would also be degraded. But why (ii) is degraded, we do not know and will leave it as an open issue.

path concerns the fact that (156) contains an 'if at all' continuation. The other concerns that it contains a future.

The first path invites us to see (156) as a conditional. Basically, (158) would be an elliptical version of (156) :

(158)   I won't leave until Friday if I leave at all,

What (158) shows us is that *I won't leave until Friday* is in the consequent of a conditional. This means that this proposition is not evaluated in the actual world, but in the worlds of the antecedent and this means that in the actual world, the event may not come about. This then would be one possible source of the apparently cancellable AI of (156). The AI itself would still be non-cancellable in the worlds the conditional takes us to. But in the actual world it gives the illusion of being cancellable. If this is the case then there is nothing special about the fact that (156) contains a future in the matrix and the following example is predicted to not be a contradiction either, which is borne out:

(159)   She didn't leave until Friday, if at all

However, de Swart's example also invites us to consider *until* in sentences other than with a past in the matrix, specifically, with the future.[49] And there, in fact, we will see that the AI appears indeed cancelable (which means that there are indeed two paths to the cancellability of the AI in de Swart's (156)).

That the AI of a negated perfective with *until* is cancellable with the future may be a strange conclusion, but it appears that the same facts hold in Czech. In the earlier examples with *dokud*, all of which contained past tense (and negation) in the matrix, the AI was not cancellable, but in (161), the AI is cancellable, just like English (160):

---

[49] In the present, only the futurate seems possible, that is, the sentences talk about the existence of a plan (see Copley 2008):
i.   She is asleep until 5pm
ii.   She is not leaving until 5pm

(160)   She will not get married until she meets a man who speaks 23 languages, so I guess she
        may never get married.

(161)   Nevdá se, dokud nepotká muže, který mluví 23 jazyky.
        neg.get.married.pfv.3sg refl DOKUD neg.meet.pfv.3sg man which speaks 23 languages
        'She will not get married until she meets a man who speaks 23 languages.'
        …takže se asi nevdá nikdy.
        … so refl probably neg.get.married.pfv.3sg never.NCI
        '…, so she'll probably / I guess never get married.'

One possible explanation might be that with the future in the matrix, the meaning shifts to
something like "before". But in addition to this being a strange operation, it makes the wrong
predictions. It predicts that (162) should be fine, which it isn't (in English nor in Czech).

(162)   He is a confirmed bachelor. #He will not get married until he dies

How can we make sense of all these facts that surface when we have future in the matrix? What is
the difference between (160)/(161)-(162)?

        In (160)/(161), given the presence of the future, there is a possible world/future branch in
which she meets a man who speaks 23 languages and marries him. That is, the non-cancellable AI
is satisfied in a world other than the actual one. In that world she will indeed marry such a man.
This is not possible in (162), however. There is no possible world/future branch in which he dies
and gets married at the same time. In other words, what we see is that *until* is *modal* and the AI is
satisfied in a world (a future branch) other than the actual one.

        The question then arises why in the absence of the future in the matrix clause, the AI also
cannot take us to a world other than the actual one. If that were possible, then the AI would appear
as cancellable in the actual world. In fact, one might in principle expect that the change from future
to past should not affect the modality. For example, the progressive/imperfective is said to be
modal (to include inertia worlds, for example), and there the modality is not lost in the past (cf.
Landman 1992; see Arregui et al 2014 for a more recent discussion of the progressive as modal):

(163)   She was crossing the street when she was hit by a car.

In (163) the event of crossing the street is completed in a world other than the actual one in the relevant accounts. So what is different in our cases with *until*?

The difference is that *until*, unlike the progressive in (162), describes the world in which the AI takes place. Given the future in (160)/(161), the event-argument of *until* also lies in the future. The model of branching futures permits the AI to be realized in some branches but not in others. The one in (162) does not permit this, given that the past happens on one branch, so to speak. Note that when the matrix shifts to the past, the argument of *until* also becomes past:

(164)   She didn't leave until I left
(165)   *She didn't leave until I am sick
(166)   *She didn't leave until I am leaving
(167)   *She didn't leave until I leave

And once the clausal argument of *until* is in the past tense, the event described there took place in the actual world. This makes it impossible for the AI of the sentence to be satisfied modally when the matrix is in the Past tense. In those cases, the world in which the AI is to occur is the actual world.

We conclude that while de Swart's example (155) is interesting and pushes us to a further understanding of *until,* it does not jeopardize the broadly accepted position that we are dealing with a non-cancellable AI.

10   Setting the RB

We have argued that there is only one *until*, and that its argument is used to set the RB of the UTS. In all the examples that we have looked at so far, the argument of *until* was a point (*until 5pm, until I left)*. In this section, we will look at more complex sentences, including sentences in which *until*'s argument is a clause. Specifically, there are three types of arguments of *until*: NP names of intervals (*until 1991, until World War II)*, imperfective clauses, i.e. predicates with the subinterval property (*until she was working at MIT, until she was sick*), and perfective clauses (*until she read Anna Karenina*). The challenge with these more complex arguments of *until* is how to set the RB

60

of the UTS. Indeed, we will see that we can predict the temporal properties of these sentences. We should say at the outset that the effects are exactly the same with Czech *dokud*, as expected, but we will not show the Czech examples here for reasons of space.[50]

We will start with predicates with the subinterval property in the matrix. When the argument of *until* is a point (*5pm*, *the moment at which I left*, etc) setting the RB is easy.

(168)   She was asleep until 5pm/I left

(169)   a.   …………………………...5pm………………UT

        _____sleep_____|$_{RB}$

    b.   …………………………I leave……………UT

      _____sleep_____|$_{RB}$

The imperfective has the temporal specification TT $\subseteq$ ST. We treat the UTS as the topic time (following von Fintel and Iatridou 2019 for the PTS), so a sentence like (169) asserts that the UTS (whose RB is 5pm or the moment at which I leave) is fully contained in the time of my sleeping. This is how we get the reading of what was called (affirmative) until-d: the predicate holds throughout the UTS.

Now let's put a perfective (and telic) predicate as the argument of *until* (170). In both English and Czech, the reading is that the unhappiness lasted until the reading of Anna Karenina was completed, and not until she merely started reading Anna Karenina. That is, RB of the UTS is the completion subinterval of the AK reading:

(170)   She was unhappy until she read AK

(171)   ………………|~~AK~~ |………………UT

       _____unhappiness __ |$_{RB}$

---

[50] We treat English statives as either containing or being identical temporally to the imperfective; in Czech such predicates have a visible imperfective (see footnote 42).

To derive (171) we follow Iatridou 2014, and von Fintel and Iatridou 2019 in that temporal adverbials like *until, since, after* contain a definite description over intervals, and that definite descriptions pick out the maximally informative interval.[51] This means that in (171), the argument of *until* picks as RB the first moment at which the perfective event description 'she reads Anna Karenina' is true. This is the interval at which she completes the reading.

Now that we have the RB of the UTS, the rest proceeds as before, given the imperfective in the matrix, that is, $TT \subseteq ST$, etc. With the same reasoning, we can look at predicates with the subinterval property in the argument of *until*:

(172)   She was happy until she was working at the grocery store

(173)   She was happy until she was sick

In those sentences, we understand the unhappiness to have lasted not until the end of the working at the grocery store or the end of the disease, but rather the beginning.

(174)   She was happy until she was working at the grocery store

(175)   ……………………….|~~~~working at grocery store~~~~~~~~

          _____happiness __ |RB

The reason is again that we pick the most informative interval, and that is the first moment at which the imperfective event description 'she is working at the grocery store' is true. Now that we have the RB, again the rest proceeds as expected with respect to the UTS and the imperfective in the matrix. Similar arguments will yield the beginning of 1990 or the beginning of World War II when these are the arguments of *until*.

The examples so far were with an imperfective in the matrix. Now let us go to negated perfectives in the matrix (the range of what was called until-p). The question now is about the temporal interpretation of the relevant sentences. There is a non-cancellable AI, which means that W&P is read at some point. English and Czech speakers report that in (176) and the equivalence in Czech, the reading of W&P follows the complete reading of AK:

---

[51] The idea of definiteness as maximal informativity was generalized to non-temporal descriptions in von Fintel, Fox & Iatridou (2014).

(176)   She didn't read War and Peace until she read Anna Karenina

(177)   ………………|~~AK~~ | |~~W&P~~|………………………………

If we pretend for the time being that 'didn't read War and Peace' were an imperfective marked predicate, then this case would be similar to (171)-(172) where the matrix imperfective predicate lasts until the final subinterval of AK-reading. Similarly in (176), the 'non-reading W&P' predicate lasts until the final subinterval of AK-reading. Given the non-cancellable AI, W&P ends up being read outside of UTS, that is, to the right on the timeline of the interval in which AK was read. Moreover, given the discussion of the most informative interval, the inference is that W&P is read upon completion of AK, that is, at the closest interval (putting issues of density aside) to the endpoint of the AK reading.

This appears to work but there was one step that was ignored: the matrix predicate in (176) is not marked morphologically imperfective, the way (172) is. It is a negated perfective. How to bridge this gap? The answer here lies in the fact that negated (perfective) predicates have the subinterval property, as we have already seen, and that predicates with the subinterval property interact with the TT the way imperfectively marked predicates do: they engulf the TT (i.e. are a superset of it). That is, given the subinterval property of the matrix property, the TT (in this case the UTS) is one of the subintervals over which the matrix predicate (which has the subinterval property) holds. The absence of a morphological imperfective does not come into play.

Considerations of space do not permit us to discuss this topic in more detail here, but we hope the reader sees the general direction of the intuitions involved. There are obviously more complexities and intricacies in the combination of lexical aspects that can be involved. But we hope that in this section we have laid out the foundations from which further and more sophisticated questions about the possible temporal interpretations can be asked.

11   Why strong?

Our unified approach to one *until* partially relies on our analysis of *in years*. We built on the many similarities these two elements have. But they have a further similarity that we have not highlighted so far: they are not just both NPIs; they are both strong NPIs. Only anti-additive environments will

support them. Is it a coincidence that *in years* and *until* are strong NPIs? A few attempts have been made in the literature to account for the distinction between strong and weak NPIs, but these accounts, of which we will dicuss one below, explain what the differences are between strong and weak NPIs. They do not address the question of why particular elements can only be strong or weak NPIs. Whether a particular NPI is weak or strong still seems arbitrary under these proposals. However, we argue that the fact that *in years* and *until* are both strong might actually not be coincidental. In this final part of the paper we will show that the fact that their PTS/UTS are presupposed and not asserted may force them to behave like strong NPIs. This may actually open up the window towards a better understanding of which NPIs are strong and which ones are weak.

Gajewski (2011) and Chierchia (2013), following Krifka (1995), take the weak-strong distinction to lie in the distinction between the exhaustifier looking only at the assertion of the NPI licenser, or at its presuppositions and/or implicatures in addition. Weak NPIs want EXH to look at the semantics of the licenser only; strong NPIs want EXH to also look at the licenser's enriched meaning.

Let's illustrate this approach with *few N*. One might intuit that *few students stayed* means 'Not many but some students stayed'. Is the semantics of *few* 'not many of' or 'not many of, but some'? That is, is the existential inference ("… but some …") part of the semantics of *few* or is it a non-asserted inference? If the semantics of *few* was 'not many of, but some', nothing would follow about (178)b on the basis of the context in (178)a

(178)   a.   If all students pass the state exam, the school will receive a $10K bonus
                If half the students pass the state exam, the school will receive a $5K bonus
                If few students pass the state exam, the school will face budget cuts
        b.   This year, no students passed the state exam, so the department will face budget cuts

Yet, we feel that (178)b does follow, which means that 'but some' should be a (cancellable) inference. But this means that the semantics of *few* is just 'not many of', not 'not many of but some'. And this is a good thing: if the semantics of *few* had been 'not many of but some', we would not have been able to understand why it licenses NPIs, which it does:

(179) a.   Few MIT students have ever been to Antarctica

   b.   Few Goettingen students have eaten anything with saffron in it

The reason why *few* would not have been able to license NPIs if it had meant 'not many but some' is that it would not have been Downward Entailing (DE): if not many but still some students wear a shirt, it is not entailed that not many but still some students wear a red shirt. But if its semantics is merely 'not many of', then it is DE, and (179) would be expected to be good. In short, a quantifier can have pragmatic inferences that would destroy its DE-ness, but if EXH looks only at its semantics and not at the pragmatic inferences, the environment can remain DE and it can shield an NPI from yielding a contradiction (and thereby ungrammaticality).[52]

   So NPIs like *ever* and *any* are fine even when there are existential inferences which would make the environment not DE, as long as these inferences are not included in the computation of DE-ness. These are the weak NPIs. Weak NPIs are fine if the assertive context they appear in is DE and any existential inferences remain safely tucked away in the non-asserted component.

   On the other hand, there are NPIs that do not survive in environments with pragmatic existential inferences. Those are the strong NPIs. For strong NPIs, there should be no existential inferences whatsoever, not even in non-asserted content. This explains the contrast between *No students have been there in years* and **Few students have been there in years*.[53] Another way to say that is that with strong NPIs, EXH operates also on non-asserted content. So strong NPIs can only survive in environments with no existential inferences whatsoever, not even in the enriched meaning. As Gajewski (2011) shows, DE elements that can give rise to an implicature that would ruin their DE-ness, are DE elements that are not the strongest scalar end-points. Hence, the only DE elements that do not give rise to such non-DE implicatures, are scalar endpoints like *not, nobody, never, no X*, etc. Such DE elements are 'anti-additive'. We refer the reader to Gajewski for details of this argumentation.

---

[52] Now one might ask why elements like 'few' trigger existential inferences (*not many but some*). The reason is that there are competing scalar alternatives that make no existential inference. *No students passed the exam* is stronger than *Few students passed the exam*, so if the speaker utters the latter, the hearer may infer that the speaker does not hold the former to be true.

[53] Gajewski (2011) points out that *few* on its proportional reading may be considered a scalar endpoint and therefore not give rise to an existential inference (see the previous footnote). In those cases, it is correctly predicted that *few* can license strong NPIs.

In summary, NPIs in anti-additive contexts do not trigger a contradiction even if the exhaustifier looks at the enriched meaning contribution of its complement. This, then, captures for Gajewski (2011) and Chierchia (2013) the difference between strong and weak NPIs. Crucial for our purposes is that strong NPIs are required to appear in a DE context whose non-truth-conditional meaning contribution does not contribute a non-DE-inference either. That is, strong NPIs can only appear in a context of which the non-truth-conditional meaning component is free of existential inferences.

Applying this perspective to *in years* (and mutatis mutandis to *until*), it follows that *in years* is a strong NPI if non-truth-conditional meaning contributions are taken into consideration. Chierchia (2013: 219-220) already shows that the oddity of (180) follows from the fact that when its presupposition is exhaustified, a contradiction arises (for the very same reason as why a contradiction arises in his example in section 4).[54]

(180) Only John has said something in weeks

  Presupposition: John has said something in weeks
  Assertion: Nobody else has said something in weeks

Whereas *in weeks* appears in a DE context in the assertion, it does not do so in the presupposition. Exhaustifing this presupposition would render a contradiction. *In weeks* cannot appear under the scope of *only*, since *in weeks* is a strong NPI and exhaustification must apply at the presuppositional, as well as the assertive meaning level. At the presuppositional level, however, a contradiction arises.

The same results obtain when implicatures are taken into consideration. If *Few students have been there in years* introduces a implicature that *some students have been there in years* and this implicature has to be exhaustified, a contradiction arises as well (as the implicature does not provide a DE context). Since strong NPIs require that exhaustification applies at every level of meaning contribution of the context they appear in, strong NPIs cannot appear under the direct scope of *few*.

---

[54] Chierchia's original example is *Only John said something in weeks*, but since *in years* requires a perfect, this example is independently ruled out. Therefore, we changed it into *Only John has said something in weeks*.

Now, the question arises why *in years* and *until* are strong NPIs and not weak NPIs. In other words, why is it not the case that only the assertion is exhaustified when the sentence contains *in years* / *until*? Gajewski (2011) and Chierchia (2013) present no fundamental reason why certain NPIs are strong and others weak, i.e., why certain NPIs require their exhaustifier to look at the enriched meaning contributions of its complement. However, we think that more can and must be said here. That is, it seems possible to explain why *in years* is a strong NPI.

Strikingly, the existence of the PTS of temporal adverbs similar to *in years* is presuppositional in nature and not part of the assertion. The classical tests for presuppositions (projection above negation, questions and if-clauses) clearly show this.

(181) I have been there in the last 5 years   There is a PTS [t, UT], such that within [t, UT] I have been there.

(182) I haven't been there in the last 5 years   There is a PTS [t, UT], such that within [t, UT] I haven't been there.

(183) Have you been there in the last 5 years   There is a PTS [t, UT] and I wonder whether within [t, UT] you have been there.

(184) If you have been there in the last 5 years,..   There is a PTS [t, UT] and if it is the case that you have been there within [t, UT] …

The same facts as above hold for *since*-adverbials. Here, we only apply the diagnostics for *in the last 5 years*, as the closest non-NPI cousin to *in* years, because *in years* itself cannot be licensed in positive sentences, questions or clauses. But if *in the last 5 years* and *in years* behave in this way the same, then it follows that the introduction of domain alternatives does not come from the assertion, but rather from the presupposition, where the existence of the PTS lives. Moreover, for *in years* it can be shown that the PTS also projects above negation. *I haven't been there in years* means that there is a particular PTS in which it is not the case that I have been there.

The same also holds for *until*. The same diagnostics show that the UTS of *until* is also presupposed and not asserted:

(185) I lived there until 2010   There is a UTS [t, 2010], such that within [t, 2010] I lived there.

(186)	I didn't leave until 2010	There is a UTS [t, 2010], such that within [t, 2010] I didn't leave.
(187)	Did you live there until 2010?	There is a UTS [t, 2010] and I wonder whether within [t, 2010] you lived there.
(188)	If you lived there until 2010,..	There is a UTS [t, 2010] and if it is the case that you have been there within [t, 2010], …

We don't think that the fact that *in years* and *until* are strong NPIs (i.e., elements that introduce domain alternatives that have to be exhaustified at every level of meaning contribution) and the fact that their PTS/UTS are presupposed, is coincidental. Rather, we hypothesize that if the domain alternatives of an NPI make reference to elements that follow from its presuppositional meaning contribution, the exhaustifier should have access to the enriched meaning contribution of its context of this NPI. In the case of *in years*, the domain alternatives are all alternatives that make reference to a PTS/UTS that is different from the one originally presupposed. The exhaustifier should then not only look at the licensing context of *in years* in the assertion if the alternative propositions are alternatives with respect to the presupposition *in years*. This reflects a suggestion, voiced in Homer (2008, 2009), that strong NPIs are sensitive to all non-truth-conditional meaning because they are more 'pragmatic' in nature somehow (cf. Gajewski 2011). For this reason, the exhaustifier should look at the enriched meaning contribution of the context in which *in years* appears. Since it is the obligatory presence of an exhaustifier that looks at the enriched meaning contribution of an NPI's licensing context that renders NPIs strong NPIs, it follows that both *in years* and *until* must be a strong NPIs.

But this does not apply only to in-adverbials like *in years* and *until*. If the above is on the correct track, we predict that other NPIs that presuppose (as opposed to assert) the existence of particular domain of quantification that obligatorily introduces domain alternatives, should also be strong NPIs. Any boundary adverbial that is an NPI, we predict to be a strong NPI. *In years* and *until* confirm this prediction. It remains to be seen if there are any counterexamples.

12 Conclusions

In this paper we argued that *in years* and *until* are boundary-adverbials that to a large extent function as mirror images of each other when used as domain wideners. They tend to stretch their time spans beyond contextual alternatives. However, as they set opposite boundaries, *in years* stretches its time span (the PTS) by aiming towards the past, while *until* stretches its time span (the UTS) by aiming towards the future. We argued that in both cases, two non-cancellable implicatures arise: the AI and the BEI.

We argued that the non-cancellable AI is the result of conflicting requirements on these adverbials: on the one hand they have to set their respective boundary, on the other hand they have to set it as far as possible. This conflict is resolved by setting the boundary at the furthest point at which the sentence can still be true: the point at which an event of the relevant sort occurs and beyond which the sentence (which asserts the absence of relevant events in the time spans) would be false.

Moreover, we argued that it is not a coincidence that given that they are NPIs, both adverbials are strong NPIs. The reason is that their domain widening function takes place on non-truth-conditional content, namely the stretching of the time spans whose existence is presupposed, not asserted. This is in line with Gajewski 2011, according to who the difference between weak and strong NPIs is that in the latter, exhaustification applies to non-truth-conditional material.

There are also differences between *in years* and *until*, and the most notable among these is that unlike *in years*, *until* also has usages in which it does not behave as a domain widener, does not have a non-cancellable actuality and other relevant inferences, and is even acceptable in affirmative sentences. This duality has given rise to proposals for a lexical ambiguity, which was assumed to also be supported by cross-linguistic arguments. We showed that the cross-linguistic arguments are not fully sound and proceeded to propose a unified approach to *until*. We argued that *until* always introduces domain alternatives and is thereby always subject to exhaustification. Its domain widening property surfaces, following Chierchia 2013, under contrastive focus. However, the scopal interplay of negation, the exhaustifier, and *until* is such that its domain widening property emerges only under certain configurations. We also showed that *in years*, given that it cannot combine with a U-Perfect, lacks certain interpretive possibilities that *until* has, which can freely combine with predicates with the subinterval property.

The last difference between the two adverbials that we briefly broached is that with *until*, one can detect elements of modality, possibly because it stretches towards the future, and not towards the past, like *in years* does.

References

Arregui, A., M. Rivero & A. Salanova. 2014. 'Cross-linguistic variation in imperfectivity.' *Natural Language and Linguistic Theory 32*: 307-362.

Chierchia, G. 2006. 'Broaden your views. Implicatures of domain widening and the "Logicality" of language.' *Linguistic Inquiry 37*: 535-590.

Chierchia, G. 2013. *Logic in Grammar. Polarity, Free Choice, and Intervention*. Oxford: Oxford University Press.

Condoravdi, C. 2008. 'Punctual Until as a scalar NPI.' In: K. Hanson & S. Inkelas (eds.), *The Nature of the Word*. Cambridge: MIT Press. 631-653.

Copley, B. 2008. 'The plan's the thing: Deconstructing futurate meanings.' *Linguistic Inquiry 39*: 261-274.

Cuoq J. 1981. 'Esclaves du «Takrūr» dans les armées de Bonaparte et de Khusraw Pacha.' In: 2000 ans d'histoire africaine. Le sol, la parole et l'écrit. Mélanges en hommage à Raymond Mauny. Tome II. Paris : Société française d'histoire d'outre-mer. 869-878.

Declerk, R. 1995. 'The problem of *not...until*.' *Linguistics 33*: 51-98.

Docekal, M. 2012. "Czech dokud and telicity". In A. Aguilar-Guevara, A. Chernilovskaya & R. Nouwen (eds.), *Proceedings of Sinn und Bedeutung 16*. Boston, MA: MIT Working Papers in Linguistics. 183-197.

Dowty, D. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Reidel.

von Fintel, K., D. Fox & S.Iatridou. 2014. 'Definiteness as Maximal Informativeness.' In L. Crnič & Uli Sauerland (eds.), *The Art and Craft of Semantics: A Festschrift for Irene Heim*, Cambridge, MA: MIT Working Papers in Linguistics. 165-174.

von Fintel, K. & S. Iatridou. 2007. 'Anatomy of a Modal Construction.' *Linguistic Inquiry 38*: 445–483.

von Fintel, K. & S.Iatridou. 2005/2019. *Since* ~~since~~. Ms MIT / Forthcoming in an Oxford University Press volume.

Gajewski, J. 2002. *L-analicity and natural language.* Ms. University of Connecticut.

Gajewski, J. 2011. 'Licensing strong NPIs.' *Natural Language Semantics 16*: 69–110.

Giannakidou, A. 2002. 'Until, Aspect, and Negation: A Novel Argument for Two *Until*s.' In B. Jackson (ed.), *Semantics and Linguistic Theory 12*. Ithaca, NY: Cornell. 84-103.

Herdan, S., & Y. Sharvit. 2006. 'Definite and non-definite superlatives and NPI-licensing.' *Syntax 9*: 1–31.

Hoeksema, J. 2006. 'In Days, Weeks, Months, Years, Ages: A class of temporal negative polarity items.' In D. Gilbers & P. Hendriks (eds.), *Rejected papers*. Feestbundel voor Ron van Zonneveld. Groningen: RUG.

Homer, V. 2008. 'Presuppositions can be disruptors too: A case against Strawson-entailment.' In N. Abner & J. Bishop (eds.), Proceedings of the 27th WCCFL. Somerville: Cascadilla. 220–228.

Homer, V. 2009. 'Disruption of NPI licensing: The case of presuppositions.' In T. Friedman & S. Ito (eds.),*Proceedings of SALT 18*. Ithaca: CLC Publications. 429–446.

Horn, L. 1969. 'A presuppositional analysis of *only* and *even.*' *Chicago Linguistic Society 5:* 98-107.

Horn, L. 1971. 'Negative transportation: unsafe at any speed?' In P. Peranteau, J. Levi & G. Phares (eds.), *Papers from the Seventh Regional Meeting of the Chicago Linguistic Society*. Chicago: University of Chicago. 120-133.

Horn, L. 1972. *On the semantic properties of logical operators in English*. PhD thesis, UCLA.

Horn, L. 1989. *A Natural History of Negation*. University of Chicago Press.

Iatridou, S. 2014. 'About determiners on event descriptions, about time being like space (when we talk), and about one particularly strange construction.' *Natural Language Semantics 22*: 219-263.

Iatridou, S., E. Anagnostopoulou & R. Izvorski. 2001. 'Observations about the form and meaning of the perfect.' In M. Kenstowicz (ed.), *Ken Hale: A life in language*. Cambridge, MA: The MIT Press. 189–238.

Iatridou, S. & H. Zeijlstra. 2017. 'Negated Perfects and Temporal *in*-adverbials.' In C. Halpert, H. Kotek & C. van Urk (eds.), *A Pesky Set: Papers for David Pesetsky*. 65-74. Cambridge, MA: MIT Working Papers in Linguistics.

Kadmon, N. & F. Landman. 1993. 'Any.' *Linguistics and Philosophy 16*: 353-422.

Karttunen, Lauri. 1974. 'Until.' *Chicago Linguistic Society 10*: 283-297.

Kaufmann, M. 2012. *Interpreting Imperatives*. Dordrecht: Springer.

Klein, W. 1994. *Time in Language*. London: Routledge.

Krifka, M. 1989. 'Nominal Reference, Temporal Constitution, and Quantification in Event Semantics.' In: J. van Benthem, Renate Bartsch & P. van Emde-Boas (eds.), *Semantics and Contextual Expressions*. Dordrecht: Foris. 75–115.

Krifka, M. 1995. 'The semantics and pragmatics of polarity items.' *Linguistic Analysis 25*: 209-257.

Kroch, A. 1974. *Amount Quantification, Referentiality and Long Wh-Movement*. Ms. University of Pennsylvania.

Landman, F. 1992. 'The progressive.' *Natural Language Semantics 1*: 1-32

Lomont, H. 1950. 'Observations ornithologiques.' *Actes de la réserve zoologique et botanique de Camargue. N. 26 - 1948 et 1949. Terre et Vie, 97e année*: 233-252.

Margulis, D. 2017. 'Expletive negation and the decomposition of *only*.' In R. Truswell (ed.), Proceedings of *Sinn und Bedeutung 21*. Edinburgh.

McCoard, R. 1978. *The English Perfect. Tense Choice and Pragmatic Inferences*. Amsterdam: North-Holland.

Mittwoch, A. 1977. 'Negative sentences with *until*.' *Chicago Linguistic Society 13*: 410-417.

Rizzi, L. 1990. *Relativized Minimality* MIT Press.

Rooth, M. 1985. *Association with focus*. PhD dissertation, University of Massachusetts, Amherst.

Rooth, M. 1992. 'A theory of focus interpretation.' *Natural Language Semantics 1*: 75–117.

Ross, H. 1984. 'Inner Islands' *Proceedings of the Tenth Annual Meeting of the Berkeley Linguistics Society* 258-265.

Rouillard, V. In progress. Ms MIT.

Staniszewski, F. 2019. *Until phrases as obligatory free choice items*. Ms MIT.

de Swart, H. 1996. 'Meaning and use of *not... until*.' *Journal of Semantics 13*: 221-263.

de Swart, H. & A. Molendijk. 1994. 'Negation in narrative discourse.' In: H. Bunt, R. Muskens & G. Rentier (eds.), *Proceedings of the International Workshop on Computational Semantics,* Tilburg: Institute for Language Technology and Artificial Intelligence. 191-200.

Verkuyl, H. 1993. *A theory of Aspectuality: The Interaction Between Temporal and Atemporal Structure,* Cambridge: Cambridge University Press.

Vlach, F. 1981. 'The Semantics of the Progressive.' In A. Zaenen & Ph. Tedeschi (eds.), *Syntax and Semantics 14: Tense and Aspect.* New York: Academic Press. 271-292.

Zeijlstra, H. 2004. *Sentential Negation and Negative Concord*. PhD Dissertation, University of Amsterdam.

Zeijlstra, H. 2014. P. Kosta, S. Franks, T. Radeva-Bork & L. Schürcks (eds), *Minimalism and beyond*. Amsterdam: Benjamins. 109-129.

Zeijlstra, H. 2018. 'Universal Quantifier PPIs.' *Glossa 2*: 91.

Zwarts, F. 1998. 'Three types of polarity.' In F. Hamm & E. W. Hinrichs (eds.), *Plurality and Quantification*. Dordrecht: Kluwer. 177–238.