The Complex Beauty of Boundary Adverbials: *In Years* and *Until*

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In this article, we discuss two negative polarity item (NPI) adverbials: *in years* (and its cousins *in days, in months, etc.*) and *until*. We argue that much is to be gained by analyzing the two in juxtaposition. We first explore *in years*, following our approach in Iatridou and Zeijlstra 2017; on the basis of our analysis of this item, we then explore *until*. Our approach permits a unified account of *until*, whose behavior has led researchers to consider it lexically ambiguous. The commonalities between *in years* and our unified *until* also allow us to explain why both these boundary adverbials are strong as opposed to weak NPIs.

**Keywords:** negative polarity items, (im)perfective, perfect, actuality inferences, *until*, temporal adverbials, subinterval property

Noah Constant (pers. comm.) observes that temporal adverbials such as *in years*, which are known to be (strong) negative polarity items (NPIs), as in (1), come with a noncancelable inference that the relevant event indeed took place (2).

(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 cancelable.

(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.

We are very grateful to two anonymous reviewers whose detailed comments helped us shape the article into a much better form. We are also grateful to Luka Crnič, Yael Greenberg, Vincent Rouillard, Frank Staniszewski, and Stan Zompi for discussion.

Abbreviations used in the article are as follows:

| Abbreviation | Meaning                  |
|--------------|--------------------------|
| 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          |
These facts are reminiscent of the two usages of until in English. In one usage, known as punctual until, until may only appear in a negative context (5) and comes with a noncancelable actuality inference (6). In the other usage, known as durative until, it can be used in both positive (7) and negative (8) contexts and lacks a noncancelable actuality inference when it is negated (9).

(5) She didn’t leave until 5 p.m.
(6) a. . . . #I don’t know about later.
   b. . . . #In fact, she never left.
(7) She was working until 5 p.m. (. . . I don’t know what happened after 5 p.m.)
(8) She wasn’t working until 5 p.m.
(9) a. . . . I don’t know about later.
   b. . . . In fact, she didn’t work at all.

In this article, 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 explain why in years and punctual until come with this noncancelable actuality inference. To do this, in sections 1–4, following earlier work in Iatridou and Zeijlstra 2017, we examine all relevant properties of in years and show how the patterns in (1)–(3) follow accordingly. Then, in sections 5–6, we discuss the two usages of until and argue that even though they prima facie differ even more than often thought, existing analyses in terms of lexical ambiguity face some serious problems. In section 7, we present a unified account for the two untils, 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 the NPI-hood of both punctual until and in years is strong, because the time intervals they introduce are presupposed and not asserted. In section 12, 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 (10a) and (10b) come with an inference that the patient had a seizure 5 years ago or in 2015 respectively (the actuality inference (AI)) but that this inference is cancelable.

(11) A: Has the patient ever had a seizure?
    B: She hasn’t had one in the 5 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.
She hasn’t had a seizure in the last 5 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 canceled. Iatridou (2014) attributes this implicature to the semantics of the perfect. Iatridou, Anagnostopoulou, and Izvorski (2001) describe a perfect like (13) as in (14)–(15).

(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, the RB is the utterance time (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 (nonoverlapping) subintervals at which the speaker visits Cape Cod.
   e. $\exists t : \text{RB(UT, } t) \text{ and LB(1990, } t) \land \exists t', t'' \subseteq t : \text{I visit Cape Cod at } t', t''$

(15) 1990

| LB | $\checkmark$ | $\checkmark$ | $\checkmark$ | RB |
|----|-------------|-------------|-------------|----|
| UT |

(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 3 days ago does not assert the existence of a day, 3 days ago). In (15), the first part of the interpretation is actually presupposed ($\exists t : \text{RB(UT, } t) \text{ and LB(1990, } t)$); the second part is asserted.

The LB of the PTS can be set by an adverbial (LB adverbial or the superset PTS adverbial), 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 United States, etc.).

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 perfective and imperfective contribute the following relationships between situation time (ST) and topic time (TT):

(17) a. $\text{ST } \subseteq \text{TT}$ (perfective aspect)
   b. $\text{TT } \subseteq \text{ST}$ (imperfective aspect)

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1 See von Fintel and Iatridou 2019 for an implementation of Iatridou, Anagnostopoulou, and Izvorski 2001 in a more formal context.

2 We leave implicit the condition that $t'$ and $t''$ must be distinct—that is, do not overlap.

3 Whenever it is not relevant for the discussion 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 contribution separately.
Or, more formally:

\[
(18) \begin{align*}
\text{a. } & \left[\text{PRF } \phi\right]' = 1 \text{ iff } \exists t' \subseteq t: \left[\phi\right]' = 1 \\
\text{b. } & \left[\text{IMPF } \phi\right]' = 1 \text{ iff } \exists t' \supseteq t: \left[\phi\right]' = 1
\end{align*}
\]

Moreover, we follow von Fintel and Iatridou’s (2019) proposal that in the perfect, the PTS relates to the (im)perfective as the TT 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 by Iatridou, Anagnostopoulou, and Izvorski (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 article. (For the composition details, see von Fintel and Iatridou 2019.)

Now consider a negated perfect.

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

Everything in (14a–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 (14a–c), we have (20)–(21) instead of (14d–e).

(20) It is not the case that in the PTS there is a subinterval at which I visit Cape Cod.  
\(=\) there is no event of my visiting Cape Cod in the PTS

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

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 the sentence contains an LB adverbial (here, since 1990 or in the last 3 years), a conversational implicature arises that conveys that a relevant event took place at the time denoted by the adverbial (here, that a visiting event took place prior to 1990 or 3 years before the 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 nonexistence of an event in a specific time span? But as illustrated in (11)–(12), and as expected, this conversational implicature is cancelable.

Noah Constant (pers. comm.) makes the striking observation that unlike in (10)–(12), in (22) the AI is not cancelable.

(22) a. He hasn’t had a seizure in years.  
\ldots #I don’t know about earlier.

b. He hasn’t had a seizure in years.  
\ldots #In fact, he has never had one.

In other words, with in years, there is a noncancelable inference that sets it apart from other LB adverbials. This is quite surprising, if the cancelability of the AI, as shown in (11)–(12), follows from the combination of a negated perfect with an LB adverbial as proposed in Iatridou 2014.
This noncancelable 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 (cancelably) inferred event does not have to be exactly at the LB of the PTS. For example, consider the context in (23) and the utterance that follows.

(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 show. With in years, not only must there be a previous occurrence of the event (the noncancelable AI)—the last occurrence of the event must be at the LB.

To show that with in years the time of the event must 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 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 fell off a ladder and was paralyzed from the neck down, and so has been unable to 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, (24a–b) are true: indeed, the last 15 years are driving-free because of the ladder accident (24a) and since 15 years certainly qualifies as “many years,” (24b) is true too. On the other hand, (24c) is false, because it conveys that Fred was driving at about the time 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, is still 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).

In other words, the PTS is not restricted by the subject’s lifetime.
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, cannot be truthfully uttered, due to the noncancelable 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 must set it at the last occurrence of the relevant event, which perforce is after the subject’s birth. In section 4, we will show 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 differs from the role it plays in sentences with since-adverbials or with other LB-adverbials like in (the last) 5 years. The difference between these two classes of LB-adverbials does not just lie in the cancelability of the AI. With in years, the time of the inferred event is the LB.

We refer to the noncancelable AI observation with in years as Constant’s observation. Constant’s observation holds for all in + bare-plural-temporal-noun combinations: in days, in months, in ages, in weeks, in hours. When using in years, we will be referring to this entire class of adverbials.⁵

The question now arises why the AI with in years is not a cancelable conversational implication. But before we address this question, one final note. Giving examples (27a–b), an anonymous reviewer observes that in certain cases the AI appears to be cancelable.

(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 would be contradictions. Christopher Baron (pers. comm.) points out that the examples 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.

⁴ The problem with (26) is not that in years requires a certain vagueness or ignorance regarding the exact time; see footnote 8.

⁵ Note that someone who hasn’t seen Miranda in 10 years can utter I haven’t seen Miranda in years. This person could also truthfully utter I haven’t seen Miranda in weeks, since 10 years is 520 weeks. But by convention the largest possible unit of measure is chosen. We assume this convention throughout the article.
Similarly, (27a–b) would be as in (29a–b) and thus would not be counterexamples 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.

Before we continue exploring this question, we will show that there is another inference that is also noncancelable when the negated perfect contains in years.

2 Another Noncancelable Inference

We have shown that the AI (at the LB) is not cancelable when the negated perfect contains in years. Now we will show that there is another noncancelable inference that arises when the negated perfect contains in years, and not other LB adverbials. To see this, consider (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—here, the length of the interval in which John did not have a seizure. (30) can be uttered in a context where John used to have seizures frequently, 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 because of a medication that John has been taking for the last 10 years, the speaker had expected there to be no seizure at all in that time span. Finally, it can be uttered if the speaker has no expectation at all. If a doctor asks whether John has had a seizure in the last 5 years, the speaker can simply answer with (30), without indicating surprise or any 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 relevant 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.

(31) I know Mary does not like to visit our 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.

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

6 This leaves the role of definitely and certainly unexplained. 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 is not certain about (a context that 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.
We refer to this second inference as the beyond expectation inference (BEI). The BEI states that the event took place beyond a contextually set expectation: the PTS is larger than a contextually salient interval. For example, *in minutes* conveys that the PTS is larger than a contextually salient number of minutes/days/seconds.\(^7\)

(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*, and so on: the event took place earlier than expected. Earlier than expected means that the PTS is longer than expected.\(^8\)

In total, then, *in years* comes with two noncancelable inferences that *in (the last) 5 years* lacks: an AI (which states that the relevant event took place and that moreover, it did so at the LB) and a BEI. We will now show 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 be the source of its unexpected behavior. First, *in years* is a so-called LB adverbial. Second, it is a (strong) NPI. Let us look at each property in some detail.

3.1 In Years as an LB Adverbial

In the perfect, the RB of the PTS is manipulated by Tense: in the present perfect, the RB is at the UT; in the past perfect, the RB is before the UT; and in the future perfect, the RB is after the UT (see Iatridou, Anagnostopoulou, and Izvorski 2001, Iatridou 2014, von Fintel and Iatridou 2019). The LB of the PTS, on the other hand, can be set by adverbials, or as example (16) illustrated, in the absence of an adverbial, contextually. LB adverbials set the LB either by specifi-

\(^7\) That a BEI is involved also becomes clear in examples 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 within 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 example, involving two other temporal *in*-adverbials that are NPIs:

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

However, these *in*-adverbials crucially behave differently from *in years*, as they obligatorily introduce an ignorance effect; *in years* does not have to convey ignorance, as (ii) 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 / #in I don’t know how long.

Hence, the inferences that *in years* gives rise to cannot follow from ignorance alone, and the BEI does not come from ignorance itself.
cally naming it, as in (34); by counting backward from the RB (e.g., in (the last) 5 years, as shown earlier); or by for-adverbials, as in (35) (see Iatridou, Anagnostopoulou, and Izvorski 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 backward from the RB. In (36a), it stretches backward from the UT, which is the RB because we are dealing with a present perfect. In (36b), it stretches backward from an RB that precedes the UT because we are dealing with a past perfect. In (36c), it stretches backward from an RB that follows the UT.

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

(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. I haven’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 adverbial, not a VP-level adverbial, and it sets the LB by stretching backward from the RB until it finds the first (i.e., the most recent) event of the VP.

For-adverbials are both PTS adverbials (i.e., adverbials that set a boundary of the PTS) and VP-level adverbials (i.e., adverbials that (temporally) modify the event description of the VP) (Dowty 1979, Iatridou, Anagnostopoulou, and Izvorski 2001). Similarly, unlike in years, which is only a PTS adverbial, in 5 years can appear both with the perfect, as already seen, and with the simple past, 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. (= He 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 2 months.

So in 5 years can function either as a PTS or a VP-level adverbial. When it is a VP-level adverbial (i)–(ii), it measures out the time of culmination. When it is a PTS adverbial (iv), it measures the PTS. The sentence-initial 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 (see Dowty 1979, Iatridou, Anagnostopoulou, and Izvorski 2001; also see Rouillard 2019 for an attempt at unification).
sort. *In (the last) 5 years* and *since*-adverbials do not behave this way. However, these are also PTS adverbials. So it cannot be the case that the noncancelability of the AI with *in years* is due to its being a PTS adverbial, nor does the BEI follow from it. Hence, another property of *in years* must be relevant too.

### 3.2 In years as a (Strong) NPI

Another important characteristic of *in years* (and *in minutes, in days*, etc.) is that it is an NPI (Horn 1971, Zwarts 1998, 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 antiadditive contexts (such as *not* or *nobody*) and not by other downward-entailing contexts, such as *few* or *at most* (Zwarts 1998).

(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) 5 years* are not NPIs.

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

Next, we will show how the NPI-hood of *in years* opens the way to explaining Constant’s observation.

### 4 Deriving Constant’s Observation

For Kadmon and 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

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10 Three points about *in years* are relevant here. First, as a reviewer points out, that *in years* is a strong NPI also can be seen in the following minimal pair (from Gajewski 2007:293):

(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.

Second, a reviewer points out that *in years* can also be an adnominal, and then it also comes with an AI.

(iii) *Letters to Samuel* is his first book in years to return to his childhood in a religious cult.

It is known that other PTS adverbials can modify nominals as well.

(iv) The years since the war have been difficult.

We also note that superlatives are (Strawson) antiadditive (see Herdan and Sharvit 2006, Gajewski 2011). Therefore, it is not surprising that *in years* can be used in examples like (iii). The exploration of PTS adverbials as adnominals is, however, beyond the scope of the article.

Third, as restrictive clauses of universal quantifiers are antiadditive, the question arises 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; see Collins and Postal 2014, Zeijlstra 2018) and therefore cannot be licensed outside the relative clause they appear in.
be contextually expected. For Kadmon and Landman, this domain-widening property is (partly) responsible for NPIs being NPIs. They present the following example to show how *any* behaves as a domain widener:11

(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.
  (Kadmon and Landman 1993:360)

More recent approaches to NPI-hood, most notably Krifka’s (1995) and Chierchia’s (2006, 2013), adopt Kadmon and Landman’s (1993) basic insight that there is a relationship between NPIs and domain widening, but they argue, contra Kadmon and Landman, that the property of domain widening itself does not underlie NPI-hood. Rather, NPI-hood may underlie domain widening.12

Chierchia (2013) argues that the premier characteristic of NPIs is that they introduce subdomain alternatives and that the sentences they occur in are obligatorily exhaustified.13 Domain widening comes about when an item that introduces subdomain alternatives is contrastively focused under negation. In this article, we will reemphasize the importance of the connection between NPIs and domain widening. But before we do so, we will 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.

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11 For Kadmon and 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: for example, in (43) the utterance that contains *any potatoes* must be stronger than the utterance that 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, that is, in downward-entailing contexts. This, for Kadmon and Landman, is what makes domain wideners NPIs.

12 Following Krifka (1995), Chierchia (2006, 2013), whose account of NPI-hood we adopt here, rejects domain widening as the primitive source of NPI-hood for two reasons. First, he argues that Kadmon and Landman’s (1993) original account is noncompositional: their strengthening requirement (i.e., the requirement that an utterance containing an NPI can only be used if that utterance 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.

13 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.
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 around. Now, when the sentence *I have any book* is exhaustified, all nonweaker alternatives are negated. In other words, ‘I have a book that is a member of the set \( \{b_1, b_2\} \)’ and ‘I have a book that is a member of the singleton set \( \{b_3\} \)’ will both be false, as these are the stronger alternatives.

However, note that 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 judgments, this renders sentences containing an unlicensed NPI unacceptable.

Once an NPI is embedded under a scale-reversing (i.e., downward-entailing) operator (before being exhaustified), the domain alternatives do not yield stronger propositions, as the entailment relations are the 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 around. 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 (2013) points out, whenever an NPI is 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 focused, NPIs are domain wideners in the sense of Kadmon and Landman (1993). Or, as Chierchia (2013:36) puts it in discussing *any*: when contrastively focused, *any* acts as a domain widener, but when it is not contrastively focused (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 is subject to an exhaustification requirement. Since Chierchia states that *in years* is in addition (in effect, lexically specified to be) contrastively focused under negation or any other antiadditive 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 along these lines (after Chierchia 2013:218):
(44) a. *Joe has met Mary in weeks.
   b. $\exists e. [\text{meet}(e, \text{Joe, Mary}) \land \text{cul}(e) \land \tau(e) \subseteq \text{WEEKS}]$
      (cul = culminated; $\tau(e)$ = the temporal span of e; $\subseteq$ stands here for temporal inclusion)
   c. There is a culminated event of Joe meeting Mary whose temporal span is included in a period that is one or more weeks long.

Once it is assumed that (44a) introduces domain alternatives of the kind shown in (45a), the NPI-ness of \textit{in weeks} follows.

(45) a. Joe has met Mary in D, where D is a time interval smaller than weeks.
   b. $\{\exists e. [\text{meet}(e, \text{Joe, Mary}) \land \text{cul}(e) \land \tau(e) \subseteq D] \mid D \subseteq \text{WEEKS}\}$

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 (45b) entail (44b). 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 type in (45b) must be false. Then we reach a logical contradiction. If no meeting event took place in any subdomain of T, a meeting 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. $\neg \exists e. [\text{meet}(e, \text{Joe, Mary}) \land \text{cul}(e) \land \tau(e) \subseteq \text{WEEKS}]$
      (cul = culminated; $\tau(e)$ = the temporal span of e; $\subseteq$ stands here for temporal inclusion)
   c. There is no culminated event of Joe meeting Mary whose temporal span is included in a period that is one or more weeks long.

(47) a. Joe hasn’t met Mary in D, where D is a time interval smaller than weeks.
   b. $\{\neg \exists e. [\text{meet}(e, \text{Joe, Mary}) \land \text{cul}(e) \land \tau(e) \subseteq D] \mid D \subseteq \text{WEEKS}\}$

Hence, assuming that \textit{in years} introduces subdomain alternatives captures that it is an NPI. When such NPIs are used contrastively under negation, as Chierchia assumes, it is further derived that they are domain wideners.

However, while we adopt Chierchia’s general approach toward NPIs, we do not adopt his specific proposal for \textit{in years}: in this proposal, there is no reason why \textit{in years} should behave differently from other PTS adverbials. Chierchia takes utterances containing expressions like \textit{in years} to have a denotation like that in (44). But this denotation leaves it a mystery why the AI is cancelable with other PTS adverbials, but not with \textit{in years} (Constant’s observation). Therefore, while we will adopt Krifka’s and Chierchia’s general approach to NPIs, we will go our own way for the \textit{in years} class.

We start by resetting some of (44) in Iatridou, Anagnostapoulou, and Izvorski’s (2001) and von Fintel and Iatridou’s (2019) framework; see (48). Most notably, the culmination referred to in (48e) is the result of the perfective that is part of the perfect participle, which contributes the meaning that the event/situation time (ST) is included in the evaluation time/topic time (TT): $\text{ST} \subseteq \text{TT}$ (Klein 1994 and many others) (see section 1).
(48) a. *Joe has met Mary in weeks.
   b. There is a time span (the PTS).
   c. The RB of the PTS is manipulated by Tense, and since (48a) is a present perfect, the RB is the UT.
   d. The LB is found stretching back weeks from the 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 , such that RB(UT, ) and LB( - weeks, )
   a. Assertion: \( \exists e. [\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{Run}(e) \subseteq ] \)
   b. Domain alternatives: \( \{ \exists e. [\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{Run}(e) \subseteq ] \mid \subseteq \} \)

The reasoning is the same as before: if an event takes place in a subdomain of the PTS smaller than , it also takes place in , whereas the reverse does not hold. This 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 there is no subdomain of the PTS where a meeting event took place, a meeting event 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 (50a) entails all domain alternatives in (50b), exhaustification takes place vacuously, as there is no longer a nonweaker alternative that is to be negated.

(50) Given a PTS , such that RB(UT, ) and LB( - weeks, )
   a. Assertion: \( \neg \exists e. [\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{Run}(e) \subseteq ] \)
   b. Domain alternatives: \( \{ \neg \exists e. [\text{meet}(e, \text{Joe}, \text{Mary}) \land \text{Run}(e) \subseteq ] \mid \subseteq \} \)

Hence, under our revised representation of in years, couched within Iatridou, Anagnostopoulou, and Iatridou’s (2001) and von Fintel and Iatridou’s (2019) approach, it still follows under the general approach to NPI-hood as formulated by Chierchia that—given that it is contrastively focused (an assumption that Chierchia makes and on which we are happy to follow him)—once in years introduces smaller subdomains of the PTS as domain alternatives, it is a domain widener. 14

However, taking in years to be a PTS adverbial that introduces domain alternatives opens up a way to understand its special inferences.

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

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14 Naturally, this raises the question of how the focus of in years must be phonetically encoded. We remain agnostic about whether the focus is lexically encoded (i.e., whether in years is inherently accented or stressed) or whether the focus follows from the prosodic configuration that in years appears in. As Edward Flemming (pers. comm.) points out, it does not seem possible to check this phonetically because, given that in years must be in the scope of negation and therefore appears at the right edge of the clause, the stress contour that it receives will be the same regardless of the presence or absence of contrastive focus. However, the fact that in years always carries some stress is consistent with the position that we inherit from Chierchia—namely, that it is always contrastively focused.
the PTS, contextual restrictions that may normally apply to the PTS no longer do so. Thus, *in years* must do two jobs: being a PTS adverbial, it must set the LB of the PTS; and being a domain widener, it must widen (i.e., extend) the PTS as much as possible. As shown earlier, *in years* is like other PTS *in-* and *for-*adverbials in that it sets the PTS not by naming it (as *since*-adverbials do) but by stretching backward from the RB (which is set by Tense). Putting these properties together, the result is that *in years* stretches backward 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 backward as far as possible from the RB, beyond any contextually salient alternatives. How can it satisfy both requirements at the same time? The resolution of the conflict lies in the fact that the *in years*-adverbial stretches backward as much as is logically possible. That is, it stretches backward from the RB until the point where the sentence would become false. Where is that point?

The only point in time that *in years* cannot skip over on its stretch-backward-from-the-RB path is the point where an event of the relevant sort took place. Stretching the PTS any farther back would make the sentence false, as the assertion is that no event of the relevant sort occurred in the PTS. In (40a), *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 event time) is problematic as well. In that case, there would be a bigger PTS in which the event did not hold as a contextual alternative; however, as a domain widener *in years* 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 (a) set the LB and (b) set it as far as possible backward from the RB. This explains why with *in years*, there unavoidably is an event of the relevant sort, why that event unavoidably occurs at the LB, and why the time of the event is unavoidably earlier than any other contextually salient alternatives (BEI). The event being earlier translates into the PTS being bigger; that is, the domain of quantification is extended. 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 (1993) famous *I didn’t eat ANY potatoes*, domain widening goes maximal. It is not assumed that it can stretch only up to leaving one potato uneaten or leaving something other than a potato uneaten. However, with *in years*, a limit is placed by a factor external to its domain-widening nature—namely, by its nature as a boundary adverbial.
The above account, then, derives Constant’s observation (i.e., the noncancelability of the AI with \textit{in years} at its LB) and the BEI. Like any perfect, a negated perfect presupposes that the LB of the PTS exists, as—like any interval—the PTS can only be defined by virtue of its boundaries. In the case of \textit{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 is an actual event; the presupposition is that there is an 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 other words, \textit{in years} differs from \textit{in (the last) 5 years}, where there is no noncancelable AI and where the BEI is absent.

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

5 \textit{Until-Adverbials}

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

5.1 Two Types of \textit{Until}

The lexical item \textit{until} sets up a time span that we will call the \textit{until time span} (UTS). The RB of the UTS is the argument of \textit{until}.

In the literature, frequent reference is made to “durative until” (henceforth \textit{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.\footnote{A predicate has the subinterval property if and only if whenever it holds at an interval, it also holds at every one of its subintervals (see Dowty 1979).} The argument of \textit{until-d} (the RB of the UTS) can be an NP or a clause.\footnote{In the examples we use in this and the next few sections, the arguments of \textit{until} are all points in time, leaving open for now the question of how the RB is set when the argument of \textit{until} refers to a (longer) time interval, as in \textit{I was working in Paris until the nineties}. We will come back to such examples in section 10.}

(52) He was asleep / composing a sonnet until 5 p.m. / 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 \textit{until-d}, that is, after the UTS. Examples (52)–(53) may suggest that the sleeping or composing ended at 5 p.m. or at my departure. However, these sentences have nothing to say about what goes on beyond that interval, so any Gricean reasoning about that should always be cancelable. 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 5 p.m. and possibly well beyond that. I’m not sure.

(55) He was asleep / composing a sonnet until 5 p.m. 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.¹⁷ We use the term boundary adverbial for all adverbials that set the boundary of an interval, regardless of whether they set the LB or the RB. So, in years, since, in (the last) 5 years, until-d, and others, are boundary adverbials.²⁰ Until-d is thus the mirror image of the boundary adverbials since and in (the last 5) years in the sense that they set opposite boundaries.¹⁹

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

(56) He was not asleep / composing a sonnet until 5 p.m. / until I left.

This sentence merely asserts that there was no sleeping or composing that reached the RB of the UTS. It does not specify whether there was no sleeping or composing at all, or whether there was some sleeping or composing that terminated before the RB of the UTS. We 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 in these sentences the throughout-not reading is much more pronounced. (Possibly, not-throughout is marginally acceptable if the sentence is understood as containing metalinguistic negation.)²⁰

(57) Until 5 p.m. / Until I left, he was not asleep / composing a sonnet.
So far, the predicates used in connection with *until* have been imperfective (*composing a sonnet*) or stative (*asleep*), whose default interpretation is imperfective. Predicates in perfective aspect behave quite differently.\(^{21}\)

(58) *She left / reached the summit until 5 p.m. / I left.*

One might say that the ungrammaticality of such sentences is not surprising, if we are dealing here with *until*-d, 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, such sentences become grammatical (see Karttunen 1974, among many others).

(59) She didn’t leave / reach the summit until 5 p.m. / I left.

Equally famously, these sentences have a noncancelable AI (Karttunen 1974 and many since). That is, considering just the *She didn’t leave* part of (59), 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 5 p.m. / I left.
   a. # . . . I don’t know if she left later.
   b. # . . . in fact, she didn’t leave at all.

(61) She didn’t leave when I left.
   a. . . . I don’t know if she left later.
   b. . . . 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 noncancelable AI has been considered a strong argument in favor of the position that *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, which also differentiates *until* in (59) from *until*-d. The occurrence of *until* in (59), called *punctual until* (*until*-p), is considered an NPI—in fact, a strong NPI, since it surfaces only in antiadditive contexts.

Karttunen (1974), Declerck (1995), Giannakidou (2002), and Condoravdi (2008), among others, provide two arguments for lexical ambiguity (*until*-d and *until*-p). The first is that there

\(^{21}\) Activities, which as atelics lack a culmination subinterval even with the perfective, can appear in the perfective with *until* without negation (see Karttunen 1974 for such examples). Staniszewski (2019) gives the following example involving a 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 such examples. What is special about (i) is that it retains the subinterval property despite the perfective, because there is no culmination, and it is the subinterval property that is crucial. For expository purposes, we concentrate on perfective telics when we want to show the significance of the absence of the subinterval property, even though we will not consistently point out that it is perfective telics that necessarily lack this property. We thank Frank Staniszewski for discussion of this point. See also Staniszewski 2019 for discussion of examples like Karttunen’s (1974) *Guests arrived until midnight.*
are languages with different phonetic exponents for the two meanings. The second 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 Crosslinguistic Argument

Let us start with the claim that there are languages—for instance, Greek and Czech—that have two different items for the two untils. Despite prior claims about such languages, we will show that they actually exhibit no morphological until-p vs. until-d distinction.

5.2.1.1 Greek

Giannakidou (2002) and Condoravdi (2008) argue that until-d in Greek is mexri, while until-p is para mono (mono can be dropped). In (62) and (63), we give one example of para mono from each paper, with the authors’ glosses and translations.

(62) I prigipisa dhen kimithike para monon ta mesanixta.
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.
(Giannakidou 2002:92)

(63) Dhen thimose para mono htes.
NEG get-angry but for only yesterday
‘He didn’t become angry until yesterday.’
(Condoravdi 2008:640)

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 . . . ).

(64) Dhen vlepo para mono tin Miranda.
NEG see.1SG PARA MONO the Miranda
‘I see no one except Miranda.’ / ‘I see only Miranda.’

22 We will take para mono to have the meaning in (i), after von Fintel and Iatridou 2007.

(i) [para mono tin Miranda]: λP. ∃x (x ≠ Miranda & P(x) = 1)
When the meaning in (i) is placed under negation, we derive the meaning for (64), for example, as follows:

(ii) [dhen . . . para mono tin Miranda]: λP. ∀x (x ≠ Miranda → P(x) = 0)
The same holds when the argument of the exceptive is a temporal adjunct (e.g., in (72)).

(iii) [dhen . . . para mono tin dekaetia tu 60]: λP. ∀t (t ≠ 60s → P(x) = 0)

23 It is important to note the equivalence between the English sentences with only in (64)–(67), 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.
These examples illustrate 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.

(68) I prigipisa dhen kimithike para monon ta mesanixta.

*The princess* *NEG* *slept* *PARA MONO* *the midnight*

‘The princess didn’t fall asleep except at midnight.’ / ‘The princess fell asleep only at midnight.’

24 Here is a place where Greek *para mono* differs from 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 like Greek, a pro-drop language, does. Stan Zompi (pers. comm.) points out that in the few contexts where French does allow postverbal “subjects” (i.e., the sequence preverbal expletive – unaccusative – nominal), it behaves like Greek.

(i) Il n’est arrivé que quatre caravanes très peu considérables.

*EXPL NE* *is* *arrived QUE four caravans very little considerable*

‘There arrived only four rather unremarkable caravans.’

(Cuoq 1981:871)

(ii) Ensuite il n’a été vu que des groupes comportant au maximum 1,000 individus.

*later EXPL NE* *has been seen QUE PART groups involving at the most 1,000 individuals*

‘Afterward only groups of at most 1,000 individuals have been witnessed.’

(Lomont 1950:243)

25 *Na* is an Infl-area particle that appears roughly in the union of the environments where other languages (e.g., Romance) would use an infinitive or subjunctive. Greek lacks infinitival complements.

26 Just as there are exclusive and scalar uses of *only*, there are scalar and exclusive uses of exceptives: *He is nothing but a soldier and I didn’t see anybody but except John* (Kai von Fintel, pers. comm.). Similarly, *para mono* has not only exclusive but also scalar uses.

(i) Dhen ine para mono stratiotis.

*not is PARA MONO soldier*

‘He isn’t but a soldier.’

We submit that (70) and (71) involve similarly scalar uses when the BEI is felt to be present. On the other hand, (69) is an example of a nonscalar exceptive. We thank one of the reviewers for pointing out this prediction to us.
We see that if we look at temporal adjuncts within the paradigm of the exceptive uses of *para mono*, we can exactly reproduce 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, when the right semantics for the general exceptive are applied to the temporal argument, we can create the same meaning as the highly specialized *until*-p. But this undermines the position that *para mono* is *until*-p. If we took the position that *para mono* is *until*-p, we would have to explain why the general exceptive cannot take a temporal argument that 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 is homophonous 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 also compatible with nonpunctual (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 that *para mono* is an exceptive.

(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 fig.trees NEG  survive the winter PARA MONO when are covered with burlap
    ‘Fig trees don’t survive the winter except when they are covered in burlap.’ / ‘Fig trees 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 of the 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 Tuesdays.’ / ‘Miranda is here only on Tuesdays.’

There is nothing punctual, perfective, or inchoative about (70)–(73). They are sentences containing exceptives with a temporal argument, with imperfective predicates.
Finally, as a reviewer points out, our analysis of *para mono* as an exceptive correctly predicts that (74) should be possible (as our translations imply, there is no grammatical counterpart in English with *until*, which is not an exceptive).

(74) Dhen thimose para mono proxthes, htes to vradhi ke simera
neg got.angry para mono day.before.yesterday yesterday the evening and today
the morning
‘She 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 mono* 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 noncancelable AI, but it is actually part of the assertion of these sentences. All this means that this particular argument from Greek in favor of the lexical ambiguity of *until* is not valid.

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

(75) a. Mexri tis 5 to apojevma, o Yanis iche idhi pchi 3 bires.
   mexri the 5 the afternoon the John had already drunk 3 beers
   ‘By 5 p.m., 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 5 p.m.’

27 Just as in one’s favorite semantics of how *I didn’t see anyone except Miranda* entails that I saw Miranda.
28 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 shown above. Dutch and German have *pas* and *erst*, respectively, and these also yield sentences with noncancelable occurrences of events. But these items do not cooccur with negation (and so are not NPIs like *until*-p), and their noncancelable AI is an expected entailment of the sentence in which they occur.

(i) Hij is pas gisteren weggegaan.
   he is PAS yesterday left
   ‘He left only yesterday.’

(ii) Er ist erst gestern krank geworden.
   he is ERST yesterday ill become
   ‘He became ill only yesterday.’

Similarly, the English sentence *Miranda only left yesterday* has a noncancelable AI, but this is no mystery either, as in most accounts of *only*, this sentence presupposes that Miranda left yesterday (see Horn 1969).
(76) a. *Until 5 p.m., John had already drunk 3 beers.
    b. *John had already drunk 3 beers until 5 p.m.

5.2.1.2 Czech Though she does not provide the actual forms, Giannakidou (2002) (citing a personal communication from Hana Filip) mentions that Czech also has two expressions that can be translated as ‘until’. These two items, dokud and až do, differ in the type of complement they take, but they do not differ along the until-d vs. until-p dimension.29

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 counterpart of until that always functions as an NPI. This is shown in (77) and (78), where both items can appear in affirmative sentences.

(77) Spal dokud / *až do jsem neodešla.
slept.IMP.3.M.SG until AUX.PAST.1SG NEG.left.PFV.3.F.SG
‘He was asleep until I left.’

(78) Spal *dokud / až do pěti.
slept.IMP.3.M.SG until 5
‘He was asleep until 5.’

Both items can appear in environments that are not downward-entailing, and both can accompany an imperfective predicate. These are not the characteristics of the elusive until-p.30 However, as in English, the perfective in an affirmative sentence cannot be modified by ‘until’ (i.e., by either dokud or až do).

(79) *Napsal dvě básně, dokud jsem neodešla.
wrote.PFV.3.M.SG 2 poems until AUX.PAST.1SG NEG.left.PFV.3.F.SG
‘He wrote 2 poems until I left.’

(80) *Napsal dvě básně až do pěti.
wrote.PFV.3.M.SG 2 poems until 5
‘He wrote 2 poems until 5.’

As in English, such examples become grammatical if negation is included.

(81) Neodešel, dokud neodešla Marie.
NEG.left.PFV.3.M.SG until NEG.left.PFV.3.F.SG Marie
‘He didn’t leave until Marie left. (#In fact, he may not have left at all.)’

29 Dočekal (2012) explicitly argues in favor of taking a unified approach to dokud. However, the questions he discusses are oriented differently from the ones we are addressing, and therefore we will discuss Czech on the basis of our own explorations of this language. We are very grateful to Ivona Kučerová and Radek Šimik for patient discussion of Czech with us. (For a detailed discussion of Czech negative concord and other issues, see Dočekal 2012.)

30 Notice that the argument of dokud contains a negative marker, which in fact is obligatory. It does not appear to yield a semantic negation; rather, it seems an instance of expletive negation or possibly an element establishing a negative concord relation with until. This issue 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).
Here, a difference shows up between *dokud* and *až do*. According to speakers we consulted, (81) has a noncancelable AI but (82) does not.\(^{31}\) The tests are the usual ones; we do not 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 an RB adverbial, but it must take a clausal argument, unlike English *until*, which can take clauses or NPs. Moreover, like English *until*, in affirmative sentences *dokud* can appear only with an imperfective predicate, in which case it lacks any kind of noncancelable AI; however, when negation is present in the matrix clause, *dokud* can appear with a perfective predicate, in which case it has a noncancelable AI. *Až do* is also a bit like English *until*: it is an RB adverbial, but one whose argument can only be an NP. In affirmative sentences, it appears only with an imperfective predicate, but when negation is present, it can appear with a perfective predicate, in which case it still has a cancelable AI.

In sum, then, *dokud* behaves like English *until*: that is, it shows 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 Noncancelable AI Argument

Next we take up the other argument that *until* is lexically ambiguous: namely, that unlike *until*-d, *until*-p has a noncancelable AI. According to the literature, the following sentences are contradictions, and indeed for our consultants, they are:

\[(83) \#\text{She did not leave until 5 p.m. and maybe she didn’t leave at all.}\]

\[(84) \#\text{She did not leave until I left and maybe she didn’t leave at all.}\]

Similar tests with *until*-d do not yield such contradictions, meaning that *until*-d lacks a noncancelable AI.

\[(85) \text{She was asleep until 5 p.m. and maybe she was asleep afterwards.}\]

\[(86) \text{She was asleep until I left and maybe she was asleep afterwards.}\]

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

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

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\(^{31}\) 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 are also attested in *until*-clauses in other languages, such as Hebrew. While in Czech this negative marker is obligatory, in other languages, like Hebrew, it is optional. However, when it is present, it brings with it certain noncancelable implicatures. See Margulis 2017 and references there. See also Dočekal 2012 specifically for Czech.
Here is a first concern. Negation has been argued to create predicates with the subinterval property (e.g., Mittwoch 1977, Krifka 1989, Verkuyl 1993, de Swart and Molendijk 1994, de Swart 1996). 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 drought.
(90) For 5 weeks, no plant died. Finally, they succumbed to the extreme drought.

Intuitively, it is clear why the application of negation should yield a predicate with the subinterval property: if an interval 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 feel like contradictions. (83)–(84) would be predicted to be truthfully utterable when she did not leave before 5 p.m. or before the time of my departure and the speaker does not know what happened after 5 p.m. or after I left. A parse with *until*-p certainly would predict a contradiction, but a parse with *until*-d should be possible as well. And because *until*-d lacks any kind of noncancelable AI, these sentences should be just fine, as the mind would look for a grammatical parse (the *until*-d parse) and find the noncontradictory readings. These sentences should then (on the *until*-d parse) be able to mean that the predicate of not-leaving held until 5 p.m. or until the time of my departure, with nothing being said about what happens outside the UTS. But the truth is that (83)–(84) *are* contradictions, which means that the *until*-d parse is not possible here.

To circumvent this problem, one might adopt Giannakidou’s (2002) approach, also relying on arguments by Karttunen (1974). Giannakidou takes issue with the position that negation can create predicates with the subinterval property. So, 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, relies on the contrast between (91) and (92). If negation could change a telic predicate into a predicate with the subinterval property, (91) and (92) should behave similarly, but 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 yield 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

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32 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.
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 show in section 7.3, it is quite possible that negation does yield the subinterval property and that the reason that (91) is odd is that it nevertheless has a noncancelable AI. This means that (91) bumps into a real-world impossibility, whereas this noncancelable AI is absent in (92). And this distinction we already know.

Giannakidou (2002) presents a further argument to defend the position that negated perfectives do not have the subinterval property. Imperatives are not good with statives, as the Greek and English examples in (93) show, yet they are good with negated perfectives (94b). Hence, the argument goes, negated perfectives are not statives.

(93) a. *Gnorise tin apandisi!
    b. *Know the answer!
(94) a. Diavase to grama!
    ‘Read the letter!’
    b. Mi diavasis to grama!
    ‘Don’t read the letter!’

But here there is a confusion between stativity and the subinterval property. This confusion is very common, in fact. Predicates that are stative in Vendler’s (1957) sense (i.e., [+durative, −dynamic, −agentive], like adjectives and verbs such as love and know) have the subinterval property. But following Dowty (1979), Vlach (1981), and others, any predicate that has the subinterval property is often called “stative.” That is, by this criterion sentences like (95a–b), with the progressive, test positive for the subinterval property and are therefore called stative.

(95) a. He is building a house.
    b. She is throwing bricks.

It is clear that this notion of “stative” has nothing to do with Vendlerian stativity. What is relevant here is whether negation yields predicates with the subinterval property, not whether negation yields Vendlerian statives. Imperatives resist statives not because of their temporal properties (the subinterval property) but because statives are typically nonagentive, which violates a condition of use of imperatives whereby they must be in the control of the addressee (see, e.g., Kaufmann 2012). Once stative verbs are understood as being in the control of the hearer, an imperative is fine.

(96) Know the answer by Friday!

Therefore, the fact that imperatives do not 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 combining an imperative with a predicate that has the subinterval property is not problematic.

(97) 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 (2002) mentions two more tests from Karttunen 1974 in arguing 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.\(^{33}\) 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, (98a–b) (from Karttunen 1974:287) should both be good, but (98b) is not.

(98) a. How long did the princess sleep?
   b. *How long did the princess not wake up?

The second test is the while-test, which is also meant to distinguish predicates with the subinterval property from negated perfectives (examples from Karttunen 1974:287).

(99) I washed the dishes while you slept.
(100) I washed the dishes while you were not in the kitchen.
(101) *I washed the dishes while you didn’t wake up.

Do these two arguments by Karttunen really force us to conclude 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

\(^{33}\) Giannakidou (2002), who discusses Greek aspect and its interaction with negation in more detail, rightly shows that these tests work the same with appropriate aspectual distinctions in Greek. While her observations introduce interesting points into the debate, a discussion of Greek aspect would take us too far afield. In any event, 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.
something basic about *how long* has escaped us. This means that in light of the ungrammaticality of (102), we should not base too much on the ungrammaticality of (98b).

Further evidence that *how long* is not well enough understood is that it seems possible with predicates with which bare temporal adverbials are not possible. More specifically, it is not surprising that (103a) is good, given that (103b) is grammatical.

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

But then how is it possible that (104a) and (105a) are good, given the ungrammaticality of (104b) and (105b)?

(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 10 years.

Given this unaccounted-for behavior, we should not rely on *how long* to draw conclusions that trump the fact that on the basis of entailments, negated perfectives do test positive for the subinterval property.

Nevertheless, it would be interesting to explore what underlies the puzzling behavior of *how long* in (98b) and (102) (we leave (104)–(105) aside, as they do not involve negation and so are not directly relevant to our main narrative). One possibility is that one can explain the above contrasts by postulating that *how long* must be generated at the vP/VP or AspP level—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, (98b) 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 (98b) because *how long* requires a predicate with the subinterval property, which *wake up* lacks. But there is another factor ruling out generation of the adverb under negation and subsequent movement over it: namely, the inner island, which blocks Ā-movement of adjuncts across negation or negative elements in general (e.g., Ross 1984, Rizzi 1990). 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 (98b)), but where the negation-induced inner island blocks movement of the adverb over negation. In

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34 Such an analysis 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 such 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. And so on.

How long did Miranda NOT sleep last week?
other words, the inner island also explains the status of (102), which Karttunen’s approach cannot do.

Our point is, then, that a negated perfective may well be a predicate with the subinterval property, and that it is incompatible with how long for 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.35

One might object to this line of reasoning by saying that even though it captures some of the facts, it is not falsifiable and does not make any predictions. But this is not true. Recall sentences (87)–(90), repeated here, which show that negation can yield predicates that are compatible with for-adverbials, even though the predicates under negation are not.

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

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.36 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. And this prediction is borne out.37

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

In summary, then, the ambiguity accounts for until must 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 that otherwise, negated perfectives would be expected to combine with until-d and thereby produce a parse that lacks the noncancelable AI, contrary to fact. But as we have shown, the argument from how long is not strong enough to preclude the conclusion that negation yields predicates with the subinterval property.

35 Similar, though not identical, explorations are relevant for the while-test. But even if we do not yet have these at our fingertips, the while-test alone cannot carry the burden against the evidence from (110)–(111) and the other points made in this section.
36 We do not explore here why for how long behaves differently from how long, or has different generation possibilities, but clearly this question merits more attention.
37 Some of the speakers we consulted prefer preposition stranding here, but that is not relevant for present concerns.
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 noncancelable AI. What to do, then? We will argue that there is no until-d/until-p distinction, and that “Why can’t until-d appear in (83)–(84)?” is not a well-formed question 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 showed that basically two arguments have been made for the position that until is lexically ambiguous in English: the alleged fact that Greek (and some other languages) have a separate lexical item for until-p, and the fact that the AI is cancelable with until-d but not with until-p. We showed that the first argument does not hold. As for the second, we agree that indeed in the relevant cases, the AI is not cancelable; however, this is not straightforwardly predicted by the lexical ambiguity approach, since it is unclear why until-d cannot combine with negated perfective predicates. To resolve the latter issue, 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. As noted earlier, until-p, unlike until-d, is an NPI. It is even a strong NPI. It needs a local antiadditive environment.\(^{38}\) Downward-entailing contexts that cannot license strong NPIs—for example, few, the first argument of a universal quantifier, or the antecedent of an if-clause—cannot appear in a clause that is modified by until-p.

\[(112) \text{a. Nobody left until 5 p.m.} \\
\text{b. Nobody left until I left.}\]

\[(113) \text{a. She never left until 5 p.m.} \\
\text{b. She never left until I left.}\]

\[(114) \text{a. *Few people left until 5 p.m.} \\
\text{b. *Few people left until I left.}\]

\[(115) \text{a. *Every student who left until 5 p.m. . . .} \\
\text{b. *Every student who left until I left . . .}\]

\[(116) \text{a. *If she left until 5 p.m., . . .} \\
\text{b. *If she left until I left, . . .}\]

And there are further differences between until-d and until-p. As noted earlier, 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 is later or earlier than it turns out to be:

\(^{38}\) For the necessity of the specification local, see footnote 10.
(117) a. I expected her to sleep until 5 p.m., but she slept until 7 p.m.
b. I expected her to sleep until 5 p.m., but she slept until 3 p.m.

The same holds for overtly negated until-d.

(118) a. I expected her to sleep until 5 p.m. but she didn’t sleep until 5 p.m. She slept until 7 p.m.
b. I expected her to sleep until 5 p.m. but she didn’t sleep until 5 p.m. She slept until 3 p.m.

Things are different with until-p.

(119) a. I expected her to arrive before 5 p.m. but/and she didn’t arrive until 7 p.m.
b. #I expected her to arrive before 5 p.m. but/and she didn’t arrive until 3 p.m.

(120) I expected her to arrive before 5 p.m. and she arrived at 3 p.m.

In the contrast between (119a) and (119b), 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 (119b) and (120) are not equivalent. That is, she didn’t arrive until 3 p.m. does not merely mean ‘she arrived at 3 p.m.’. In other words, until-p does not merely yield a noncancelable 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 5 p.m., but she didn’t submit it until 6 p.m.
b. #The paper was due at 5 p.m., but she didn’t submit it until 4 p.m.

(122) a. The paper was due at 5 p.m., but it is well-known that nobody submits anything until 6 p.m.
b. #The paper was due at 5 p.m., but it is well-known that nobody submits anything until 4 p.m.

That the noncancelably 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 6 p.m. #In fact, she left at 7 p.m.

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

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

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 noncancelable AI and
BEI are not independent properties. This is where the comparison with in years becomes relevant. In sections 2–4, we argued that in years is a strong NPI with a noncancelable AI and BEI. For in years, we argued that the fact that it comes with a noncancelable AI and 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 than the other domain alternatives—specifically, 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 toward the “left” on the timeline (i.e., toward earlier time points), while until-p, being an RB adverbial, does so by aiming toward the “right” (i.e., toward later time points). Merely building references to earlier time points into the semantics of until, as for instance Giannakidou (2002) and Condoravdi (2008) have proposed, misses this larger picture.39

Moreover, we have argued that in years (as opposed to in 5 years) stretches the PTS to the left as far as is logically possible—namely, until an occurrence of the relevant event. This explains why in years has not only a BEI, but also a noncancelable AI. Similarly, assuming that until-p is a domain-widening NPI, just like in years, explains why until-p also comes with a noncancelable AI. It stretches the RB of the UTS as far as 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 noncancelable AI or BEI.

In short, the noncancelable AI and BEI of until-p are due to the same mechanisms as those of in years. In this, they both differ from their non-domain-widening counterparts, which can set their relevant boundary freely and therefore lack a noncancelable AI and BEI.40

To summarize this section, we have shown that there is much to be gained by analyzing 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 we also seem to have reached a paradox. On the one
hand, we have provided arguments showing 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 have introduced other differences between until-d and until-p that seem to provide further evidence for an ambiguity approach. Specifically, the discussion above provides strong motivation for assuming that until-p is a domain widener, but until-d is not. How can we appear to be setting the stage for a unification account, yet 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 results when an element introducing subdomain alternatives finds itself in an environment of contrastive focus under negation (following Chierchia 2013). In the absence of contrastive focus, only the introduced subdomain alternatives are at play. Under the unification account, until always introduces subdomain alternatives (as a lexical property), but the domain-widening effect only appears under contrastive focus, in which case the constellation of properties arises 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 nontrivial problems. This opens up the possibility for a unified analysis that predicts that both usages of until referred to as until-p and until-d follow. Below, we provide a particular proposal. However, even if this proposal proves to be incorrect, we hope to have shown that what is behind the inferences of until-p and in years should be analyzed 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 that we applied to in years: like in years, until-p obligatorily introduces domain alternatives, which must be exhausti-

(iv) He has written 5 books, if not more.
Moreover, as Horn (1972) points out, the boundary can be pushed in one direction only.

(v) He didn’t leave until Sunday, if not later / #if not earlier.
(Horn 1972, via Condoravdi 2008:647)
This also follows from the fact about lower bounds; it has nothing to do with until-p being an NPI, as it can also be shown to hold for numerals and until-d.

(vi) He has written 5 books, if not more / #if not fewer.

(vii) She was asleep until 5 p.m., if not later / #if not earlier.
We can devise the same type of example for in years and the like, but unsurprisingly the legitimate direction is the opposite of until’s.

(viii) I haven’t seen him in weeks, if not months / #if not days.
fied, leading to the falsity of all stronger domain alternatives. So let us assign the (simplified) semantics of (126) to (125), with \( t^0 \) a contextually set LB, 7 p.m. the RB of the UTS \( \tau \), and \( \text{Run}(e) \) the run time of an event \( e \); in other words, \( \text{Run}(e) \) and \( \text{ST} \) are different notations that refer to the same interval. The UTS is the TT.

(125) Sue didn’t arrive until 7 p.m.
(126) Given a UTS \( \tau \), such that \( \tau = [t^0, 7] \)

Assertion: \( \neg \exists e. [\text{arrive}(e, \text{Sue}) \land \text{Run}(e) \subseteq \tau] \)

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

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

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 were absent. To see this, take the (ungrammatical) positive counterpart of (126).

(128) *Sue arrived until 7 p.m.

Given the perfective in the matrix predicate, (128) should have the denotation in (129).

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

Assertion: \( \exists e. [\text{arrive}(e, \text{Sue}) \land \text{Run}(e) \subseteq \tau] \)

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

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

In the case of (128), two concrete domain alternatives are (131a–b).

(131) a. \( \exists e. [\text{arrive}(e, \text{Sue}) \land \text{Run}(e) \subseteq [t^0, 6]] \)
   b. \( \exists e. [\text{arrive}(e, \text{Sue}) \land \text{Run}(e) \subseteq [6, 7]] \)

Now, if an event took place between 6 p.m. and 7 p.m., or between \( t^0 \) and 6 p.m., it also took place between \( t^0 \) and 7 p.m. This means that the alternatives in (130)/(131) are stronger than (129); that is, 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) \( \neg \exists e. [\text{arrive}(e, \text{Sue}) \land \text{Run}(e) \subseteq [t^0, 7]] \)

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 (2013) and Gajewski’s (2002, 2011) system makes (128) ungrammatical: the demands that until-p brings with it can
never be satisfied in this sentence, yielding ungrammaticality. This explains why \textit{until-p} can only
be used with negated predicates.

7.2 Until-\textit{d} Is Until-\textit{p}

In the previous section, we analyzed \textit{until-p} along the lines of our analysis of \textit{in years}. At first
blush, \textit{until-d} looks different from \textit{until-p}, since unlike the latter, \textit{until-d} can appear in both
positive and negative sentences.

(133) a. Miranda was reading \textit{Anna Karenina} until yesterday.
b. Miranda wasn’t reading \textit{Anna Karenina} until yesterday.

So one option would be to keep the lexical ambiguity hypothesis “minimal” in some way and
postulate that \textit{until-d} is the polarity-insensitive counterpart of \textit{until-p}. This would still be a
semi–lexical ambiguity of sorts, as \textit{until} would be described as optionally introducing subdomain
alternatives. With the idea that the difference between \textit{until-d} and \textit{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 a noncancelable AI and BEI
will only accompany \textit{until-p}. However, just like the other lexical ambiguity accounts, this one
does not derive one important fact: that polarity-insensitive \textit{until} (i.e., \textit{until-d}) can only modify
predicates with the subinterval property, while polarity-sensitive \textit{until} can modify predicates without
the subinterval property. If polarity-insensitive \textit{until} could appear with predicates without the
subinterval property, (134) should be good and have the meaning in (135), contrary to fact.

(134) *She broke a glass until 7 p.m.

(135) Given a UTS $\tau$, such that $\tau = [t^0, 7]$
Assertion: $\exists e. [\text{break}(e, \text{Sue, glass}) \land \text{Run}(e) \subseteq \tau]$

If \textit{until-d} was just the polarity-insensitive counterpart of \textit{until-p}, and no further restriction, aspec-
tual or otherwise, set it apart from \textit{until-p}, nothing would rule (134) out. Even though this hypothe-
sis would correctly predict the absence of the noncancelable AI or BEI for \textit{until-d}, it would not
capture the aspecual restriction of \textit{until-d} to predicates with the subinterval property and of \textit{until-}
p to predicates without it. So we conclude that the view that \textit{until-d} is simply nonpolarity \textit{until}
cannot be correct and a different approach is needed.

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

On this proposal, then, (136) has the meaning in (137).

(136) Miranda was reading \textit{Anna Karenina} until yesterday.
(137) Given a UTS \( \tau \), such that \( \tau = [t^0, \text{yesterday}] \)
Assertion: \( \exists e. [\text{read}(e, \text{Miranda}, \text{AK}) \land \tau \subseteq \text{Run}(e)] \)

The imperfective contributes that the TT (here, the UTS) is a subset of the ST (the event of reading \textit{Anna Karenina}). In other words, the imperfective contributes the ‘\( \tau \subseteq \text{Run}(e) \)’ part. Hence, the UTS is “filled” with \textit{Anna Karenina}–reading.\(^{41}\)

Given that now the subinterval property holds of the predicate, it follows that all subdomain alternatives of (137) are actually entailed by the assertion. If Miranda has been reading \textit{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 \textit{until}-d is actually \textit{until}-p. This brings us one step closer to a unification analysis.

Now let us look at negated \textit{until}-d sentences to see whether \textit{until} can also be analyzed here under the unified approach. Consider (133b) again, repeated here.

(138) Miranda wasn’t reading \textit{Anna Karenina} until yesterday.

Recall that such sentences are ambiguous between the \textit{throughout-not} and \textit{not-throughout} readings and that this results from negation taking scope under or over \textit{until}-d. Recall also that in both cases, the matrix predicate has the subinterval property because the imperfective yields the relationship in which the TT (here the UTS \( \tau = [t^0, \text{yesterday}] \)) is contained inside the ST.

We noted earlier that the \textit{throughout-not} reading involves low scope of negation.\(^{42}\)

(139) Given a UTS \( \tau \), such that \( \tau = [t^0, \text{yesterday}] \)
Assertion: \( \exists e. [\neg \text{read}(e, \text{Miranda}, \text{AK}) \land \tau \subseteq \text{Run}(e)] \)

---

\(^{41}\) For examples with a stative predicate, as in (i), the same considerations apply that apply to the examples with the imperfective.

(i) John has (not) been here until 7 p.m.

However, lexically stative elements like \textit{be here} raise the question of whether their “imperfective” property, basically the subinterval property, is the result of their lexical semantics or of the functional layer of the imperfective. For English, it can be claimed, and has been, that the subinterval property is part of its lexical semantics (Dowty 1979). However, if one looks at other languages, it quickly becomes 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, we must revisit the issue of whether the subinterval property of stative predicates like \textit{be here} is indeed a property of their lexical semantics or of an unpronounced imperfective layer above them. To avoid resolving this issue (which is orthogonal to present concerns), we use an example where the “imperfective” properties are clearly due to the functional category of imperfective.

\(^{42}\) Note that we have created a negated eventuality here, “not-be-reading \textit{AK}.” We refer only to negated events in this article, not to negative events. As a reviewer points out, if we were to include negative events in our discussion, we would obtain the negative event of “not-reading-\textit{AK}” holding at an interval, which would be too weak a reading, as it would be true of an interval in which I am involved in something completely different, such as running a marathon. We therefore do not discuss negative events and instead focus only on negated events.

Regarding (139), the order imperfective > negation > VP may well be a necessary ingredient for any speaker for whom \textit{throughout-not} is the result of \textit{until} scoping over negation (Condoravdi 2008 and references therein). The details of 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.
Wide scope negation, on the other hand, yields the *not-throughout* reading.

(140) Given a UTS $\tau$, such that $\tau = [t^0, \text{yesterday}]$

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

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

(141) $\{ \exists e. [\neg \text{read}(e, \text{Miranda, AK}) \land \tau' \subseteq \text{Run}(e)] \mid \tau' \subseteq \tau \}$

If throughout the entire interval Miranda has not been reading AK, she has not been reading it in any subinterval either, so no domain alternative in (141) is stronger than the assertion. Exhaustification 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 nonweaker than (140).

(142) $\{ \neg \exists e. [\text{read}(e, \text{Miranda, AK}) \land \tau' \subseteq \text{Run}(e)] \mid \tau' \subseteq \tau \}$

If Miranda was not 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 any larger interval either. Negating these stronger alternatives would entail that in every smaller subinterval of interval $\tau = [t^0, \text{yesterday}]$, Miranda has been reading *Anna Karenina* throughout, which contradicts the original assertion that Miranda reading *Anna Karenina* does not hold throughout the entire UTS $\tau = [t^0, \text{yesterday}]$.

But there is another possible parse 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 below it (which yields the *throughout-not* reading) and the fact that in imperfectives the subinterval 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 of where exhaustifiers may appear in the structure).43

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

Next, exhaustify the obligatorily introduced alternatives of (143).

---

43 And given that exhaustification after the application of negation yields a contradiction, it is not just possible, but necessary, to exhaustify before applying negation.
As seen before, this exhaustification takes place vacuously. No domain alternative in (144) is stronger than the assertion. Consequently, EXH((143)) is identical to (143). As a final step, negation applies to the exhaustified (143) and the result is (140).

In 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).

Both alternative scopal construals will yield the contradiction as well, and thus will indeed not be available. For (146a), the domain alternatives are nonweaker. If there was a nonarriving event in a time interval smaller than \( \tau = [t^0, 7] \), then there was a nonarriving 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 is negated in \( \tau = [t^0, 7] \), but not in any smaller subinterval of \( \tau \), a clear contradiction. Similarly, as we showed 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 (a) NEG > EXH > UNTIL, (b) EXH > NEG > UNTIL, and (c) EXH > UNTIL > NEG. As shown above, (a) is the only available scopal construal for until modifying a negative perfective predicate, and (b) and (c) are the only available scopal construals for until modifying a negative imperfective predicate. In addition, positive imperfectives can be modified by until. These are indeed the facts we want to derive and that we can derive with our unified analysis for until.

So far so good! The unification approach seems to work. But a big question remains. When we were still talking about until-d and until-p, we showed that the latter has a BEI and a noncancelable 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 we laid out in section 4. We also showed that the noncancelability of the AI and other inferences of in years follows from the fact that in years is a contrastively focused NPI and
therefore a domain widener. This opens up the following possibility: the fact that until sometimes comes with a noncancelable AI and BEI and sometimes does not, despite always introducing domain alternatives, results from the fact that sometimes it is contrastively focused, in which case it functions as a domain widener and the inferences are present, and sometimes it is not contrastively focused, in which case the inferences are absent. If the usage of until that is known as until-p has the domain-widening property, the BEI and the noncancelable 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 in years under our treatment, its RB can only be set by the moment the relevant event takes place.

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

We argue that the answer to this lies in the interaction among negation, the exhaustifier, and until. The three grammatical examples in (147) all involve an exhaustifier, and the ones in (147b) and (147c) involve 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 noted in the previous section, given that the exhaustifier must scope over until, in principle the following scopal orders are possible:

(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 above.

The order in (148a) is the one the literature calls until-d (in positive sentences), as in (147a). The order in (148b) is the one the literature calls until-p, as in (147b). The orders in (148c1–2) are the ones the literature calls the throughout-not reading and the not-throughout reading, the two readings (147c) 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 the exhaustifier cannot apply to these alternatives first. Then, the only configuration where negation has immediate scope over (unexhaustified) until is (148b). This means that only in (148b) can until receive contrastive focus under negation. Then, only in (148b) can until be a domain widener. In (148a) and (148c1–2), it can never be a domain widener. The reason is that in (148a) and (148c1–2), 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. In this way, it follows that only those instances of until that the literature calls until-p yield the BEI and the noncancelable AI.
So we have captured why what the literature calls *until*-p gives rise to the BEI and the noncancelable AI. We have not captured why it must do so, however. In other words, it does not yet follow why this *until* must be contrastively focused when it directly scopes under negation. If it were only optionally contrastively focused, it would only optionally be a domain widener and the BEI and the noncancelable AI would not necessarily emerge. Note, however, that the same question arises in the case of *in years*, where we accepted, following Chierchia (2013), that *in years* is always emphatic and therefore always contrastively focused (see section 4). If we assume that *until* is also always used emphatically, so that when it appears under the direct scope of negation it becomes contrastively focused under negation and therefore a domain widener, everything follows.\(^{44}\)

If this is indeed correct, not only does it follow why only those instances of *until* that the literature calls *until*-p can yield the BEI and the noncancelable AI—it also follows why they must do so. We conclude, then, that a unification approach to English *until* is possible and that the duality of its behavior 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 in Chierchia’s (2013) terms, an item needs to introduce domain alternatives, be contrastively focused, and be in the scope of a downward-entailing operator. Under our proposal, *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 have shown, these are the (affirmative) cases of *until*-d. *Until*-d then satisfies only two of Chierchia’s three conditions for being a domain widener and therefore fails to be one (hence no AI or BEI). *Until*-p satisfies all three conditions and thus is indeed a domain widener.

Note that the distinction between (91) and (92), repeated here, also follows. These examples were taken to question the fact that negation can 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, given that it is a negated perfective, (149) has the scopal construal in (148b), where *until* takes scope below negation and the exhaustifier and is therefore a domain widener, yielding a noncancelable AI. The subinterval property arises at a later stage of the derivation, after negation

\(^{44}\) As mentioned earlier, Edward Flemming (pers. comm.) points 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 *until* and *in years* must be in the scope of negation and therefore appear at the right edge of the clause, the stress contour they receive would be the same whether stress is present or absent.

Alternatively, as suggested by Yael Greenberg (pers. comm.), it could also be possible that *until* is lexically restricted to introduce all contextually salient domain alternatives as its domain alternatives. This would indeed also derive the desired result.
has applied and the noncancelability of the AI is determined. This noncancelability of the AI renders the sentence odd. In (150), by contrast, there is no negation, so *until* cannot act as a domain widener and the noncancelable AI is not derived.

### 8 Comparing *In Years* and *Until*

Given our assimilation of *until* to *in years*, the question naturally arises 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 appear only with negated predicates and not with affirmative predicates with the subinterval property. If (151a) and (151b) are alike, why is there a contrast between (152a) and (152b)?

\[
\begin{align*}
(151) & \quad \text{a. He didn’t break the glass until 7 p.m.} \quad (\text{negated predicate} + \text{*until}) \\
& \quad \text{b. He hasn’t broken a glass in years.} \quad (\text{negated predicate} + \text{in years}) \\
(152) & \quad \text{a. He was asleep until 7 p.m.} \quad (\text{affirmative predicate} + \text{until}) \\
& \quad \text{b. *He has been asleep in years.} \quad (\text{*affirmative predicate} + \text{in years})
\end{align*}
\]

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*. The latter class of adverbials is compatible only with the E-perfect, not the U-perfect (regarding which, see section 1).

(153) He has been sick in the last 5 years. \quad (\text{E-perfect}; \text{*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. To begin with, this means that (152b) is out as a U-perfect. However, this is not enough to derive the ungrammaticality of (152b). For that, we would have to exclude the E-perfect reading of this sentence as well. 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, (152b) is ungrammatical because the existential and universal readings of the perfect are independently ruled out.

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

\[
\begin{align*}
(154) & \quad \text{a. EXH > IN YEARS} \\
& \quad \text{b. EXH > NEG > IN YEARS} \\
& \quad \text{c1. EXH > IN YEARS > NEG} \\
& \quad \text{c2. NEG > EXH > IN YEARS}
\end{align*}
\]
The grammatical order for *in years* is (154b), where *in years* is contrastively focused in the immediate scope of negation.

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

This leaves (154c1–2). Recall that for *until*, this represents the negated “*until*-d” readings: *not-throughout* in (148c1) and *throughout-not* in (148c2). That is, these are 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 “*until*-d” cases, which lack a noncancelable AI and BEI. The boundary adverbial *in years* lacks such readings. Its AI is never cancelable (recall Constant’s observation).

So how do we exclude (154c1–2) 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* is it 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 called *until*-p can appear. However, *in years* cannot appear in the scopal configurations in which what was traditionally called *until*-d can appear, because of its own, independent aspectual restrictions.45

### 9 A Possible Counterexample

In sections 5–7 we set out to explain the noncancelable AI of what has been called *until*-p, and we provided a unified account of *until*. In other words, we followed previous literature and accepted the existence of such a noncancelable AI.

In this section, we discuss a potential counterexample to the noncancelable AI of *until*-p, which is presented in de Swart 1996. On the basis of (155)–(156), both containing the future modal *woll*, de Swart argues that the AI of *until* is actually cancelable.

---

45 One wonders whether it is possible to duplicate a context with *definitely/certainly* for *until* as we did for *in years* in section 1. 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 7 p.m.

We have actually found a few speakers who accept (i), but we have indeed also found some for whom it is degraded compared with 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 7 p.m.

Given the degraded status of (ii), it is not surprising that (i) would also be degraded. But why (ii) is degraded, we do not know; we will leave this as an open question.
(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, given its embedding and the presence of would, (155) does not provide an argument for cancelability. 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, and we believe it opens up two possible paths, one because it contains an ‘if at all’ continuation, the other because it contains a future.

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

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

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

(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 ones with a past in the matrix—specifically, sentences with a future. And there we will see that the AI indeed appears cancelable (which means that there are indeed two paths to the cancelability of the AI in de Swart’s (156)).

That the AI of a negated perfective with until is cancelable with the future may be a strange conclusion; also, it appears that the same facts hold in Czech. In the examples in section 5.2.1.2 with dokud, all of which contain past tense (and negation) in the matrix, the AI is not cancelable, but in (161) the AI is cancelable, just as in English (160).

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

46 With the present tense, only the futurate seems possible; that is, the sentences talk about the existence of a plan (see Copley 2008).

(i) She is asleep until 5 p.m.

(ii) She is not leaving until 5 p.m.
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 is not (either in English or 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 the matrix contains a future? What is the difference between (160)/(161) and (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 noncancelable AI is satisfied in a world other than the actual one. In that world, she will indeed marry such a man. A similar outcome 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, 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 cancelable 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 (see Landman 1992; and see Arregui, Rivero, and Salanova 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 the relevant accounts, in (163) the event of crossing the street is completed in a world other than the actual one. 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 branching-futures model permits the AI to be realized in some branches but not in others. The sentence 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 noncancelable 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 we have looked at so far, the argument of *until was a point (*until 5 p.m., *until I left). In this section, we will look at more complex sentences, including ones in which *until’s argument is a clause. Specifically, *until takes three types of arguments: NP names of intervals (*until 1991, *until World War II); imperfective clauses, that is, 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 of the UTS. Indeed, we will show 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.47

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

(168) She was asleep until 5 p.m. / I left.

(169) a. .................. 5 p.m. .................. UT
    __________sleep__________|_{RB}

   b. .................. I leave .................. UT
    __________sleep__________|_{RB}

The imperfective has the temporal specification TT ⊆ ST. We treat the UTS as the topic time (following von Fintel and Iatridou 2019 for the PTS), so a sentence like (168) asserts that the UTS (whose RB is 5 p.m. or the moment at which I leave) is fully contained in the time of her sleeping. This is how we get the reading of what has traditionally been called (affirmative) *until-d: the predicate holds throughout the UTS.

47 We treat English statives as either containing or being identical temporally to the imperfective; in Czech, such predicates have a visible imperfective (see footnote 41).
Now let’s insert 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, not until she merely started reading Anna Karenina. That is, the RB of the UTS is the completion subinterval of the Anna Karenina–reading.

(170) She was unhappy until she read Anna Karenina.

(171) ........................................ |~~AK~~| ........................................ UT
       ________unhappiness______________|RB

To derive (171), we follow Iatridou (2014) and von Fintel and Iatridou (2019) in that temporal adverbials like until, since, and after contain a definite description over intervals, and that definite descriptions pick out the maximally informative interval.48 This means that in (171), the argument of until picks as the 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 ⊆ ST, and so on. 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 these sentences, we understand the happiness to have lasted not until the end of the working at the grocery store or the end of the disease, but rather until the beginning.

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

(175) ........................................ |~~~working at grocery store~~~~
       ________happiness______________|RB

Again, the reason is 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.

So far, the examples have had an imperfective in the matrix. Now let us look at negated perfectives in the matrix (the range of what has been called until-p). What is the temporal interpretation of the relevant sentences? (176) has a noncancelable AI, which means that War and Peace is read at some point. English and Czech speakers report that in (176) and the Czech equivalent, the reading of War and Peace follows the complete reading of Anna Karenina.

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48 The idea of definiteness as maximal informativity was generalized to nontemporal descriptions in von Fintel, Fox, and 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*’ is an imperfective-marked predicate, then this case would be similar to (171)–(172), where the matrix imperfective predicate lasts until the final subinterval of *Anna Karenina*–reading. Similarly in (176), the ‘nonreading *War and Peace*’ predicate lasts until the final subinterval of *Anna Karenina*–reading. Given the noncancelable AI, *War and Peace* ends up being read outside of the UTS, that is, to the right on the timeline of the interval in which *Anna Karenina* was read. Moreover, given the discussion of the most informative interval, the inference is that *War and Peace* is read upon completion of *Anna Karenina*, that is, (putting issues of density aside) at the interval closest to the endpoint of the *Anna Karenina*–reading.

This appears to work, but one step was ignored: the matrix predicate in (176) is not marked morphologically imperfective, the way the matrix predicate in (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, 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 predicate, the TT (in this case, the UTS) is one of the subintervals over which the matrix predicate holds. The absence of a morphological imperfective does not come into play.

For space reasons we do not discuss this topic in more detail here. Obviously, more complexities and intricacies in the combination of lexical aspects can be involved. However, we hope that the general direction of the relevant intuitions is clear and that we have laid the foundations from which further and more sophisticated questions about the possible temporal interpretations can be asked.

11 Why Strong?

Our unified approach to *until* partially relies on our analysis of *in years*. We built on many similarities between these two elements. 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 antiadditive environments will support them. Is it a coincidence that *in years* and *until* are both strong NPIs? A few attempts have been made in the literature to account for the differences between strong and weak NPIs; we will discuss one of these below. However, these accounts 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 section, 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 the window toward a better understanding of which NPIs are strong and which are weak.

Gajewski (2011) and Chierchia (2013), following Krifka (1995), take the weak/strong distinction to lie in whether the exhaustifier looks only at the assertion of the NPI licenser or whether
it also looks at its presuppositions and/or implicatures. 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.

We will 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 nonasserted inference? If the semantics of few were ‘not many of, but some’, nothing about (178b) would follow from the context in (178a).

(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 (178b) does follow, which means that ‘but some’ should be a (cancelable) inference. But this means that the semantics of few is just ‘not many of’, not ‘not many of, but some’.\(^{49}\) And this is a good thing: if the semantics of few were ‘not many of, but some’, we would not be able to understand why it licenses NPIs, which it does.

(179) a. Few MIT students have ever been to Antarctica.
   b. Few Göttingen students have eaten anything with saffron in it.

The reason why few would not be able to license NPIs if it meant ‘not many of, but some’ is that it would not be 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 the quantifier’s semantics and not at its pragmatic inferences, the environment can remain DE and it can shield the quantifier from yielding a contradiction (and thereby from ungrammaticality).\(^{50}\)

So NPIs like ever and any are fine even when there are existential inferences that 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 nonasserted component.

\(^{49}\) A further piece of evidence that the meaning of few is not ‘not many of, but some’ is the fact that (i) is not a contradiction, unlike (ii).

(i) Few, if any, students will graduate this year.
(ii) *Many/Some, if any, students will graduate this year.

\(^{50}\) Now one might ask why elements like few trigger existential inferences (not many but some). The reason, arguably, 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.
On the other hand, there are NPIs that do not survive in environments with pragmatic existential inferences. These are the strong NPIs. For strong NPIs, there should be no existential inferences whatsoever, not even in nonasserted content. This explains the contrast between *No students have been there in years* and *Few students have been there in years.* Another way to say this is that with strong NPIs, EXH operates also on nonasserted 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 endpoints. Hence, the only DE elements that do not give rise to such non-DE implicatures are scalar endpoints like *not, nobody, never, no X,* and the like. Such DE elements are antiadditive. (For details of this argumentation, see Gajewski 2011.)

In summary, NPIs in antiadditive contexts do not trigger a contradiction even if the exhaustifier looks at the enriched meaning contribution of its complement. For Gajewski (2011) and Chierchia (2013), this then captures the difference between strong and weak NPIs. Crucial for present 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 whose 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) has already shown that the oddity of (180) follows from the fact that when its presupposition is exhaustified, a contradiction arises (for the same reason that a contradiction arises in his example (44a) above).

(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. Exhaustifying 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 an implicature that *some students have been there in years* and this implicature must be exhaustified, a contradiction arises as well (as the implicature does not provide a DE context). Since strong NPIs require that exhaustification apply at every level of

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51 Gajewski (2011) points out that on its proportional reading, *few* may be considered a scalar endpoint and therefore not give rise to an existential inference (see footnote 50). In such cases, it is correctly predicted that *few* can license strong NPIs.

52 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 to *Only John has said something in weeks.*
meaning contribution of the context they appear in, strong NPIs cannot appear under the direct scope of few.

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—that is, 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.

\[(181)\]  
\[
\begin{align*}
&\text{a. I have been there in the last 5 years.} \\
&\text{b. There is a PTS } [t, UT], \text{ such that within } [t, UT] \text{ I have been there.}
\end{align*}
\]

\[(182)\]  
\[
\begin{align*}
&\text{a. I haven’t been there in the last 5 years.} \\
&\text{b. There is a PTS } [t, UT], \text{ such that within } [t, UT] \text{ I haven’t been there.}
\end{align*}
\]

\[(183)\]  
\[
\begin{align*}
&\text{a. Have you been there in the last 5 years?} \\
&\text{b. There is a PTS } [t, UT], \text{ and I wonder whether within } [t, UT] \text{ you have been there.}
\end{align*}
\]

\[(184)\]  
\[
\begin{align*}
&\text{a. If you have been there in the last 5 years, . . .} \\
&\text{b. There is a PTS } [t, UT], \text{ and if it is the case that you have been there within } [t, UT], \text{ . . .}
\end{align*}
\]

The same facts 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 is not licensed in positive sentences, questions, or *if*-clauses. But if *in the last 5 years* and *in years* behave alike in this way, then it follows that the introduction of domain alternatives does not come from the assertion; instead, it comes 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 holds for *until*. The same diagnostics show that the UTS of *until* is also presupposed and not asserted.

\[(185)\]  
\[
\begin{align*}
&\text{a. I lived there until 2010.} \\
&\text{b. There is a UTS } [t, 2010], \text{ such that within } [t, 2010] \text{ I lived there.}
\end{align*}
\]

\[(186)\]  
\[
\begin{align*}
&\text{a. I didn’t leave until 2010.} \\
&\text{b. There is a UTS } [t, 2010], \text{ such that within } [t, 2010] \text{ I didn’t leave.}
\end{align*}
\]

\[(187)\]  
\[
\begin{align*}
&\text{a. Did you live there until 2010?} \\
&\text{b. There is a UTS } [t, 2010] \text{ and I wonder whether within } [t, 2010] \text{ you lived there.}
\end{align*}
\]

\[(188)\]  
\[
\begin{align*}
&\text{a. If you lived there until 2010, . . .} \\
&\text{b. There is a UTS } [t, 2010] \text{ and if it is the case that you lived there within } [t, 2010], \text{ . . .}
\end{align*}
\]
We do not think that the fact that *in years* and *until* are strong NPIs (i.e., elements that introduce domain alternatives that must be exhaustified at every level of meaning contribution), and the fact that their PTS/UTS is presupposed, are 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 the 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 look not only 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 by Homer (2008, 2009), that strong NPIs are sensitive to all non-truth-conditional meaning because they are somehow more “pragmatic” in nature (see 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 strong NPIs.

But this should not only apply to boundary adverbials like *in years* and *until*. If the above suggestions are on the right track, we predict that other NPIs that presuppose (as opposed to assert) the existence of a 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. Whether there are any counterexamples remains to be seen.

12 Conclusions

In this article, 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 setting the LB, while *until* stretches its time span (the UTS) by setting the RB. We argued that in both cases, two noncancelable implicatures arise: the AI and the BEI.

We argued that the noncancelable AI is the result of conflicting requirements on these adverbials: on the one hand, they must set their respective boundary; on the other hand, they must set it as far as possible. This conflict is resolved by setting the boundary at the farthest 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 span) 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 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’s (2011) argument that the difference between weak and strong NPIs is that in the latter case, exhaustification applies to non-truth-conditional material.
There are also differences between *in years* and *until*, the most notable being that unlike *in years*, *until* also has usages in which it does not behave as a domain widener, does not have a noncancelable AI and BEI, and is even acceptable in affirmative sentences. This duality has given rise to proposals for a lexical ambiguity, which was assumed to be supported as well by crosslinguistic arguments. We showed that the crosslinguistic arguments are not fully sound and instead proposed 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, because it cannot combine with a U-perfect, *in years* lacks certain interpretive possibilities displayed by *until*, which can freely combine with predicates with the subinterval property.

The last difference that we broached is that with *until*, one can detect elements of modality, possibly because it stretches toward the future, not toward the past as *in years* does.

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